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Growth and productivity of potato as influenced by cultivar and reproductive growth: I. Stomatal conductance, rate of transpiration, net photosynthesis, and dry matter production and allocation/T.

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Scientia Horticulturae, Volume 105, Issue 1, 30 May 2005, Pages 13-27, ISSN 0304-4238, DOI: 10.1016/j.scienta.2005.01.029.

(<http://www.sciencedirect.com/science/article/pii/S0304423805000464>)

Abstract:

The effect of cultivar and reproductive growth on leaf gas exchange, water relations, dry matter production and allocation in potato was the subject of investigation. Debudded, flowering and fruiting plants of cultivars Al-624, Al-436, CIP-388453-3(A) and CIP-388453-3(B) were evaluated under field condition of a sub-humid tropical highland of Ethiopia during 2003. Cultivars exhibited differences with respect to leaf stomatal conductance, rate of transpiration and net photosynthesis rate. Cultivars Al-624 and CIP-388453-3(A) showed higher stomatal conductance and rate of leaf transpiration than CIP-388453-3(B) and Al-436. CIP-388453-3(A) exhibited higher net photosynthesis than Al-624 while Al-436 is intermediate. Fruiting plants had higher leaf stomatal conductance and higher rate of leaf transpiration and net photosynthesis. Fruit development promoted early plant maturity and without affecting total dry matter production it reduced the amount partitioned to the leaves, stems, and tubers. The experiment demonstrated that cultivar and fruit development influence on water relations, rate of net photosynthesis and source-sink interactions in the potato.

Keywords: Assimilate partitioning; Berry set; Photosynthesis; Potato; Stomatal conductance; Transpiration

Different irrigation methods and water stress effects on potato yield and yield components/Sermet Onder, Mehmet Emin Caliskan, Derya Onder, Sevgi Caliskan,

Agricultural Water Management, Volume 73, Issue 1, 20 April 2005, Pages 73-86, ISSN 0378-3774, DOI: 10.1016/j.agwat.2004.09.023.

(<http://www.sciencedirect.com/science/article/pii/S0378377404002720>)

Abstract:

This research was conducted during the spring seasons of 2000 and 2002 in Hatay province located in the East Mediterranean Region of Turkey. The research investigated the effects of two drip irrigation methods and four different water stress levels on potato yield and yield components. The surface drip (SD) and subsurface drip (SSD) irrigation methods were used. The levels were full irrigation (I100), 66% of full irrigation (I66), 33% of full irrigation (I33) and un-irrigated (I0) treatments. Five and three irrigation were applied in 2000 and 2002 early potato growing seasons, respectively. Total irrigation amount changed from 102 to 302 mm and from 88 to 268 mm in 2000 and 2002, respectively. Seasonal evapotranspiration changed between 226 and 473 mm and 166 and 391 mm in 2000 and 2002, respectively. SD and SSD irrigation methods did not result in a significant difference on yield. However, SD method has more advantages than SSD method, which has difficulties in replacement and higher system cost. Irrigation levels resulted in significant difference in both years on yield and its components. Water stress significantly affected the yield and yield

parameters of early potato production. Water deficiency more than 33% of the irrigation requirement could not be suggested. Water use efficiency (WUE) of SD irrigation methods had generally higher values than SSD irrigation methods. Treatment I33 gave maximum irrigation water use efficiency (IWUE) for both years. SSD irrigation method did not provide significant advantage on yield and WUE, compared to SD irrigation in early potato production under experimental conditions. Therefore, the SD irrigation method would be recommended in early potato production under Mediterranean conditions.

Keywords: Drip irrigation; Mediterranean region; Potato; Water stress

Production of mouse adiponectin, an anti-diabetic protein, in transgenic sweet potato plants/Thomas Berberich, Toshiyuki Takagi, Atsushi Miyazaki, Motoyasu Otani, Takiko Shimada, Tomonobu Kusano, *Journal of Plant Physiology*, Volume 162, Issue 10, 14 October 2005, Pages 1169-1176, ISSN 0176-1617, DOI: 10.1016/j.jplph.2005.01.009. (<http://www.sciencedirect.com/science/article/pii/S017616170500074X>)

Abstract:

Adiponectin is a 30 kDa protein exclusively produced and secreted from adipocytes and as a cytokine has been found to link obesity, insulin resistance, and type 2 diabetes. Production of biologically active adiponectin in large scale is desirable for pharmaceutical applications. Mouse adiponectin cDNA was used for developing transgenic sweet potato plants via *Agrobacterium*-mediated transformation. The presence of the transgene was verified by PCR and DNA gel blot analysis. Further investigated were five independent transgenic lines, all of which expressed high levels of adiponectin mRNA. Immuno blot analysis with a mouse adiponectin antiserum revealed that, in addition to a 29 kDa-protein which co-migrates with the adiponectin protein produced in *Escherichia coli* cells, a 31 kDa-protein was produced, indicative of a post-translational modification of the protein. The transgenic plants did not show obvious differences in growth rate and morphology in response to adiponectin production.

Keywords: Adiponectin; *Agrobacterium*-mediated transformation; Diabetes; *Ipomoea batatas*; Transgenic plant

Increasing potato yields with additional water and increased soil temperature/Xiao-Ling Wang, Feng-Min Li, Yu Jia, Wen-Quan Shi *Agricultural Water Management*, Volume 78, Issue 3, 5 December 2005, Pages 181-194, ISSN 0378-3774, DOI: 10.1016/j.agwat.2005.02.006. (<http://www.sciencedirect.com/science/article/pii/S0378377405001010>)

Abstract:

Many water saving practices have been adopted to dryland crop production such as in semiarid loess regions of China. In the present study, a field experiment was conducted to examine the yield promotion of potato crops cultivated with in plastic-covered ridges and supplied with water from a furrow rainfall harvesting (PRFRH) system. The experiment included seven treatments: (1) 30 cm wide ridge covered with plastic film (P30), (2) 45 cm wide ridge covered with plastic film (P45), (3) 60 cm wide ridge covered with plastic film (P60), (4) 30 cm wide ridge without covering (B30), (5) 45 cm wide ridge without covering (B45), (6) 60 cm wide ridge without covering (B60), (7) soil surface flat without covering (B0). The PRFRH system increased temperature and availability of nutrients in the ridges, and maintained soil moisture in ridges. It promoted crop growth during the early period and diminished water stress at the later stages of potato growth. Potato yield as well as the water use efficiency in the PRFRH

system was significantly ($P < 0.01$) higher than in the other systems. The best ridge width was between 40 and 45 cm.

Keywords: Plastic mulch; Potato; Rainwater harvesting; Ridge and furrow; Semiarid region

Cloning and characterization of a cytosolic isoform of triosephosphate isomerase developmentally regulated in potato leaves/Sonia Dorion, Parveen, Julie Jeukens, Daniel P. Matton, Jean Rivoal, *Plant Science*, Volume 168, Issue 1, January 2005, Pages 183-194, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2004.07.029. (<http://www.sciencedirect.com/science/article/pii/S0168945204003644>)

Abstract:

A full-length cDNA encoding a triosephosphate isomerase (TPI) was cloned from the wild potato *Solanum chacoense*. Sequence analysis showed that the cDNA has high levels of homology to sequences coding for cytoplasmic TPIs (cTPIs) and lower homology to plastidic TPI (pTPI) sequences. A specific polyclonal antiserum was generated against recombinant (6 x His) epitope-tagged cTPI expressed in *Escherichia coli*. In *Solanum tuberosum* this immune-serum recognized a single TPI polypeptide present in crude leaf extracts while an antigenic signal was not evident in purified chloroplasts. Immunoblot analysis demonstrated that cTPI was distributed in all vegetative and reproductive tissues. TPI activity was followed over a 3 months time course encompassing the whole development of potato plants. Activity expressed on a fresh weight basis was significantly higher in expanding leaves compared to mature and senescing leaves during the course of the experiment. Consistent with this, there was a gradient of TPI activity and cTPI protein along the shoot axis with the highest levels found in the youngest tissues. Analysis of TPI isoforms profiles by anion exchange chromatography demonstrated that (i) photosynthetic and non-photosynthetic tissues express 2 TPI isoforms and (ii) cTPI always represents the bulk of extractable TPI activity. Of all tissues surveyed, expanding leaves had the highest cTPI to pTPI ratio. The results are discussed in relation to the hypothesis that leaf cTPI plays a role in growing tissues, where glycolysis and respiration fulfill a key function in production of energy and C skeletons for biosynthetic purposes.

Keywords: Triosephosphate isomerase; Potato; Glycolysis; Carbohydrate metabolism; Plant development; Triose phosphate

Influence of a flavonoid (formononetin) on mycorrhizal activity and potato crop productivity in the highlands of Peru/Fred T. Davies Jr., Constantino M. Calderon, Zosimo Huaman, Rene Gomez, *Scientia Horticulturae*, Volume 106, Issue 3, 3 October 2005, Pages 318-329, ISSN 0304-4238, DOI: 10.1016/j.scienta.2005.04.013. (<http://www.sciencedirect.com/science/article/pii/S0304423805001597>)

Abstract:

Mycorrhizal fungi serve as biofertilizers, reduce plant stress, and can increase plant productivity. Since the potato originated from the highlands of Peru and Bolivia, a goal of this research was to utilize indigenous Peruvian mycorrhizal populations to enhance crop productivity in a subsistence production site. The field study was also conducted to test the effectiveness of the flavonoid, formononetin, to stimulate native mycorrhizal activity and subsequent yield of six Andean potato (*Solanum tuberosum* L.) cultivars. The subsistence site was located at an altitude of 3900 m (61 kPa) in San Jose de Aymara (Department of Huancavelica), in the central highlands of Peru. This is

approaching the highest altitude in the world that potatoes are grown. The site had a sandy-loam soil with pH 3.6, low phosphorus (P) availability and high aluminum (Al). Tubers were planted in November 1999, and grown during the rainy season. Minimal organic fertilizer was applied and the potato crop received no supplementary irrigation. Formononetin was applied as a soil drench when shoots from tubers began to emerge. At the end of the 6.5 month study, formononetin increased either potato tuber dry mass and/or Nos. 1 and 2 grade tubers in three of the six cultivars. Soil sporulation of indigenous mycorrhizae was increased more than three-fold by formononetin. There were differences in total mycorrhizal colonization among the six cultivars. The predominant arbuscular mycorrhiza genera at the site were Gigaspora, Glomus and Scutellosporas.

Keywords: Aluminum (Al); Arbuscular mycorrhizal fungi (AMF); Biofertilizers; Formononetin; Glomus spp.; Gigaspora spp.; Isoflavonoid; Phosphorus (P); Solanum tuberosum L

Root to shoot communication and abscisic acid in calreticulin (CR) gene expression and salt-stress tolerance in grafted diploid potato clones/Javad Shaterian, Fawzy Georges, Atta Hussain, Doug Waterer, Hielke De Jong, Karen K. Tanino,

Environmental and Experimental Botany, Volume 53, Issue 3, June 2005, Pages 323-332, ISSN 0098-8472, DOI: 10.1016/j.envexpbot.2004.04.008. (<http://www.sciencedirect.com/science/article/pii/S009884720400070X>)

Abstract:

Potato is an important world crop but its cultivation is relatively limited by its sensitivity to salt-stress. Auto- and hetero-grafting was used to examine the effect of rootstock and abscisic acid (ABA) on expression of the Ca²⁺-storage protein calreticulin (CR) and salt-stress tolerance in potato. Sibling-selected diploid clones of potato (*S. tuberosum*) were utilized that are distinguished by differential root Na⁺ absorption; including type: late-maturing, LM and excluding type, early-maturing, EM under salt treatment; salt-stress sensitivity (S/T, sensitive or tolerant); and abscisic acid production (AD/AN, ABA-deficient or-normal sibling lines). CR expression, osmotic potential (OP) and leaf Ca²⁺ were measured at the end of a 5 days NaCl stress treatment applied at tuber initiation. Increased CR expression was induced by NaCl stress and associated with salt tolerance in early-maturing tolerant (EMT) and late-maturing tolerant (LMT) clones with higher levels of CR in LMT compared to the EMT clone. Early-maturing sensitive (EMS) clone salt tolerance increased when grafted onto LMT but not onto EMT rootstocks. EMS scions maintained less negative leaf OP when grafted onto LMT rootstocks than grafting onto the EMT rootstock. Exogenous ABA application induced a less negative upper leaf OP in the salt-stress sensitive AD clone but not in the AN clone. AD clones were characterized by low CR levels, which did not increase after stress. However, grafting the AD clone onto LMT increased CR expression in the AD portion of the graft combination. Salt-stress induced CR expression and is positively associated with the presence of ABA and the salt-stress tolerant phenotypes. Both, elevation in CR expression and salt tolerance in the tolerant rootstocks, were translocated to sensitive scions although highest permeation depended on the LM type. Calreticulin expression appears to be involved in ABA-induced salt tolerance and both salt-stress tolerance and CR expression appear to be regulated by the roots.

Keywords: Calreticulin (CR); Osmotic potential (OP); Potato; Salt-stress; Abscisic acid (ABA)

Evaluation of several culture media for production of patulin by *Penicillium* species/Mary Ann Dombrink-Kurtzman, Judy A. Blackburn, ***International Journal of Food Microbiology***, Volume 98, Issue 3, 15 February 2005, Pages 241-248, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2004.07.006. (<http://www.sciencedirect.com/science/article/pii/S0168160504003526>)

Abstract:

The aim of this study was to evaluate different species of *Penicillium* to identify those which have the potential to produce the greatest amount of the mycotoxin, patulin. Additionally, six different culture media were compared to determine maximum patulin production. Eleven different strains of *Penicillium* species were selected because they had previously been reported to be producers of patulin. The strains included *Penicillium expansum*, *Penicillium griseofulvum* (formerly *Penicillium urticae*), *Penicillium clavigerum*, and *Penicillium coprobium* and a recent *Penicillium* sp. isolated from an apple. Cultures were grown in duplicate in three different liquid media: potato dextrose, malt extract, and glucose/yeast extract/peptone, both with and without manganese supplementation. Patulin production was compared at 24, 48, 72, and 96 h. Variability in patulin production occurred among the different species, growth media used, and time of incubation. All three of the *P. griseofulvum* isolates were the highest producers of patulin at 96 h. For most of the strains, potato dextrose broth supplemented with manganese was optimal for maximum production of patulin. Although *P. expansum* is frequently cited as the most likely source of patulin in apple juice, certain other *Penicillium* species are capable of producing more patulin than strains of *P. expansum*. The apple juice industry should be alert to the possibility that *Penicillium* species other than *P. expansum* can be responsible for the occurrence of patulin.

Keywords: Apple juice; Manganese; Patulin production; *Penicillium*

Patulin-producing molds in corn silage and high moisture corn and effects of patulin on fermentation by ruminal microbes in continuous culture/M.O. Tapia, M.D. Stern, A.L. Soraci, R. Meronuck, W. Olson, S. Gold, R.L. Koski-Hulbert, M.J. Murphy

Animal Feed Science and Technology, Volume 119, Issues 3-4, 4 April 2005, Pages 247-258, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2004.12.002.

(<http://www.sciencedirect.com/science/article/pii/S0377840104003037>)

Abstract:

The objectives were to investigate the presence of patulin-producing *Penicillium* sp. in corn silage and high moisture corn as well as adverse effects of patulin on microbial fermentation in continuous culture fermenters. Eighty-three samples of corn silage or high moisture corn were cultured to determine the presence of molds. *Penicillium* sp. were isolated from 0.82 of samples. Of these *Penicillium* sp. isolates, 0.03 produced patulin on yeast extract sucrose and potato dextrose agar. The patulin-producing isolates belonged to the *P. viridicatum* group. The other molds identified were: *Mucor* sp. (0.45), *Aspergillus* sp. (0.41), and *Fusarium* sp. (0.25). Eight single-flow continuous culture fermenters were used to study effects of patulin on fermentation by ruminal microbes. Two 1-l fermenters were supplemented with 0, 10, 20 or 40 mg of patulin every 12 h for three consecutive days. Increasing patulin reduced neutral detergent and acid detergent fiber digestibility at a decreasing rate (linear, $P < 0.01$; quadratic, $P < 0.05$). True digestion of organic

matter and total non-structural carbohydrates decreased linearly ($P < 0.05$) as patulin concentration increased. Crude protein digestion and bacterial N flows decreased linearly ($P < 0.05$). Conversely, there was a linear increase ($P < 0.05$) in ammonia nitrogen with increased patulin. Total, ammonia and non-ammonia N flows were not affected by patulin. Efficiency of microbial protein synthesis was not affected by patulin but there was a linear decrease ($P < 0.05$) in the efficiency of N utilization. Increasing patulin levels caused a linear decrease ($P < 0.001$) of total volatile fatty acid concentration and a quadratic decrease of acetate and propionate molar proportions ($P < 0.05$). Ten and 20 mg/l of patulin produced a decrease in acetate proportion and an increase in propionate proportion. Lactate concentration (mmol/l) increase from 0.0 to 216.5 mmol/l (linear, $P < 0.05$) with increasing patulin concentration. Penicillium sp. molds are common contaminants of corn silage and high moisture corn and they produce patulin that can adversely affect fermentation by ruminal microbes. Alterations in microbial digestion of dry matter, and production of microbial end products, impact the production and/or health of ruminants.

Keywords: Patulin; Fermented feeds; Ruminal fermentation; Continuous culture

Effect of aeration rate and waste load on evolution of volatile fatty acids and waste stabilization during thermophilic aerobic digestion of a model high strength agricultural waste/J. Obeta Ugwuanyi, L.M.

Harvey, B. McNeil

Bioresource Technology, Volume 96, Issue 6, April 2005, Pages 721-730, ISSN 0960-8524, DOI: 10.1016/j.biortech.2004.06.028.

(<http://www.sciencedirect.com/science/article/pii/S0960852404002469>)

Abstract:

Thermophilic aerobic digestion (TAD) is a relatively new, dynamic and versatile low technology for the economic processing of high strength waste slurries. Waste so treated may be safely disposed of or reused. In this work a model high strength agricultural waste, potato peel, was subjected to TAD to study the effects of oxygen supply at 0.1, 0.25, 0.5 and 1.0 vvm (volume air per volume slurry per minute) under batch conditions at 55 [degree sign]C for 156 h on the process. Process pH was controlled at 7.0 or left unregulated. Effects of waste load, as soluble chemical oxygen demand (COD), on TAD were studied at 4.0, 8.0, 12.0 and 16.0 g l⁻¹ (soluble COD) at pH 7.0, 0.5 vvm and 55 [degree sign]C. Efficiency of treatment, as degradation of total solids, total suspended solids and soluble solid, as well as soluble COD significantly increased with aeration rate, while acetate production increased as the aeration rate decreased or waste load increased, signifying deterioration in treatment. Negligible acetate, and no other acids were produced at 1.0 vvm. Production of propionate and other acids increased after acetate concentration had started to decrease and, during unregulated reactions coincided with the drop in the pH of the slurry. Acetate production was more closely associated with periods of oxygen limitation than were other acids. Reduction in oxygen availability led to deterioration in treatment efficiency as did increase in waste load. These variables may be manipulated to control treated waste quality.

Keywords: Thermophilic aerobic digestion; (TAD); Volatile fatty acids; Acetate; Soluble chemical oxygen demand; Agricultural waste; Air flow

Effect of nitrogen supply on leaf appearance, leaf growth, leaf nitrogen economy and photosynthetic capacity in maize (*Zea mays* L.)/J. Vos, P.E.L. van der Putten, C.J. Birch

Field Crops Research, Volume 93, Issue 1, 14 July 2005, Pages 64-73, ISSN 0378-4290, DOI: 10.1016/j.fcr.2004.09.013.

(<http://www.sciencedirect.com/science/article/pii/S0378429004002400>)

Abstract:

Leaf area growth and nitrogen concentration per unit leaf area, N_a ($g\ m^{-2}\ N$) are two options plants can use to adapt to nitrogen limitation. Previous work indicated that potato (*Solanum tuberosum* L.) adapts the size of leaves to maintain N_a and photosynthetic capacity per unit leaf area. This paper reports on the effect of N limitation on leaf area production and photosynthetic capacity in maize, a C4 cereal. Maize was grown in two experiments in pots in glasshouses with three (0.84-6.0 $g\ N\ pot^{-1}$) and five rates (0.5-6.0 $g\ pot^{-1}$) of N. Leaf tip and ligule appearance were monitored and final individual leaf area was determined. Changes with leaf age in leaf area, leaf N content and light-saturated photosynthetic capacity, P_{max} , were measured on two leaves per plant in each experiment. The final area of the largest leaf and total plant leaf area differed by 16 and 29% from the lowest to highest N supply, but leaf appearance rate and the duration of leaf expansion were unaffected. The N concentration of expanding leaves (N_a or %N in dry matter) differed by at least a factor 2 from the lowest to highest N supply. A hyperbolic function described the relation between P_{max} and N_a . The results confirm the 'maize strategy': leaf N content, photosynthetic capacity, and ultimately radiation use efficiency is more sensitive to nitrogen limitation than are leaf area expansion and light interception. The generality of the findings is discussed and it is suggested that at canopy level species showing the 'potato strategy' can be recognized from little effect of nitrogen supply on radiation use efficiency, while the reverse is true for species showing the 'maize strategy' for adaptation to N limitation.

Keywords: Nitrogen supply; Nitrogen concentration; Leaf growth; Leaf appearance rate; Photosynthesis; Gramineae; Broad leaf species

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Effects of irrigation and straw mulch on water use and tuber yield of potato in eastern India/Gouranga Kar, Ashwani Kumar

Agricultural Water Management, Volume 94, Issues 1-3, 16 December 2007, Pages 109-116, ISSN 0378-3774, DOI: 10.1016/j.agwat.2007.08.004.

(<http://www.sciencedirect.com/science/article/pii/S0378377407002144>)

Abstract:

Potato, being a temperate crop, its growth and tuber production are limited by high atmospheric temperatures (mean temperature >17 [degree sign]C). As a result potato is grown in winter season only (November-March) in the eastern plain of India when temperature is favourable. But during winter season, rainfall is erratic and meagre, therefore, potato crop in the region can only be grown with supplemental irrigation. In this study, potato crop was grown with four phenology based irrigation treatments (75 mm water depth with each irrigation) with three replications. Straw mulch at a rate of 6 t ha⁻¹ was applied during the first earthing up in half of the plots to observe the variation of plant growth, water use efficiency and tuber production

between mulched and non-mulched plots. The experimental split-plot design consisted of irrigation treatments in the main plots with mulching and non-mulching as subplots. Two years of pooled data with four irrigations resulted in air-dry tuber yields of 14.9 and 11.2 t ha⁻¹ for the mulched and non-mulched plots, respectively. Significantly ($p < 0.05$) higher leaf area index, water use efficiency and intercepted photosynthetically active radiation (IPAR) were recorded in the mulched plots compared to the non-mulched plots under the same irrigation treatment. Higher yield and better crop growth were observed in the mulched plots, which might be due to conservation of soil moisture and reduction of soil temperature by 4-6 [degree sign]C. The highest PAR (89% of the PAR incident above the crop canopy) was found near the crop with mulching and four irrigations. The 77-103 mm less depleted soil moisture in the different treatments was due to the application of straw mulch. Application of straw mulch significantly increased the available phosphorus and potassium in the soil. Water use efficiency and tuber productions differed significantly among irrigation treatments in the non-mulched plots but they did not in the mulched plots with three and four irrigations. Therefore, three irrigations of 75 mm each and mulching were recommended for growing potato in the region when limited water was available.

Keywords: Potato; Soil moisture; Soil temperature; Intercepted photosynthetically active radiation; Mulching

Visible fungal growth on baled grass silage during the winter feeding season in Ireland and silage characteristics associated with the occurrence of fungi/Martin O'Brien, Padraig O'Kiely, Patrick D. Forristal, Hubert T. Fuller

Animal Feed Science and Technology, Volume 139, Issues 3-4, 15 December 2007, Pages 234-256, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2007.01.010.

(<http://www.sciencedirect.com/science/article/pii/S037784010700034X>)

Abstract:

The extent of visible fungal growth and the identity of fungi causing spoilage of baled grass silage were recorded regularly through a winter feeding period in Ireland. The study was conducted from November 2003 to March 2004 on 50 farms differing in farming systems and geographical locations in the Irish Midlands and two bales were examined in detail on each farm ($n = 100$ bales). Visible fungal growth was present on 90 of the 100 bales examined. There were more fungal colonies visible on bales in March (mean, 8) than in November (mean, 4) ($P < 0.05$), but the number of fungal colonies on bales did not differ between the very youngest and oldest bales ($P > 0.05$). Fungal contamination was higher ($P < 0.001$) in bales where the surrounding polythene stretch-film was visibly damaged compared to bales where the film appeared intact. No other bale production or storage characteristic significantly predisposed bales to increased fungal spoilage. The most prevalent fungus on bales throughout the feeding season was *Penicillium roqueforti* which represented 0.43 of all fungal colonies observed and was present on 0.78 of bales. The proportion of bale surface areas visibly colonised by *P. roqueforti* increased ($P < 0.05$) monthly from November to March. Other fungi frequently isolated throughout the winter included *Schizophyllum commune*, mucoraceous moulds and *Pichia fermentans*. Redundancy analysis showed that the distribution of fungi on bales was best explained by the concentrations of ethanol and lactic acid, dry matter content, bale tying, month of bale feed-out, age of bales, polythene film damage, ryegrass dominance, bale storage location

and volatile fatty acid concentrations. Forward selection of these silage characteristics showed that butyric acid concentration and age of bales contributed significantly ($P < 0.05$) to the variance found in the species data and these two variables could explain 0.19 of the explained variance. *P. roqueforti* occurrence was positively correlated to higher concentrations of propionic and butyric acids, to month of bale feed-out and to bale age. *S. commune* was more commonly isolated from bales made from ryegrass dominant swards, that had visibly damaged polythene film, that were stored in farmyards and from silage with a lower lactic acid concentration. Overall, a high incidence of visible fungal growth was recorded on bales throughout the winter season and the extent of colonisation and fungal species occurring were not random. To prevent fungal spoilage of baled silage, the focus of best farm practice should be to provide low oxygen conditions in well wrapped and carefully managed bales.

Keywords: Baled grass silage; Mould; *Penicillium roqueforti*; Spoilage; Visible fungal growth; Yeast

Developmental modulation of inulin accumulation in storage organs of transgenic maize and transgenic potato/Johan M. Stoop, Jeroen Van Arkel, Johanna C. Hakkert, Cheryl Tyree, Perry G. Caimi, Andries J. Koops,

Plant Science, Volume 173, Issue 2, August 2007, Pages 172-181, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2007.04.011.

(<http://www.sciencedirect.com/science/article/pii/S0168945207001343>)

Abstract:

Many important health promoting and functional characteristics are attributed to the non-digestible polysaccharide, inulin. Its use as a prebiotic in functional food and feed has further increased inulin demand worldwide. Inulin production in crops used for food and feed application, such as maize and potato, may provide a more direct and cost-effective route to provide functional food or feed when compared to native inulin producers. Towards this end we have expressed the inulin synthesizing enzymes, 1-SST and 1-FFT from Jerusalem artichoke in maize and potato. Transgenic maize plants produced inulin type fructan (at 3.2 mg/g kernel) when expressing an endosperm targeted gene cassette. Kernel development and germination were not affected. Potato tubers expressing 1-sst accumulated 1.8 mg inulin/g tuber while tubers with a combined expression of 1-sst and 1-fft accumulated 2.6 mg inulin/g tuber. Inulin accumulation in maize kernels was modulated by kernel development. Inulin levels peaked and then underwent moderate degradation by late kernel development. In potato, inulin production was relatively stable throughout tuber development and little evidence of degradation was observed. The accumulation of 1-kestose in transgenic maize was positively correlated with kernel sucrose concentration. Introduction of the fructan synthetic pathway in a high-sucrose maize background increased inulin accumulation to 41 mg/g kernel. Evidence is presented indicating that sucrose availability is limiting fructan production in transgenic maize.

Keywords: Fructan; Inulin; Developmental regulation; Transgenic maize and potato

Control of soilborne potato diseases using Brassica green manures/
Robert P. Larkin, Timothy S. Griffin

Crop Protection, Volume 26, Issue 7, July 2007, Pages 1067-1077, ISSN 0261-2194, DOI: 10.1016/j.cropro.2006.10.004.

(<http://www.sciencedirect.com/science/article/pii/S0261219406003140>)

Abstract:

Brassica crops used in crop rotations and as green manures have been associated with reductions in soilborne pests and pathogens. These reductions have been attributed to the production of volatile sulfur compounds through a process known as biofumigation, and to changes in soil microbial community structure. In this study, selected Brassica crops, including canola, rapeseed, radish, turnip, yellow mustard, and Indian mustard, were evaluated for control of various soilborne potato pathogens and diseases in culture, in greenhouse trials, and in field trials on commercial potato farms. In in vitro assays, volatiles released from chopped leaf material of Brassica crops and barley inhibited growth of a variety of soilborne pathogens of potato, including *Rhizoctonia solani*, *Phytophthora erythroseptica*, *Pythium ultimum*, *Sclerotinia sclerotiorum*, and *Fusarium sambucinum*, with Indian mustard resulting in nearly complete inhibition (80-100%). All Brassica crops and barley reduced inoculum levels of *R. solani* (20-56% reduction) in greenhouse tests, and radish, rapeseed, and Indian mustard reduced subsequent potato seedling disease by 40-83%. In an on-farm field trial at a site with a substantial powdery scab problem, Indian mustard, rapeseed, canola, and ryegrass grown as green manure rotation crops reduced powdery scab in the subsequent potato crop by 15-40%, and canola and rapeseed reduced black scurf by 70-80% relative to a standard oats rotation. At another field site where common scab was the primary disease problem, an Indian mustard green manure reduced common scab by 25%, and rapeseed, yellow mustard, and 'Lemtal' ryegrass also reduced black scurf relative to a standard ryegrass rotation. Disease reductions were not always associated with higher glucosinolate-producing crops, and were also observed with non-Brassica crops (barley and ryegrass), indicating other mechanisms and interactions are important, particularly for control of *R. solani*. Overall, Indian mustard was most effective for reducing powdery scab and common scab diseases, whereas rapeseed and canola were most effective in reducing *Rhizoctonia* diseases. These results indicate that Brassica crops have potential for use as green manures for the control of multiple soilborne disease problems.

Keywords: *Solanum tuberosum*; Cropping systems; Stem canker; Black scurf; Powdery scab; *Rhizoctonia solani*; *Spongospora subterranea*; *Streptomyces scabiei*

Fodder and tuber yields, and fodder quality of sweet potato cultivars at different maturity stages in the West African humid forest and savanna zones/A. Larbi, I. Etela, H.N. Nwokocha, U.I. Oji, N.J. Anyanwu, L.D. Gbaraneh, S.C. Anioke, R.O. Balogun, I.R. Muhammad, ***Animal Feed Science and Technology***, Volume 135, Issues 1-2, 15 May 2007, Pages 126-138, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2006.05.021. (<http://www.sciencedirect.com/science/article/pii/S0377840106002276>)

Abstract:

A 2-year study was conducted in the West African humid forest and southern Guinea savanna zones to determine fodder and tuber yields, fodder crude protein (CP) and neutral detergent fibre concentrations, and dry matter (DM) degradation characteristics of 18 sweet potato (*Ipomoea batatas*) cultivars harvested at 8, 12, 16, and 20 weeks after planting (WAP). Significant ($P < 0.05$) differences were found in fodder and tuber yields, and fodder CP and DM degradation characteristics among cultivars. Fodder yields showed both linear and non-linear trends, whilst tuber yields increased linearly in response to

increasing WAP. The average CP, degradable fraction, rate of degradation, and effective degradability were relatively higher when the fodder was harvested at 12 WAP than at 20 WAP. In terms of fodder and tuber yields, and fodder quality attributes, cultivars TIS-8470, TIS-8164, TIS-87/0087, and TIS-82/0070.OP.120 could be classified to have high potential for both fodder and tuber production in both zones, whilst cultivars TIS-2534, GR-1-9-5, and TIS-82/0270.OP.13 showed low potential. The promising cultivars could be harvested between 12 and 16 WAP in the savanna zone, and 20 WAP in the humid forest zone to maximize yields of tuber and quality of fodder.

Keywords: Sweet potato; Fodder; Tuber; Crude protein; Rumen degradation; Dual-purpose

Potato tuber yield and quality and soil inorganic nitrogen as affected by timing of ridging with and without catch crops/Christian Bugge Henriksen, Jesper Rasmussen, Jens Peter Molgaard, **Soil and Tillage Research**, Volume 94, Issue 1, May 2007, Pages 36-46, ISSN 0167-1987, DOI: 10.1016/j.still.2006.06.009. (<http://www.sciencedirect.com/science/article/pii/S0167198706001541>)

Abstract:

Field experiments were conducted on sand and sandy loam from 2000 to 2002 to determine how timing of ridging affects potato tuber yield and quality depending on soil texture and the use of catch crops. On sand, ridging in winter increased soil N availability in the 0-50 cm soil layer in spring from 5.7 to 6.8 mg N kg⁻¹ soil (19%) compared with ridging in autumn ($P < 0.001$) and from 6.3 to 6.8 mg N kg⁻¹ soil (8%) compared with ploughing in spring ($P < 0.05$). Catch crops increased soil N availability in the 0-25 cm soil layer in spring from 7.7 to 10.2 mg N kg⁻¹ soil (32%, $P < 0.001$).

With a total and marketable yield of 27.9 and 14.2 t ha⁻¹, respectively, ridging in winter resulted in higher tuber yields than both ridging in autumn and ridging in autumn + tilting and re-establishment of ridges in winter. Yields were comparable to spring ploughing, but because of the ability to perform direct planting of potatoes in the winter ridges on sand, workload was significantly reduced.

Catch crops increased total yield from 26.4 to 28.0 t ha⁻¹ ($P < 0.001$) and marketable yield from 12.6 to 14.6 t ha⁻¹. There was no effect of timing of ridging when catch crops were not used, but a ryegrass catch crop combined with ploughing in spring or ridging in winter resulted in a higher total yield and marketable yield than a cruciferous catch crop mixture combined with earlier ridging ($P < 0.05$).

Besides differences between years, tuber quality was only weakly affected by treatments. Taste quality was improved and the percentage of tubers with common scab, malformation, growth cracks and greening was reduced in 2001 compared with 2002.

On sandy loam, there was no effect of timing of ridging on tuber yield and quality. Ridging in winter resulted in similar levels of soil inorganic nitrogen and similar tuber yields as ploughing in winter, but because ridges had to be rotovated in spring before planting to create a sufficiently loose soil, workload was not reduced. On sandy loam, catch crops significantly reduced soil N availability in all soil layers in spring ($P < 0.05$).

It is concluded that ridging in winter, especially in combination with a ryegrass catch crop, represents a potent alternative for organic potato production on sand but not on sandy loam.

Keywords: Ridging; Timing; Catch crops; Soil inorganic nitrogen; Leaching; Solanum tuberosum

Effect of different N and K sources on tuber nutrient uptake, total and graded yield of potatoes (*Solanum tuberosum* L.) for processing/T.

Haase, C. Schuler, J. He[ss]

European Journal of Agronomy, Volume 26, Issue 3, April 2007, Pages 187-197, ISSN 1161-0301, DOI: 10.1016/j.eja.2006.09.008.

(<http://www.sciencedirect.com/science/article/pii/S1161030106001304>)

Abstract:

A field experiment was conducted for 3 consecutive years (2002-2004) on loamy sand on an organically managed farm near Osnabruck, Germany. Four replicates of four fertilizer treatments and a control were established annually in a split-plot design for two maincrop potato cultivars (*Solanum tuberosum* L. cv. Agria and cv. Marlen). The application of fertilizers followed a soil test of available potassium at the onset of vegetation. Fertilizer treatments were deep litter cattle manure, potassium sulphate (40% K), potassium sulphate + horn grits (14% N) and horn grits, all supplying equivalent quantities of K (175-215 kg ha⁻¹) and/or N (100-145 kg ha⁻¹), respectively, and a control with no fertilization. Deep litter cattle manure was analysed for total N, K and other elements and - just as the other fertilizers - applied in spring just before ploughing. Soil content of NO₃-N was determined from samples taken at defined growth stages of the potato crop. Furthermore, total and graded tuber yields, tuber concentration as well as uptake and concentration of N and K were assessed.

Results of soil nitrate-N content confirmed that organic cropping systems are dominantly nitrogen limited and this is likely to affect crop utilization of K. Available K content of soil and K in tuber dry matter could be increased through application of either cattle manure or potassium sulphate.

Total yields depended strongly on the individual year and varied between 27.9 and 35.3 t ha⁻¹ (cv. Agria). Results indicate a strong influence of fertilizer treatment on total tuber yields and those relevant for processing into crisps (40-65 mm) or French fries (proportion of tubers >50 mm in yield >35 mm). Highest yields were obtained after application of the combined mineral K (potassium sulphate) and organic N (horn grits) source. The response of tuber yield to cattle manure was not consistent over the growing seasons, which confirms that cattle manure is generally a very insecure source of plant available N in the year of application. Possibly, the positive yield response in 2004 was due to K rather than N, since only tuber K concentration and uptake were significantly affected. Overall, the results suggest that in organic potato cropping the correlation between available K - as determined with the common soil test procedures - and yield response may be low. Response of tuber yields graded for crisps and French fries production confirmed that cultivars have to be chosen carefully to secure adequate tuber yield of the required size grades.

Keywords: Potato; Potassium; Nitrogen; Mineral fertilizer; Manure; Organic agriculture; Yield; Processing

A thermostable [α]-amylase from a moderately thermophilic *Bacillus subtilis* strain for starch processing/M. Asgher, M. Javaid Asad, S.U. Rahman, R.L. Legge

Journal of Food Engineering, Volume 79, Issue 3, April 2007, Pages 950-955, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2005.12.053.

(<http://www.sciencedirect.com/science/article/pii/S0260877406002792>)

Abstract:

A newly isolated *Bacillus subtilis* JS-2004 strain was cultured in liquid media containing waste potato starch to produce $[\alpha]$ -amylase. The effect of calcium, yeast extract and glucose supplementation of the production medium on bacterial growth and enzyme production was studied. Maximum enzyme production 72 U/mL was achieved after 48 h cultivation at pH 7.0 and 50 [degree sign]C. Addition of calcium and yeast extract enhanced microbial growth and enzyme production, where as glucose at 1.0% level showed a strong repression. Studies on crude $[\alpha]$ -amylase characterization revealed that optimum activity was at pH 8.0 and 70 [degree sign]C. The enzyme was quite stable for 1 h at 60 and 70 [degree sign]C, while at 80 and 90 [degree sign]C, 12% and 48% of the original activities were lost, respectively. After incubation of crude enzyme solution for 24 h at pH 8.0 at 70 [degree sign]C, a decrease of about 6% of its original activity was observed. The enzyme was activated by Ca^{2+} (relative activity 117%). It was strongly inhibited by Co^{2+} , Cu^{2+} , and Hg^{2+} but less affected by Mg^{2+} , Zn^{2+} , Ni^{2+} , Fe^{2+} , and Mn^{2+} . The *B. subtilis* JS-2004 strain produced high levels of thermostable $[\alpha]$ -amylase with characteristics suitable for application in starch processing and food industries.

Keywords: Thermostable $[\alpha]$ -amylase; *Bacillus subtilis* JS-2004; Media optimization; Characterization; Starch processing

Xylogalacturonan exists in cell walls from various tissues of *Arabidopsis thaliana*/Joris Zandleven, Susanne OxenbollSorensen, Jesper Harholt, Gerrit Beldman, Henk A. Schols, Henrik V. Scheller, Alphons J. Voragen,

Phytochemistry, Volume 68, Issue 8, April 2007, Pages 1219-1226, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2007.01.016.

(<http://www.sciencedirect.com/science/article/pii/S0031942207000556>)

Abstract:

Evidence is presented for the presence of xylogalacturonan (XGA) in *Arabidopsis thaliana*. This evidence was obtained by extraction of pectin from the seeds, root, stem, young leaves and mature leaves of *A. thaliana*, followed by treatment of these pectin extracts with xylogalacturonan hydrolase (XGH). Upon enzymatic treatment, XGA oligosaccharides were primarily produced from pectin extracts obtained from the young and mature leaves and to a lesser extent from those originating from the stem of *A. thaliana*. The oligosaccharide GalA3Xyl was predominantly formed from these pectin extracts. No XGA oligosaccharides were detected in digests of pectin extracts from the seeds and roots.

A low number of XGA oligosaccharides was obtained from pectins of *A. thaliana*. This indicates a uniform distribution of xylose in XGA from *A. thaliana*. The predominant production of GalA3Xyl, as well as the release of linear GalA oligosaccharides pointed to a lower degree of xylose substitution in XGA from *A. thaliana* than in XGA from apple and potato.

The estimated amount of XGA accounted for approximately 2.5%, 7% and 6% (w/w) of the total carbohydrate in the pectin fraction of the stem, young leaves and mature leaves, respectively.

Keywords: *Arabidopsis thaliana*; Pectin; Xylogalacturonan hydrolase; Xylogalacturonan

Effects of soil matric potential on potato growth under drip irrigation in the North China Plain/Feng-Xin Wang, Yaohu Kang, Shi-Ping Liu, Xiao-Yan Hou,

Agricultural Water Management, Volume 88, Issues 1-3, 16 March 2007, Pages 34-42, ISSN 0378-3774, DOI: 10.1016/j.agwat.2006.08.006. (<http://www.sciencedirect.com/science/article/pii/S0378377406002381>)

Abstract:

This research examines the affect of five soil matric potential (SMP) treatments [F1 (-15 kPa), F2 (-25 kPa), F3 (-35 kPa), F4 (-45 kPa), F5 (-55 kPa)] under drip irrigation conditions conducted in the North China Plain. The temporal and spatial SMP changes observed in the soil profile along with changes in potato root growth suggest that tensiometers placed immediately beneath the emitter (at 20 cm) can be effectively used in scheduling the drip irrigation regimen. Although rain affected soil water distribution during the growing season, the affects of SMP on potato growth were very clear. Crop evapotranspiration was highest for F2, decreasing thereafter to F1, F3, F4, and F5. Other potato growth properties such as crop height, leaf and stem water content, tuber bulk rate and grade, as well as WUE (water use efficiency) and IWUE (irrigation water use efficiency) suggest that an SMP of -25 kPa was the most favorable setting for potato production, while -15 kPa was too high and -45 kPa lead to severe water stress.

Keywords: Drip irrigation; Potato growth; Soil matric potential; Tensiometer

Effect of drip tape placement depth and irrigation level on yield of potato/Neelam Patel, T.B.S. Rajput

Agricultural Water Management, Volume 88, Issues 1-3, 16 March 2007, Pages 209-223, ISSN 0378-3774, DOI: 10.1016/j.agwat.2006.10.017. (<http://www.sciencedirect.com/science/article/pii/S0378377406002745>)

Abstract:

Subsurface drip irrigation (SDI) is the most advanced method of irrigation, which enables the application of the small amounts of water to the soil through the drippers placed below the soil surface. One of the most commonly discussed aspects of SDI system is installation depth of drip lateral. Determining the appropriate depth of installation involves consideration of soil structure, texture, and crop's root development pattern. Site-wise and crop-wise variations of these parameters preclude the possibility of framing general recommendations for installation depths of SDI system. An experiment was conducted on potato (var. Kufri Anand) during October-February for 3 years (2002-2003, 2003-2004 and 2004-2005) to study the effect of depth of placement of drip tape and different levels of irrigation application on potato yield. Drip tapes were buried manually in the middle of different ridges. Tests for uniformity of water application through the SDI system were carried out in the month of October every year. Three different irrigation levels of 60, 80 and 100% of the crop evapotranspiration and five depths of placement of drip tape namely, 0.0, 5.0, 10.0, 15.0 and 20.0 cm were maintained in the study. The coefficient of variation (CV) of flow rates was found 0.046, 0.047 and 0.064 during 2002-2003, 2003-2004 and 2004-2005, respectively. The low CV indicated good performance of the SDI system throughout the cropping season. The values of statistical uniformity (SU) and distribution uniformity (DU) were more than 92.0% during all the three cropping seasons. Soil water distribution at different growth stages of potato under different depths of placement of drip tape for varying irrigation levels was monitored. When drip tape was placed at surface and buried at 5.0 cm soil depth, upward movement of water takes place, 21.5% soil water content was found throughout the crop season of potato. When drip

tape was buried 10.0, 15.0 and 20.0 cm below the surface, upward water movement due to capillary forces was not sufficient and soil surface remained relatively dry.

The maximum yield was recorded when drip tape was buried at 10.0 cm during 2002-2003 and 2004-2005 and at 15.0 cm during 2003-2004 that was followed by drip tape placement at 20.0, 10.0 and 5.0 cm depths in 2002-2003 to 2004-2005, respectively. Treatment 0.6T4 gave maximum IWUE of 2.07, 2.13 and 2.05 t ha⁻¹ cm⁻¹ during 2002-2003, 2003-2004 and 2004-2005, respectively. The highest benefit cost ratio of 1.7 was obtained for treatment T3. Lowest benefit-cost ratio of 0.9 was found for treatment 0.6T5. The cost incurred for the installation of drip tape at successively higher depths, increases the annual cost of production. The placement depth of drip tape significantly affected potato yield. Maximum yield was obtained by applying the 100% of the crop evapotranspiration (23.6 cm of irrigation water) and by placing the drip tape at 10.0 cm depth. In the sandy loam soil at the experimental site, the gravity force predominated over the capillary force causing a greater downward movement of water. Therefore, shallow depth of placement of drip tape (10.0 cm) was recommended in potato crop to get higher yield. Appropriate depth of placement of drip tape however, will differ with crop and the change in soil type.

Keywords: Potato; Subsurface drip irrigation; Depth of placement of drip tape; Irrigation

Alterations in secondary metabolism of aposymbiotically grown mycobionts of *Xanthoria elegans* and cultured resynthesis stages/Georg Brunauer, Armin Hager, Martin Grube, Roman Turk, Elfie Stocker-Worgotter

Plant Physiology and Biochemistry, Volume 45, Issue 2, February 2007, Pages 146-151, ISSN 0981-9428, DOI: 10.1016/j.plaphy.2007.01.004. (<http://www.sciencedirect.com/science/article/pii/S0981942807000071>)

Abstract:

HPLC analyses of *Xanthoria elegans* cultivated on different media and either aposymbiotically or with its photobiont revealed that the carbon source and the presence of the algal partner have an impact on the secondary metabolism of the mycobiont. The aposymbiotically (without photobiont) grown mycobiont contained up to 70% more of the main compounds in its thallus than in resynthesis stage. Although this is speculative, the induction of the polyketide pathway may be a feedback mechanism to the absence of the photobiont. All cultures produce a variety of substances which were not detectable in the voucher specimen. Besides physcion (the major substance), we were able to identify emodin as well as physcion-bisanthrone, teloschistin monoacetate and derivatives. A strong inducible effect on the production of physcion, physcion-bisanthrone and on their precursors and derivatives was found for mannitol. By contrast, supplementation of ribitol had negligible effects, if any, on polyketide quantities although it is the main carbon source for the mycobiont in free-living lichens with *Trebouxia* photobiont.

Keywords: *Xanthoria elegans*; Lichen-culture; Mycobiont; Re-synthesis; Carbon source; Anthraquinone; HPLC

Minimally processed potatoes: Part 2. Effects of high oxygen partial pressures in combination with ascorbic and citric acid on loss of some quality traits/S. Limbo, L. Piergiiovanni

Postharvest Biology and Technology, Volume 43, Issue 2, February 2007, Pages 221-229, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2006.08.015.

(<http://www.sciencedirect.com/science/article/pii/S0925521406002213>)

Abstract:

Sliced potatoes were stored in flexible packaging under different oxygen partial pressures (10, 55 and 100 kPa) after dipping treatments with ascorbic and citric acid at different concentrations. The levels of oxygen, ascorbic and citric acid were modulated according to a Central Composite Design. The response surface methodology allowed an assessment of the effects of these variables and their interactions on the respiration rate in a closed system, on the carbon dioxide accumulation rate and the volatile metabolites production inside flexible pouches. The results showed that the respiration rate did not increase in direct linear proportion to the oxygen partial pressure and there was no significant difference in respiration between 55 and 100 kPa, even though the respiration rate was higher at these super-atmospheric oxygen levels than at 10 kPa. Citric acid did not affect the respiration significantly, while the respiration rate increased with the increase in ascorbic acid concentration. However, at the highest level of ascorbic acid tested (5%), the respiration rate decreased. During storage in a high barrier plastic pouch, a higher CO₂ accumulation rate was generally observed under 55 kPa than under 10 and 100 kPa. High oxygen partial pressures (55 and 100 kPa) did not stop the production of hexanal but they had an inhibitory effect on the anaerobic volatiles production.

Keywords: Minimally processed potatoes; High oxygen packaging; Ascorbic acid; Citric acid; Central Composite Design; Respiration rate; Volatile compounds; Flexible packaging

Deployment of low-level ozone-enrichment for the preservation of chilled fresh produce/Nikos Tzortzakis, Ian Singleton, Jeremy Barnes, *Postharvest Biology and Technology*, Volume 43, Issue 2, February 2007, Pages 261-270, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2006.09.005. (<http://www.sciencedirect.com/science/article/pii/S0925521406002274>)

Abstract:

Tomatoes, strawberries, table grapes and plums were inoculated with *Botrytis cinerea* (grey mould), transferred to chilled storage (13 [degree sign]C) and exposed to 'clean air' or low-level ozone-enrichment (0.1 [mu]mol mol⁻¹). Ozone-enrichment resulted in a substantial decline in spore production as well as visible lesion development in all treated fruit. Exposure-response studies performed specifically on tomato fruit (exposed to concentrations ranging between 0.005 and 5.0 [mu]mol mol⁻¹ ozone) revealed lesion development and spore production/viability to be markedly reduced in produce exposed to ozone prior to, or following, infection with *B. cinerea*; higher concentrations/duration of exposure yielding greater reductions in lesion development and spore production/viability. Impacts on *Botrytis* colonies grown on Potato Dextrose Agar (PDA) for 5-6 days at 13 [degree sign]C and 95% relative humidity (RH) revealed less effects than studies on fruit inoculated with the pathogen in vivo. Taken as a whole, the results imply that ozone-induced suppression of pathogen development is due, to some extent, to impacts on fruit-pathogen interactions. This work suggests that ozone may constitute a desirable and effective residue-free alternative to traditional postharvest fungicide practices. Data presented illustrate that optimal ozone treatment regimes are likely to be commodity-specific and require detailed investigation before such practices can be contemplated commercially.

Keywords: Botrytis cinerea; Fresh produce; Microbial spoilage; Modified atmosphere storage; Ozone; Tomato

In vitro evaluation of starch degradation from feeds with or without various heat treatments/Johannes Sveinbjornsson, Michael Murphy, Peter Uden,

Animal Feed Science and Technology, Volume 132, Issues 3-4, 15 January 2007, Pages 171-185, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2006.03.018.

(<http://www.sciencedirect.com/science/article/pii/S0377840106001520>)

Abstract:

An in vitro method was used to evaluate starch degradation from various feeds with or without heat treatments in four studies. The method was based on incubation of feed samples with a buffered rumen fluid solution and subsequent enzymatic analysis of the remaining starch. In all studies, heat treatment of the feed samples increased rate or extent of starch degradation to glucose. In Study 1, measurements of remaining starch, after 5 h in vitro incubations, demonstrated substantial effects of cooking on starch degradation in potatoes, and a trend to faster degradation from autoclaving peas. Up to 0.60 of the starch remaining after a 5 h of incubation was not recovered by centrifugation at 3000 x g for 10 min. In Study 2, cooking increased in vitro starch degradation rate from isolated potato starch (from 0.038 to 0.197/h). Intact starch in barley and wheat grain had similar rates of degradation (0.117 and 0.109/h, respectively). In Study 3, both autoclaving time (15, 30, 60 min) and temperature (115, 130 and 145[degree sign]C) affected in vitro starch degradation rates in peas, and, in no case did autoclaving for only 15 min increase degradation rates. For the 30 min autoclaving time, only the highest temperature (145[degree sign]C) increased the degradation rate of the pea starch compared to the untreated peas (0.175 versus 0.110/h). When autoclaving for 60 min, both 130 and 145[degree sign]C resulted in a considerable increase in starch degradation rate (0.211 and 0.193/h, compared to 0.110/h for the untreated peas). In Study 4, the proportion of starch degraded at 8 h of in vitro incubation was increased by heat treatment of pure potato starch (0.155 versus 0.870), peas (0.491 versus 0.815), barley (0.686 versus 0.913) and maize (0.351 versus 0.498). Measurements of volatile fatty acid production in the fermentation tubes showed a lower acetate:propionate ratio for the faster fermenting heat-treated feeds. Heat treatment generally increased starch degradation in vitro.

Keywords: Degradation; Heat treatment; In vitro; Rumen; Starch

Effects of partial root-zone drying on yield, tuber size and water use efficiency in potato under field conditions/Ali Shahnazari, Fulai Liu, Mathias N. Andersen, Sven-Erik Jacobsen, Christian R. Jensen, **Field Crops Research**, Volume 100, Issue 1, 4 January 2007, Pages 117-124, ISSN 0378-4290, DOI: 10.1016/j.fcr.2006.05.010.

(<http://www.sciencedirect.com/science/article/pii/S0378429006001407>)

Abstract:

Water resources are limited for irrigation worldwide; therefore, there is a need for water-saving irrigation practices to be explored. Partial root-zone drying (PRD) is a new water-saving irrigation strategy being tested in many crop species. Experiments were conducted in potato (*Solanum tuberosum* L. cv. Folva) under open field conditions in 2004 and under a mobile rainout shelter in 2005. Two subsurface irrigation treatments were studied: full irrigation (FI) receiving 100% of

evaporative demands, 50.1 and 201 mm of irrigation water in the 2 years, to keep it close to field capacity; and PRD, which received 21.7 and 140 mm of irrigation in 2004 and 2005 respectively. Due to rain in 2004, the PRD treatment was imposed over a short period only during the late tuber filling and maturing stages. In 2005, the PRD treatment was imposed during the whole period of tuber filling and tuber maturation. The PRD treatment was shifted from one side to the other side of potato plants every 5-10 days. Especially in 2005 it was apparent that stomatal conductance was generally lower in the PRD than in the FI plants, whereas leaf water potential tended to be lower in only a few instances. During the treatment period, plants were harvested five times, and no significant difference was found between the treatments in leaf area index, top dry mass and tuber yield. At final harvest, tubers were graded based on size into four classes C1-C4, of which the yield of the important marketable class (C2) was significantly higher (20%) in the PRD than in the FI treatment. Compared with FI, the PRD treatment saved 30% of irrigation water while maintaining tuber yield, leading to a 61% increase of irrigation water use efficiency. The limited data of 2004 support these results. In summary, PRD is a promising water-saving irrigation strategy for potato production in areas with limited water resources.

Keywords: Partial root-zone irrigation; Soil water distribution;
Solanum tuberosum L

Deodorisation of off-odour during sweet potato juice production by employing physical and chemical deodorants/Kazuhiko Tamaki, Takeshi Tamaki, Yoshitake Suzuki

Food Chemistry, Volume 105, Issue 2, 2007, Pages 454-461, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.03.064.

(<http://www.sciencedirect.com/science/article/pii/S030881460700310X>)

Abstract:

The mechanism and efficiency of three types of deodorants, namely activated carbon (AC), maltosyl cyclodextrin (MCD) and apple polyphenol (AP), in reducing the 'boiled heavy odour' of saccharified sweet potato juice was investigated. The highest deodorising efficiency of AC, followed by MCD and AP, was confirmed by using the electronic nose and sensory analysis. Furthermore, flavour compounds in the sweet potato juice were identified by GC-MS analysis. While AC decreased the peak intensities of all the compounds to below the minimum detection limit, MCD, which eliminated the odour components by the formation of enclosure compounds, did not reduce the peak intensities to a similar extent. The mechanisms of adsorption with AC and envelopment with MCD for the identified odour components of sweet potato juice was also clarified.

Keywords: Sweet potato juice; Deodorisation; Sensory analysis;
Electronic sensor analysis; Activated carbon; Maltosyl cyclodextrin

Non-enzymatic browning and estimated acrylamide in roots, tubers and plantain products/E.T. Quayson, G.S. Ayernor

Food Chemistry, Volume 105, Issue 4, 2007, Pages 1525-1529, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.05.066.

(<http://www.sciencedirect.com/science/article/pii/S0308814607004979>)

Abstract:

Acrylamide has been discovered in foods, especially high carbohydrate foods that are dry-cooked (baked, fried or roasted) at high temperatures which also create the conditions for non-enzymatic

browning. Baking, frying and roasting are common food preparation methods in Ghana. Fifteen different high carbohydrate foods in Ghana, that undergo dry-cooking, have been investigated for non-enzymatic browning and acrylamide production. The products that showed notable non-enzymatic browning and acrylamide levels include fried sweet potato, plantain chips from the fresh produce, with their respective non-enzymatic browning and acrylamide values as 0.095 +/- 0.006 optical density (OD), 1043 +/- 47.6 parts per billion (ppb); 0.034 +/- 0.03 OD, 568 +/- 22.9 ppb. Roots and tuber products had relatively high non-enzymatic browning and acrylamide levels while plantain products showed low levels of non-enzymatic browning and acrylamide.

Keywords: Acrylamide; Non-enzymatic browning; Dry-cooking

Stage-specific distribution of oxidative radicals and antioxidant enzymes in the midgut of *Leptinotarsa decemlineata*/Natraj Krishnan, Dalibor Kodrik, Ferit Turanli, Frantisek Sehnal

Journal of Insect Physiology, Volume 53, Issue 1, January 2007, Pages 67-74, ISSN 0022-1910, DOI: 10.1016/j.jinsphys.2006.10.001.

(<http://www.sciencedirect.com/science/article/pii/S0022191006001740>)

Abstract:

The titers of reactive oxygen species (ROS) represented by superoxide anion and general peroxides, and the activities of antioxidant enzymes superoxide dismutase (SOD) and catalase (CAT), are regulated in the midgut of the Colorado potato beetle (CPB) relative to the gut compartment, developmental stage, and food intake. ROS concentration is low in the potato leaves but it is very high in their digest in insect's anterior midgut. It is proposed that intensive ROS production in this gut region is linked to the processing of allelochemicals. SOD and CAT activities, low oxygen tension, and unidentified redox systems that maintain a slightly reducing milieu in the midgut lumen (pe+pH=6.95 declining to 5.36), obviously contribute to the decrease of ROS concentration along the gut length to a minimum in the wall of posterior midgut region. SOD and CAT activities are higher in the potato leaves than in the midgut tissues but the role of plant enzymes in ROS elimination within the gut lumen remains to be shown. A lower level of ROS and a higher antioxidant potential in the adult than in the larval midgut indicate stage specificity in the management of oxidative stress. The antioxidant defense is high in the diapausing adults that contain no detectable superoxide and about ten times less peroxides than the reproducing adults.

Keywords: Catalase; Insect digestion; Peroxides; Superoxide anion; Superoxide dismutase

Feeding activity of the East African millipede *Omopyge sudanica* Kraus on different crop products in laboratory experiments/E. Ebregt, P.C. Struik, P.E. Abidin, B. Odongo,

NJAS - Wageningen Journal of Life Sciences, Volume 54, Issue 3, 2007, Pages 313-323, ISSN 1573-5214, DOI: 10.1016/S1573-5214(07)80022-4.

(<http://www.sciencedirect.com/science/article/pii/S1573521407800224>)

Abstract:

Millipedes can cause considerable damage in the production of sweet potato and some other crops in East Africa. Quantitative information on intake of crop diets by and body weight gain of millipedes was collected in short-term no-choice feeding activity laboratory experiments conducted in north-eastern Uganda using female millipedes of the species *Omopyge sudanica*. Diets consisted of sweet potato and cassava storage root material, groundnut seeds, or maize grains.

Differences in intake and body weight gain between diets were not statistically different. The consumption index, i.e., the ratio between intake and body weight gain, was significantly higher for sweet potato than for most other diets. The efficiency of conversion of ingested food, i.e., 100 x the ratio between body weight gain and intake, was significantly lower for the root crops -- especially sweet potato -- than for the grain crops. The research showed how difficult it is to obtain reliable, quantitative data on the feeding habits of millipedes, but also illustrated that *O. sudanica* can cause harm to crops in north-eastern Uganda and elsewhere in East Africa.

Keywords: no-choice feeding activity; food intake; body weight gain; consumption index; efficiency of conversion of ingested food

Comparison of fungal growth and production of extracellular pectin lyase activity by pathogenic and non-pathogenic races of *Colletotrichum lindemuthianum* cultivated under different conditions/Lorena Hernandez-Silva, Carlos Pinon-Escobedo, Horacio Cano-Camacho, Ma. Guadalupe Zavala-Paramo, Ismael Acosta-Rodriguez, Everardo Lopez-Romero, ***Physiological and Molecular Plant Pathology***, Volume 70, Issues 1-3, January-March 2007, Pages 88-95, ISSN 0885-5765, DOI: 10.1016/j.pmp.2007.07.005.

(<http://www.sciencedirect.com/science/article/pii/S0885576507000665>)

Abstract:

A comparison between pathogenic (1472) and non-pathogenic (0) races of *Colletotrichum lindemuthianum* revealed significant differences in terms of growth and production of extracellular pectin lyase activity on different carbon and nitrogen sources in liquid culture. Race 1472 grew faster in media containing glucose or polygalacturonic acid. On the latter, both races secreted comparable levels of pectin lyase activity but race 1472 produced approximately twice the amount of mycelia. On 92%-esterified pectin, race 1472 produced the highest activity detected in this study and this was about two-fold higher as compared with race 0. Cell walls isolated from *Phaseolus vulgaris* hypocotyls and to a lower degree cellulose sustained growth of both races but induced PNL only in the pathogenic race. On xylan, both races produced substantial and similar enzyme levels but this polysaccharide sustained growth of race 1472 only. Compared with race 1472, race 0 grew much slower on glutamate but produced similar amounts of mycelia in other nitrogen sources. On ammonium chloride, race 1472 produced a five-fold higher activity than race 0. Differences are discussed in terms of their possible relevance in fungal pathogenesis.

Keywords: *Colletotrichum lindemuthianum*; Pathogenic race; Non-pathogenic race; Growth; Pectin lyase activity; Induction

Effects of the application of anti-browning substances on the metabolic activity and sugar composition of fresh-cut potatoes/Pietro Rocculi, Federico Gomez Galindo, Fernando Mendoza, Lars Wadso, Santina Romani, Marco Dalla Rosa, Ingegerd Sjöholm

Postharvest Biology and Technology, Volume 43, Issue 1, January 2007, Pages 151-157, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2006.08.002. (<http://www.sciencedirect.com/science/article/pii/S0925521406002080>)

Abstract:

We investigated possible physiological effects of the application of anti-browning substances on metabolically active potato tissues. The use of citric acid, ascorbic acid and l-cysteine for browning prevention of fresh-cut potatoes increased their metabolic heat production as measured by isothermal calorimetry. This effect was

particularly high after treatment with l-cysteine, which also proved to be the most effective substance for inhibiting enzymatic browning. This increase in metabolic activity was concentration dependent and correlated with a decrease in the concentration of reducing sugars in the tissue, showing evidence that substances used in the prevention of enzymatic browning may have physiological effects in the tissue. The possible implications of these effects for the fresh-cut industry are discussed.

Keywords: Fresh-cut potatoes; Ascorbic acid; Citric acid; l-Cysteine; Isothermal calorimetry

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Distribution of mechanical resistance in potato tuber tissues/Jadwiga Sadowska, Jozef Fornal, Kazimiera Zgorska

Postharvest Biology and Technology, Volume 48, Issue 1, April 2008, Pages 70-76, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.09.018. (<http://www.sciencedirect.com/science/article/pii/S0925521407003018>)

Abstract:

The distribution of mechanical resistance in relation to the type of tissue for potato cultivars of different technological uses (cooking, French fries and potato chip production) was examined. A puncture test performed both perpendicularly and parallel to the long axis of the tubers was used and the mechanical resistance expressed by puncture force (N) and puncture energy (mJ). The results showed statistically significant differences in mechanical resistance between the cultivars, with those designed for potato chip production having the highest mechanical resistance. The mechanical resistance of the morphological elements of all examined cultivars could be ordered as follows (according to increasing values): (1) perimedullary zone, (2) pith and (3) cortex. Distribution of puncture resistance within the tuber volume was not uniform--puncture force and energy values were usually higher near the stem end of the tuber for all morphological elements. The values of puncture forces measured perpendicularly to the length of the tuber axis were always lower than those measured parallel to the long axis. The opposite was true for puncture energy.

Keywords: Mechanical resistance; Puncture test; Potato; Tissue; Tuber

Economic and environmental impacts of introducing land use policies and rotations on Prince Edward Island potato farms/John Baptist D. Jatoe, Emmanuel K. Yiridoe, Alfons Weersink, J. Stephen Clark

Land Use Policy, Volume 25, Issue 3, July 2008, Pages 309-319, ISSN 0264-8377, DOI: 10.1016/j.landusepol.2007.08.005. (<http://www.sciencedirect.com/science/article/pii/S0264837707000713>)

Abstract:

A 2002 Prince Edward Island (PEI) Agricultural Crop Rotations (ACR) Act and other sustainable land use policies regulate what crops can be grown in rotation with potatoes, and the frequency and sequence of specific crops in such rotation systems. Given that there are alternative crops that may be rotated with potatoes and managed for various rotation lengths, the policies raise questions about the economic and environmental implications of such land use policies and legislation on PEI potato-based agriculture. A multi-year linear programming model of a representative potato-based PEI farm was developed and then used to investigate the economic and environmental

impacts of introducing various crop rotation systems and land use policy regulations specified under the PEI ACR Act. Results suggest that adoption of legislated rotation systems would lead to considerable reduction in gross margins. The extent of such financial losses increased as the frequency of potatoes in the rotations decreased (i.e., farm losses increased with rotation length). Both crop choice and sequence in a rotation influenced magnitude of the economic impacts of the land use and rotation legislation. For example, among 4-year rotations, gross margins for P-SC-B-RG (potato/silage corn/barley/ryegrass) were higher by \$79, 955, when potatoes replaced silage corn in SC-SC-B-RG (silage corn/silage corn/barley/ryegrass). In addition, higher potato yields stemming from nutrient carry-over effects of particular crops (e.g., barley compared to spring wheat), did not necessarily translate into higher overall farm returns for the associated rotation. Economic-environmental trade-off frontier analysis suggest that different rotations generated varying levels of reduction in the use of agricultural chemicals, compared to benchmark production systems. However, environmental improvements associated with such reductions in chemical use required substantial reduction in gross margins to producers.

Keywords: Land use regulations; Economic-environmental trade-offs; Potato; Crop rotation systems; Environmental quality

Effect of process parameters and soy flour concentration on quality attributes and microstructural changes in ready-to-eat potato-soy snack using high-temperature short time air puffing/A. Nath, P.K. Chattopadhyay

LWT - Food Science and Technology, Volume 41, Issue 4, May 2008, Pages 707-715, ISSN 0023-6438, DOI: 10.1016/j.lwt.2007.05.001.
(<http://www.sciencedirect.com/science/article/pii/S0023643807001806>)

Abstract:

High-temperature short time (HTST) air puffing has been found to be very useful process for production of potato-soy ready-to-eat snack food as it ideally produced highly porous and light texture. The process parameters considered viz. puffing temperature (185-255 [degree sign]C) and puffing time (20-60 s) with constant initial moisture content of 36.74% and air velocity of 3.99 m/s for potato-soy blend with varying soy flour content from 5% to 25% were investigated using response surface methodology with central composite rotatable design (CCRD). The optimum product in terms of maximum expansion ratio (3.69), minimum hardness (2754.3 g) and maximum overall acceptability (7.3) were obtained with 10.31% soy flour blend in potato flour at the process conditions of puffing temperature (230.06 [degree sign]C) and puffing time (25.46 s). Microstructural changes were evaluated at different stages (with an interval of 5 s) of HTST puffing for product obtained with the optimum processing conditions. The maximum expanded porous structures with larger cracks and smaller pits were recorded in the SEM micrographs at 20 s of HTST air puffing.

Keywords: Microstructure; Scanning electron microscope; Puffing; High-temperature short time; Ready-to-eat snack food

Glycoalkaloid responses of potato to Colorado potato beetle defoliation/Courtney L. Pariera Dinkins, Robert K.D. Peterson, James E. Gibson, Qing Hu, David K. Weaver

Food and Chemical Toxicology, Volume 46, Issue 8, August 2008, Pages 2832-2836, ISSN 0278-6915, DOI: 10.1016/j.fct.2008.05.023.
(<http://www.sciencedirect.com/science/article/pii/S0278691508002573>)

Abstract:

Two experiments were conducted to measure the glycoalkaloid concentrations of potato tubers in response to Colorado potato beetle and manual defoliation. For plants defoliated by Colorado potato beetles, there was a significantly greater production of glycoalkaloids than in control plants and manually defoliated plants for both skin and inner tissue of tubers in experiment 1. In experiment 1, there was a 58.1% and 48.3% increase in glycoalkaloids in skin and inner tissue of tubers, respectively, from plants defoliated at high levels by Colorado potato beetles compared to control plants. In experiment 2, although a significant difference in glycoalkaloid concentration was not observed among the treatments, the skin and inner tissue of tubers from plants defoliated at high levels by Colorado potato beetles increased glycoalkaloid concentration by 23.4% and 14.5%, respectively, compared to tubers from control plants. In experiment 1, the concentration of tuber extract required to reduce Chinese hamster ovary (CHO) cellular proliferation by 50% was 10-fold less for the skin versus the inner tissue, indicating that skin tissue was more toxic under the in vitro conditions of this assay.

Keywords: Solanum tuberosum; Potato; Alkaloid; Herbivory; Food toxicity; Food safety

Agrophysiological characterisation and parametrisation of Andean tubers: Potato (*Solanum* sp.), oca (*Oxalis tuberosa*), isano (*Tropaeolum tuberosum*) and papalisa (*Ullucus tuberosus*/Bruno Condori, Pablo Mamani, Ruben Botello, Fernando Patino, Andre Devaux, Jean Francois Ledent *European Journal of Agronomy*, Volume 28, Issue 4, May 2008, Pages 526-540, ISSN 1161-0301, DOI: 10.1016/j.eja.2007.12.002. (<http://www.sciencedirect.com/science/article/pii/S116103010700127X>)

Abstract:

Bolivia is part of the eight most important centres of biodiversity and domestication of plants in the world, including a broad diversity of Andean grains, roots and tubers. A study was implemented to obtain the quantitative information to develop and validate, a simple growth potential model of Andean tubers in production areas located above 3000 m altitude, and to analyze the difference between species in growth attributes and the resulting tuber production. Three potato species and sub-species (*Solanum tuberosum* ssp. *andigenum* and ssp. *tuberosum*, and *Solanum juzepczukii*) as well as Oca (*Oxalis tuberosa*), Isano (*Tropaeolum tuberosum*) and Papalisa (*Ullucus tuberosus*) were studied. Trials were conducted under normal field conditions prevailing in Bolivia but with the best cropping techniques available locally to obtain optimal growing conditions. Data on dry weight (of leaves, stems, tubers and roots) and leaf area were taken at several dates in five trials conducted between 1993 and 2003. The percentage of ground cover was also measured. Beta functions were fitted to data of dry weight and leaf area to establish growth curves. The potato groups have a smaller cycle duration than other Andean tubers. The Crop Growth Analysis indicated three important characteristics differentiating Andean tubers: the *S. juzepczukii* potato has a high Relative Growth Rate (RGR) and a higher leaf mass ratio but a smaller tuber yield, due to a smaller harvest index (HI) and a very low Net Assimilation Rate (NAR). *S. tuberosum* ssp. *tuberosum* potatoes have smaller Leaf Area Index (LAI), and RGR than *juzepczukii*, but their NAR and HI are higher. *S. tuberosum* potatoes are quite productive for the size of their LAI. The *Tropaeolum tuberosum* or Isano has a great capacity of Ground Cover (GC) or a great LAI that is not translated into a greater tubers yield.

It has low RGR, NAR and HI compared to all the other species studied. The crop growth was interpreted in Light Use Efficiency (LUE) and evolution of light interception through a linear model. The LUE of potato group is more elevated than the LUE of the other Andean tubers. Within each group there is no statistical difference for the LUE value. The relationship of LAI with GC or fraction of light interception was determined with both linear and exponential relations. The low slope value for the relationship between LAI and GC characterises all Andean tubers studied compared to results reported for potato under other latitudes.

Keywords: Native potato; Andean tuber; Growth analysis; Light use efficiency

Ex ante assessment of dual-purpose sweet potato in the crop-livestock system of western Kenya: A minimum-data approach/L. Claessens, J.J. Stoorvogel, J.M. Antle, *Agricultural Systems*, Volume 99, Issue 1, December 2008, Pages 13-22, ISSN 0308-521X, DOI: 10.1016/j.agsy.2008.09.002. (<http://www.sciencedirect.com/science/article/pii/S0308521X08000954>)

Abstract:

Mixed crop-livestock systems have a crucial role to play in meeting the agricultural production challenges of smallholder farmers in sub-Saharan Africa. Sweet potato is seen as a potential remedial crop for these farmers because of its high productivity and low input requirements, while its usefulness for both food and feed (dual-purpose) make it attractive in areas where land availability is declining. In this paper, we develop and apply a 'minimum-data' methodology to assess ex ante the economic viability of adopting dual-purpose sweet potato in Vihiga district, western Kenya. The methodology uses and integrates available socio-economic and bio-physical data on farmers' land use allocation, production, and input and output use. Spatially heterogeneous characteristics of the current system regarding resources and productivity are analyzed to assess the profitability of substituting dual-purpose sweet potato for other crops currently grown for food and feed. Results indicate that a substantial number of farmers in the study area could benefit economically from adopting dual-purpose sweet potato. Depending on assumptions made, the adoption rate, expressed as the percentage of the total land under adopting farms, is between 55% and 80%. The analysis shows that the adoption rate is likely to vary positively with the average total yield of dual-purpose sweet potato, the harvest index (the ratio between tuber and fodder yields), the price of milk, and the nutritional value of available fodder. This study demonstrates the usefulness of the minimum-data methodology and provides evidence to support the hypothesis that dissemination of the dual-purpose sweet potato could help improve the livelihoods of smallholder farmers operating in mixed crop-livestock systems in east Africa.

Keywords: Dual-purpose sweet potato; Adoption; Mixed systems; Integrated assessment; Africa

Generation and analyses of the transgenic potatoes expressing heterologous thermostable [β]-amylase/Kuan-Hung Lin, Hongyong Fu, Cheng-Han Chan, Hsiao-Feng Lo, Ming-Chih Shih, You-Ming Chang, Long-Fang O. Chen

Plant Science, Volume 174, Issue 6, June 2008, Pages 649-657, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2008.04.001. (<http://www.sciencedirect.com/science/article/pii/S0168945208000903>)

Abstract:

[beta]-Amylase hydrolyzes the [alpha]-1,4-glycosidic linkages of starch resulting in the release of maltose. This reaction is of industrial importance for maltose production and for the preparation process of fermented foods and alcoholic beverages. A demand for an acceleration of the rate of enzymatic cleavage of the starch macro-molecule is a prerequisite for large-scale and highly efficient production. Increasing the temperature up to the optimum of approximately 60 [degree sign]C can significantly speed up the reaction. However, at higher temperatures, the effect on protein denaturation becomes dominant, and the conversion rate decreases. The primary objective of this study was to generate transgenic plants of the 'Kennebec' potato variety for production of thermostable [beta]-amylase using Agrobacterium-mediated transformation. Four chimeric genes encoding the [beta]-amylase with or without signal peptide sequences for targeting expression in cytoplasm, amyloplasts, or vacuoles were constructed and driven by high tuber expression promoter from Sucrose synthetase gene Sus4. Forty-two transgenic lines were selected for this study. Transgenic lines with various [beta]-amylase constructs were verified for the existence and expression of the transgenes by PCR approaches. The expression level of the introduced [beta]-amylase protein was estimated by immunoblot analyses using polyclonal antibodies. Recombinant [beta]-amylase was successfully expressed in Escherichia coli B21 (DE3), and temperature ranges of these inducible recombinant proteins were found to be between 40 and 90 [degree sign]C. This enzymatic complex produced in the in vitro cultured microtubers and field-grown tubers from transgenic potatoes were proved to be stable and active at 60 [degree sign]C. The relative activities of [beta]-amylase in tubers of field-grown potatoes were compared, and the maximum increase was found with transgenic line #6A of the pSUS4-AMY construct which has an 11-fold greater increase than the untransformed 'Kennebec'. Variations of the chemical compositions were found in the selected transgenic lines. Results of this study suggest the feasibility of utilizing thermostable [beta]-amylase in transgenic potatoes for the starch-processing industries.

Keywords: Thermostability; [beta]-Amylase; Transgenic potato

Oxylipin profile and antioxidant status of potato tubers during extended storage at room temperature/Pierre Delaplace, Jorge Rojas-Beltran, Patrick Frettinger, Patrick du Jardin, Marie-Laure Fauconnier *Plant Physiology and Biochemistry*, Volume 46, Issue 12, December 2008, Pages 1077-1084, ISSN 0981-9428, DOI: 10.1016/j.plaphy.2008.09.001. (<http://www.sciencedirect.com/science/article/pii/S0981942808001629>)

Abstract:

Potato tubers (cv. Bintje) (*Solanum tuberosum* L.) were stored under extreme conditions at 20 [degree sign]C for 350 days without sprout inhibitors in order to assess whether aging- and/or senescence-related processes occurred. Under these extreme storage conditions, multiple sprouting followed by the formation of daughter tubers occurs. At the same time, an increase in respiration intensity, as evidenced by cytochrome c oxidase activity (E.C. 1.9.3.1), is observed, leading to a potential increase in reactive oxygen species (ROS) production. As polyunsaturated fatty acids are priority targets of oxidative attacks, the damage to lipids was assessed by oxylipin profiling in both free and esterified forms. Oxylipin profiling showed a predominance of linoleic acid-derived oxylipins and of 9-hydroxy and 9-hydroperoxy fatty acids in both free and esterified forms. No significant

accumulation of individual oxylipin was observed 350 days after harvest. To further understand the absence of lipid breakdown products accumulation, the main enzymatic and non-enzymatic antioxidants were assessed. Antioxidant enzyme activities [superoxide dismutase (E.C. 1.15.1.1), catalase (E.C. 1.11.1.6.), ascorbate peroxidase (E.C. 1.11.1.11)] were enhanced during the advanced phase of aging. The main non-enzymatic antioxidant compound, ascorbate, decreased markedly in the early stages of storage, followed by a slower decline. Total radical scavenging activity was also maintained at the end of the storage period. Our results indicate that the enhanced aging process occurring during storage at room temperature does not seem to be associated with the changes classically encountered during leaf senescence or seed aging and that the observed degenerative processes do not surpass the protective potential of the tubers.

Keywords: Potato; *Solanum tuberosum* L.; Oxylipin; Aging; Fatty acid hydroperoxide; Oxidative stress; Post-harvest storage

Reduction of acrylamide formation by selected agents in fried potato crisps on industrial scale/Shiyi Ou, Qilin Lin, Yuping Zhang, Caihuan Huang, Xi Sun, Liang Fu

Innovative Food Science & Emerging Technologies, Volume 9, Issue 1, January 2008, Pages 116-121, ISSN 1466-8564, DOI:

10.1016/j.ifset.2007.06.008.

(<http://www.sciencedirect.com/science/article/pii/S1466856407000823>)

Abstract:

Great interest and rapid research efforts on acrylamide in foods followed an announcement in April 2002 by the Swedish National Food Authority and the University of Stockholm. Reduction of acrylamide in high-temperature processing foods, including selection of the raw material and variation of processing parameters, etc. were extensively reported. In this research, effect of some agents on acrylamide formation was investigated. A glucose-asparagines reaction model system was used to test the effect of ferulic acid, catechin, CaCl₂, NaHSO₃, and l-cysteine on inhibition of acrylamide formation and three efficient inhibitors, NaHSO₃, CaCl₂ and l-cysteine were screened. The results showed that immersing of the fresh potato chips using different concentration of the agents greatly inhibited acrylamide formation in fried potato crisps, and the efficiency increased as their concentrations increased; among them, l-cysteine is the most efficient agent but CaCl₂ is most potential. Effects of these food additives on the texture of fried potato crisps were also studied. It was found that l-cysteine showed little effect on the texture of the crisps and CaCl₂ is regarded as the suitable choice because of its low price and the acceptable mouth feel of fried crisps treated by CaCl₂, although it increased the brittleness. Moreover, the application of CaCl₂ in industrial production of fried potato crisps was also studied. In the blanching process (deactivation process of enzymes at 85 [degree sign]C), a computerized electrical conductivity detector was used to keep the concentration of CaCl₂ at constant and the result showed that immersion of potato slices in CaCl₂ solution at 5 g/L reduced acrylamide formation by more than 85% in fried crisps. Industrial relevance

This research presents a technology to inhibit acrylamide formation in fried potato chips by immersion of fresh potato chips with some food additives. The approach suggested that cysteine and calcium chloride significantly decreased the content of acrylamide in fried potato chips

and their concentrations could be kept constant by using a conductor as a detector.

Keywords: Acrylamide; Agents; Potato crisps; Inhibition

Soil water in relation to irrigation, water uptake and potato yield in a humid climate/G.C. Starr, D. Rowland, T.S. Griffin, O.M. Olanya ***Agricultural Water Management***, Volume 95, Issue 3, March 2008, Pages 292-300, ISSN 0378-3774, DOI: 10.1016/j.agwat.2007.10.012. (<http://www.sciencedirect.com/science/article/pii/S0378377407002703>)

Abstract:

Efficiently controlling soil water content with irrigation is essential for water conservation and often improves potato yield. Volumetric soil water content ($[\theta]_v$) in relation to irrigation, plant uptake, and yield in potato hills and replicated plots was studied to evaluate four water management options. Measurements of $[\theta]_v$ using a hammer driven probe were used to derive a $[\theta]_v$ index representing the relative $[\theta]_v$ status of replicated plots positioned along a hill slope. Time series for $[\theta]_v$ were determined using time domain reflectometry (TDR) probes at 5 and 15 cm depths at the center, shoulder, and furrow locations in potato hills. Sap flow was determined using flow collars in replicated field plots for four treatments: un-irrigated, sprinkler, surface drip, and sub-surface drip irrigation (40 cm depth). Irrigated yields were high/low as the $[\theta]_v$ index was low/high suggesting $[\theta]_v$ excess was a production problem in the wetter portions of the study area. The diurnal pattern of sap flow was reflected in the $[\theta]_v$ fluctuation it induces at hill locations with appreciable uptake. Hill locations with higher plant uptake were drier as was the case for the 5 cm (dry) depth relative to the 15 cm (wet) depth and for locations in the hill (dry) relative to the furrow (wet). The surface drip system had the lowest water use requirement because it delivers water directly to the hill locations where uptake is greatest. The sub-surface drip system wetted the hill gradually (1-2 days). Measurement of the $[\theta]_v$ index prior to experimental establishment could improve future experimental design for treatment comparisons.

Keywords: Soil water; Irrigation; Potato; Time series; Diagnostic modeling; Water use efficiency; Time domain reflectometry

Energy production from agricultural residues: High methane yields in pilot-scale two-stage anaerobic digestion/W. Parawira, J.S. Read, B. Mattiasson, L. Bjornsson

Biomass and Bioenergy, Volume 32, Issue 1, January 2008, Pages 44-50, ISSN 0961-9534, DOI: 10.1016/j.biombioe.2007.06.003. (<http://www.sciencedirect.com/science/article/pii/S0961953407000918>)

Abstract:

There is a large, unutilised energy potential in agricultural waste fractions. In this pilot-scale study, the efficiency of a simple two-stage anaerobic digestion process was investigated for stabilisation and biomethanation of solid potato waste and sugar beet leaves, both separately and in co-digestion. A good phase separation between hydrolysis/acidification and methanogenesis was achieved, as indicated by the high carbon dioxide production, high volatile fatty acid concentration and low pH in the acidogenic reactors. Digestion of the individual substrates gave gross energy yields of 2.1-3.4 kWh/kg VS in the form of methane. Co-digestion, however, gave up to 60% higher methane yield, indicating that co-digestion resulted in improved methane production due to the positive synergism established in the digestion liquor. The integrity of the methane filters (MFs) was

maintained throughout the period of operation, producing biogas with 60-78% methane content. A stable effluent pH showed that the methanogenic reactors had good ability to withstand the variations in load and volatile fatty acid concentrations that occurred in the two-stage process. The results of this pilot-scale study show that the two-stage anaerobic digestion system is suitable for effective conversion of semi-solid agricultural residues as potato waste and sugar beet leaves.

Keywords: Anaerobic digestion; Two-stage; Pilot scale; Potato; Sugar beet leaves; Co-digestion

Arbuscular mycorrhizal fungal spore-associated bacteria affect mycorrhizal colonization, plant growth and potato pathogens/Dharam Parkash Bharadwaj, Per-Olof Lundquist, Sadhna Alstrom

Soil Biology and Biochemistry, Volume 40, Issue 10, October 2008, Pages 2494-2501, ISSN 0038-0717, DOI: 10.1016/j.soilbio.2008.06.012.

(<http://www.sciencedirect.com/science/article/pii/S0038071708002058>)

Abstract:

Arbuscular mycorrhizal (AM) fungi and their bacterial associates are essential living components of the soil microbiota. From a total of 385 bacteria previously isolated from spores of AM fungi (AMB), 10 were selected based on ability to inhibit growth of plant pathogens. Effects of these isolates on AM fungal colonization, plant growth in potato (*Solanum tuberosum* L.) and inhibition of pathogens was investigated. AM fungal root colonization of potato was 7-fold higher in the presence of the *Pseudomonas* FWC70 isolate in a greenhouse and was 6-9-fold higher in the presence of the three isolates *Pseudomonas* FWC70, *Stenotrophomonas* FWC94 and *Arthrobacter* FWC110 in an outdoor pot experiment. Several growth traits of potato were stimulated by the *Pseudomonas* isolates FWC16, FWC30 and FWC70 and by the *Stenotrophomonas* isolate FWC14. All three *Pseudomonas* isolates showed inhibition against *Erwinia carotovora*, *Phytophthora infestans* and *Verticillium dahliae* but *Stenotrophomonas* isolates were variable. Protease(s), siderophores and indole acetic acid were produced by all isolates. Chitinase(s) were produced by all *Stenotrophomonas* and phosphate-solubilizing activity by all *Pseudomonas* isolates, the *Stenotrophomonas* FWC14 isolate and the *Arthrobacter* FWC110 isolate. We conclude that some AMB are multifunctional and production of extracellular enzymes and bioactive compounds are likely mechanisms for their multifunctional activities. Our results show that some AMB are likely to contribute to the often described ability of AM fungi to inhibit pathogens, acquire mineral nutrients and modify plant root growth.

Keywords: Arbuscular mycorrhizal fungi; Glomus; Plant pathogen; Potato; Root colonization; Spore-associated bacteria

ACE-inhibitory and antioxidant properties of potato (*Solanum tuberosum*/Anne Pihlanto, Sari Akkanen, Hannu J. Korhonen,

Food Chemistry, Volume 109, Issue 1, 1 July 2008, Pages 104-112, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.12.023.

(<http://www.sciencedirect.com/science/article/pii/S0308814607012800>)

Abstract:

Proteins were isolated from potato tubers (*Solanum tuberosum*) at different physiological states, and by-products from the potato industry were used to evaluate their ACE-inhibitory and radical-scavenging potencies. Protein isolates and by-products were autolysed or hydrolysed by alcalase, neutrase and esperase. Hydrolysis increased the inhibition of the angiotensin-converting enzyme (ACE) and the radical-scavenging activity. The ACE-inhibitory potencies of the

hydrolysates were high (IC₅₀ = 0.018 - 0.086) and the by-product fractions showed ACE-inhibition also before hydrolysis. All samples exhibited low radical-scavenging activity, and hydrolysis for 2 h with proteases was needed to produce an increase in the activity. Ultrafiltration through 10-3 kDa membranes efficiently separated the ACE-inhibitory compounds into permeate fractions. The results of this study suggest that potato is a promising source for the production of bioactive compounds as ingredients for developing functional foods with a beneficial impact on cardiovascular health.

Keywords: Potato; Hydrolysate; ACE-inhibition; Antioxidative; Functional foods

Comparison of potato seed tuber yields in beds, pots and hydroponic systems/Ricardo Monteiro Correa, Jose Eduardo Brasil Pereira Pinto, Cesar Augusto Brasil Pereira Pinto, Valdemar Faquin, Erika Soares Reis, Aline BeraldoMonteiro, Willian E. Dyer

Scientia Horticulturae, Volume 116, Issue 1, 10 March 2008, Pages 17-20, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.10.031.

(<http://www.sciencedirect.com/science/article/pii/S0304423807003846>)

Abstract:

The objective of this study was to compare potato seed tuber production of cvs. Monalisa and Agata growing in beds, pots or hydroponics, with either single or staggered harvests. All culture systems were established in plastic sheeting-covered greenhouses protected with an anti-aphid network. The beds and 3 L pots were filled with Plantmax(R) substrate and placed in suspended beds. The hydroponic system utilized NFT (Nutrient film technique) and 4 m x 15 cm x 7 cm PVC tubes with a 4% slope and the fertilizers were a commercial formula. Each experiment was 4 treatments in factorial Scheme 2 x 2 with 2 cultivars (Monalisa and Agata) and 2 harvest methods (single and staggered). All three experiments were carried out in randomized design with 6 replicates and 7 plants per replicate.

The hydroponics system presents some advantages: as harvest easiness, mineral nutrition control of plants, efficient use of water besides reducing the costs with pesticide. This system allows many harvest during the cycles culture allowing to maximize potato seed tubers harvest.

The hydropony system was better statistically for tubers/plant number in single and staggered harvest. In all systems, the non-destructive harvest provided larger amount of tubers/plant, being the length and biomass these tubers smaller than in single harvest.

There were significant interaction between culture system and harvest methods for the number of tubers per plant, tuber length and tuber fresh weights. The number of tubers per plant in hydroponics was 147% higher than the bed and pot systems for a single harvest. Even, tuber production from a staggered harvest in hydroponics was 286% greater than in the bed and pot systems for Monalisa and Agata cvs. Tuber lengths from potatoes growing in beds were 17% longer than those growing in pots or hydroponics from a single harvest. It was observed that tuber fresh weights in bed system, from a single harvest, were 51% larger than pot and hydroponic systems. Numbers of sprouts per tuber ranged from 2.55 to 3.04 for the 3 culture systems and 2 harvest methods. The sprouts length ranged 0.51-0.92 for Monalisa and Agata cultivar growing in bed, pots and hydropony system.

Keywords: Solanum tuberosum L.; Tissue culture; Seed tubers; Nutrient film technique

Effect of gibberellic acid on the duration of dormancy of potato tubers produced by plants derived from true potato seed/Alexios A. Alexopoulos, George Aivalakis, Konstantinos A. Akoumianakis, Harold C. Passam

Postharvest Biology and Technology, Volume 49, Issue 3, September 2008, Pages 424-430, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.02.009. (<http://www.sciencedirect.com/science/article/pii/S0925521408000793>)

Abstract:

Gibberellic acid (GA) was applied to potato tubers cultivated from true seed (TPS) either by immersion of intact tubers in aqueous solutions, or by the excision of a small area of the tuber close to the point of detachment from the stolon and immersion of this region only in GA. Corresponding treatments with deionised water were used as controls. Tubers that had been treated with GA broke dormancy earlier than the controls, especially when the tubers were cut prior to treatment. Dormancy breakage correlated with higher weight loss and an increase in the rate of respiration of tubers following sprout emergence. The optimum time of immersion in GA to achieve dormancy breakage was 2 h, irrespective of GA concentration over the range tested (1-50 mg L⁻¹). The bisection of tubers at various times after GA application to the point of detachment from the stolon indicated that GA movement longitudinally within the tuber was necessary for it to have an effect on sprouting. GA did not affect the rate of ethylene production by the tubers, but increased starch breakdown and [alpha]-glucosidase activity in the bud, as well as the RNA content, especially at the sprout apex, prior to sprouting.

Keywords: [alpha]-Glucosidase; Ethylene; Respiration; RNA; Starch

Biochemical and molecular diagnosis of insecticide resistance conferred by esterase, MACE, kdr and super-kdr based mechanisms in Italian strains of the peach potato aphid, *Myzus persicae* (Sulzer)/A. Criniti, E. Mazzoni, S. Cassanelli, P. Cravedi, A. Tondelli, D. Bizzaro, G.C. Manicardi,

Pesticide Biochemistry and Physiology, Volume 90, Issue 3, March 2008, Pages 168-174, ISSN 0048-3575, DOI: 10.1016/j.pestbp.2007.11.005. (<http://www.sciencedirect.com/science/article/pii/S0048357507001526>)

Abstract:

In this paper we analysed the basis of insecticide resistance in 59 Italian strains of the peach potato aphid *Myzus persicae* using both molecular and biochemical assays. Our data as a whole clearly indicate that most *M. persicae* strains (76.3%) have high or extremely high production of an esterase enzyme which sequester and detoxify insecticides with esteric group. Kdr genotypes conferring resistance towards pyrethroids are present in 57.7% of the analysed populations. Moreover, 26.5% of the kdr positive strains possess also the M918T mutation conferring super-kdr phenotype. Strains with modified AChE (MACE) are not so numerous (27.1%), although they can be found almost everywhere in Italy. Considering all the strains analysed, both MACE and kdr phenotypes are associated with high levels of esterase activity. In Central-Southern regions, kdr and MACE resistance mechanisms resulted in linkage disequilibrium. Bioassays performed in order to evaluate the efficacy of a pyrethroid insecticide against a strain possessing a F979S mutation within its para-type sodium channel gene suggests that this amino acid substitution could affect the sodium channel responsivity to pyrethroids.

Keywords: Myzus persicae; Insecticide resistance; Biochemical and molecular diagnosis; Screening; RFLP-PCR; Esterase; MACE; kdr; Super-kdr; AChE

Effects of temperature on the activity and kinetics of the granulovirus infecting the potato tuber moth *Phthorimaea operculella* Zeller (Lepidoptera: Gelechiidae)/Marc Sporleder, Octavio Zegarra, Erica Maritza Rodriguez Cauti, Jurgen Kroschel

Biological Control, Volume 44, Issue 3, March 2008, Pages 286-295, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2007.10.021. (<http://www.sciencedirect.com/science/article/pii/S1049964407002332>)

Abstract:

The granulovirus infecting the potato tuber moth (PoGV) is an important biocontrol agent, especially for managing the pest in rustic potato storerooms. For efficient propagation and use of baculoviruses in pest control strategies, information on the effects of temperature on virus multiplication and activity is crucial. The interaction between PoGV infection and incubation temperature on *P. operculella* was studied in laboratory bioassays by determining the survival, yield of virus-infected larvae, and the kinetics of virus in vivo increase. Bioassays for LC50 determination by using the egg-dip method were repeated over a period of six years in controlled incubation chambers at six constant temperatures ranging from 16 to 28 [degree sign]C. Additionally, at temperatures of 17 and 24 [degree sign]C the kinetics of virus development and increase in larva were assessed in destructive time-series experiments. Three different virus concentrations were used for inoculation. Control mortality was significantly temperature-dependent and was well described by a second-order polynomial function, with lowest mortality at 25 [degree sign]C (~20%) and highest at 16 [degree sign]C (>60%). LC50 values and slopes of probit-mortality curves were not significantly different between temperatures. Numbers of virus-infected larvae increased exponentially with increasing log-concentration of virus inoculum; an effect of temperature was not evident. Virus granules per larva correlated highly with larval age and larval weight. Multiple regression revealed minor direct effects of temperature on virus numbers; however, with decreasing temperature, larval weight and hence virus numbers increased. As a result, temperature is an important factor to be considered in virus-production facilities. Rearing temperature in virus-production facilities should be maintained at temperatures around 24 [degree sign]C.

Keywords: Integrated pest management; Baculovirus; Biological control; Microbial control; Baculovirus propagation; Temperature-dependency; In vivo propagation; Biological activity

Evaluation of sweet potato (*Ipomoea batatas*) live mulch at different spacings for weed suppression and yield response of maize (*Zea mays* L.) in southwestern Nigeria/R.D. Aladesanwa, A.W. Adigun

Crop Protection, Volume 27, Issue 6, June 2008, Pages 968-975, ISSN 0261-2194, DOI: 10.1016/j.cropro.2007.11.019. (<http://www.sciencedirect.com/science/article/pii/S0261219407003213>)

Abstract:

The use of living plants for ground cover management in food crops is very recent in spite of the fact that food crop production in chemically killed sod has been practiced for years. A randomized complete block field experiment was conducted over 2 years to evaluate the influence of sweet potato live mulch at different intra row spacings (60 cmx25 cm, 60 cmx50 cm and 60 cmx75 cm) on weed suppression

and yield response of maize in southwestern Nigeria. Hoe-weeding once at 3 and 7 weeks after planting was included in the experimental set-up as the standard cultural weed control practice. Results indicated that all the spacing regimes tested significantly ($P < 0.05$) suppressed weed growth and increased grain yield over the unweeded sole maize. Regressing weed growth parameters (Y) against decreasing intra row spacing expressed as increasing plant population density of the sweet potato intercrop (X) showed highly significant ($P \leq 0.001$) negative relationships. Of the treatments tested, maize plus sweet potato at 60 cm x 25 cm and weeding once at 3 and 7 weeks after planting (WAP) produced the highest yields, but bearing in mind the economics of labour input, weed control and yield, maize plus sweet potato at 60 cm x 50 cm would appear to be the most promising of all the treatments. The results of this study further confirm the potential of sweet potato as a suitable crop for use as live mulch that can be effectively exploited for weed suppression and improved growth and yield responses in maize.

Keywords: Weed control; Arable crop; Live mulch; Tropics

Energy balance under a conventional crop rotation system in northern Japan: Perspectives on fuel ethanol production from sugar beet/Nobuhisa Koga

Agriculture, Ecosystems & Environment, Volume 125, Issues 1-4, May 2008, Pages 101-110, ISSN 0167-8809, DOI: 10.1016/j.agee.2007.12.002. (<http://www.sciencedirect.com/science/article/pii/S016788090700285X>)

Abstract:

In the context of sustainable and less energy-dependent agricultural biomass production, an energy balance was developed for a conventional rotation of winter wheat (*Triticum aestivum* L.), sugar beet (*Beta vulgaris* L. subsp. *vulgaris*), adzuki bean (*Vigna angularis* (Willd.) Ohwi & Ohashi) and potato (*Solanum tuberosum* L.) under the highly fuel-dependent and material-intensive farming systems in the Tokachi region of Hokkaido, northern Japan. As annual energy inputs, tractor operations, truck transportations and grain drying for adzuki bean and winter wheat consumed the equivalent of 6.09 and 11.50 GJ ha⁻¹ year⁻¹ in fossil fuels, respectively. Input-output table estimates of the energy consumption resulting from the use of materials necessary to agricultural production (chemical fertilizers, biocides and agricultural machines) ranged between 11.01 +/- 0.26 GJ ha⁻¹ year⁻¹ for winter wheat and 24.38 +/- 0.35 GJ ha⁻¹ year⁻¹ for sugar beet. Thus, total annual energy inputs for fuel and materials consumed in cultivation and transportation steps amounted to 22.51 +/- 0.26, 32.97 +/- 0.35, 20.71 +/- 1.58 and 24.44 +/- 0.41 GJ ha⁻¹ year⁻¹ for winter wheat, sugar beet, adzuki bean and potato production, respectively. Chemical fertilizer consumption contributed significantly to the energy use, representing 25-43% of the total energy inputs. Based on regional crop production statistics (1999-2003), total energy outputs as yield and crop residue biomass were estimated at 151.3 +/- 18.1, 346.1 +/- 17.9, 42.0 +/- 18.1 and 163.8 +/- 11.6 GJ ha⁻¹ year⁻¹ for winter wheat, sugar beet, adzuki bean and potato production, respectively, resulting in regional conventional cropping energy output/input ratios of 6.72, 10.50, 2.03 and 6.70. Sugar beet is the most promising biomass-derived energy feedstock crop in this region, due to its high energy output/input ratio and net energy gain (energy output-input). However, for the full sugar beet-based bioethanol production system, a much lower energy output/input ratio and net energy gain were expected, given the greater energy inputs required in the transformation process.

In addition to altering agronomic practices, transformation technologies less dependent on fossil fuels are crucial to developing sustainable bioethanol production systems in northern Japan.

Keywords: Bioethanol; Biomass production; Crop rotation; Energy balance; Fuel consumption

Inhibitory effects of *Satureja hortensis* L. essential oil on growth and aflatoxin production by *Aspergillus parasiticus*/Mehdi Razzaghi-Abyaneh, Masoomeh Shams-Ghahfarokhi, Tomoya Yoshinari, Mohammad-Bagher Rezaee, Kamkar Jaimand, Hiromichi Nagasawa, Shohei Sakuda

International Journal of Food Microbiology, Volume 123, Issue 3, 30 April 2008, Pages 228-233, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2008.02.003.

(<http://www.sciencedirect.com/science/article/pii/S0168160508000627>)

Abstract:

In an effort to screen the essential oils of some Iranian medicinal plants for novel aflatoxin (AF) inhibitors, *Satureja hortensis* L. was found as a potent inhibitor of aflatoxins B₁ (AFB₁) and G₁ (AFG₁) production by *Aspergillus parasiticus* NRRL 2999. Fungal growth was also inhibited in a dose-dependent manner. Separation of the plant inhibitory substance(s) was achieved using initial fractionation of its effective part (leaf essential oil; LEO) by silica gel column chromatography and further separation by reverse phase-high performance liquid chromatography (RP-HPLC). These substances were finally identified as carvacrol and thymol, based on the interpretation of ¹H and ¹³C NMR spectra. Microbioassay (MBA) on cell culture microplates contained potato-dextrose broth (PDB) medium (4 days at 28 [degree sign]C) and subsequent analysis of cultures with HPLC technique revealed that both carvacrol and thymol were able to effectively inhibit fungal growth, AFB₁ and AFG₁ production in a dose-dependent manner at all two-fold concentrations from 0.041 to 1.32 mM. The IC₅₀ values for growth inhibition were calculated as 0.79 and 0.86 mM for carvacrol and thymol, while for AFB₁ and AFG₁, it was reported as 0.50 and 0.06 mM for carvacrol and 0.69 and 0.55 mM for thymol. The results obtained in this study clearly show a new biological activity for *S. hortensis* L. as strong inhibition of aflatoxin production by *A. parasiticus*. Carvacrol and thymol, the effective constituents of *S. hortensis* L., may be useful to control aflatoxin contamination of susceptible crops in the field.

Keywords: *Satureja hortensis* L.; Aflatoxin; *Aspergillus parasiticus*; NMR spectra; Chromatography; Growth inhibition

Production of biosurfactant and antifungal compound by fermented food isolate *Bacillus subtilis* 20B/Sanket Joshi, Chirag Bharucha, Anjana J. Desai,

Bioresource Technology, Volume 99, Issue 11, Exploring Horizons in Biotechnology: A Global Venture, July 2008, Pages 4603-4608, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.07.030.

(<http://www.sciencedirect.com/science/article/pii/S0960852407005809>)

Abstract:

A biosurfactant producing strain, *Bacillus subtilis* 20B, was isolated from fermented food in India. The strain also showed inhibition of various fungi in in-vitro experiments on Potato Dextrose Agar medium. It was capable of growth at temperature 55 [degree sign]C and salts up to 7%. It utilized different sugars, alcohols, hydrocarbons and oil as a carbon source, with preference for sugars. In glucose based minimal medium it produced biosurfactant which reduced surface tension to 29.5

mN/m, interfacial tension to 4.5 mN/m and gave stable emulsion with crude oil and n-hexadecane. The biosurfactant activity was stable at high temperature, a wide range of pH and salt concentrations for five days. Oil displacement experiments using biosurfactant containing broth in sand pack columns with crude oil showed 30.22% recovery. The possible application of organism as biocontrol agent and use of biosurfactant in microbial enhanced oil recovery (MEOR) is discussed.

Keywords: Biosurfactant; *Bacillus subtilis*; Surface tension; Interfacial tension; MEOR, Biocontrol agent

Co-composting of oil exhausted olive-cake, poultry manure and industrial residues of agro-food activity for soil amendment/F. Sellami, R. Jarboui, S. Hachicha, K. Medhioub, E. Ammar

Bioresource Technology, Volume 99, Issue 5, March 2008, Pages 1177-1188, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.02.018. (<http://www.sciencedirect.com/science/article/pii/S0960852407001654>)

Abstract:

The co-composting of exhausted olive-cake with poultry manure and sesame shells was investigated. These organic solid wastes were watered by the confectionary wastewater which is characterized by its high content of residual sugars raising its COD. Four aerated windrows were performed to establish the effects of confectionary by-products on the compost process. Different mixtures of the agro-industrial wastes were used. During the composting process, physico-chemical parameters (temperature, moisture, pH, electrical conductivity, total carbon and total nitrogen) were studied. The stability of the biological system was noticed after 70 days. The final products were characterized by their relatively high organic matter content, and low C/N ratio of 14-17. The humidification of the windrows with the wastewater seemed to have accelerated the composting process in comparison to a windrow humidified with water. In addition, the organic matter degradation was enhanced to reach 55-70%. The application of the obtained composts to soil appeared to significantly improve the soil fertility. Indeed, field experiments showed an increase in potato yield; the production was 30.5-37.5 tons ha⁻¹, compared to 30.5 tons ha⁻¹ with farm manure.

Keywords: Exhausted olive cake; Composting; Sesame shells; Waste disposal; Confectionary wastewater

Farming systems of the Loess Plateau, Gansu Province, China/Sharna Nolan, Murray Unkovich, Shen Yuying, Li Lingling, William Bellotti **Agriculture, Ecosystems & Environment**, Volume 124, Issues 1-2, Special Section: Problems and Prospects of Grassland Agroecosystems in Western China, March 2008, Pages 13-23, ISSN 0167-8809, DOI: 10.1016/j.agee.2007.08.009.

(<http://www.sciencedirect.com/science/article/pii/S0167880907002071>)

Abstract:

Gansu Province in north western China contains a large portion of China's rural poor. Within this province we compared extant farming systems in lower and higher rainfall areas of the Loess Plateau. The farming systems were dominated by subsistence winter wheat production in the higher rainfall more productive area (Qingyang), and subsistence spring wheat in the lower rainfall less productive area (Dingxi). Once household grain production is satisfied, remaining land is allocated to cash crop and livestock enterprises. Similar farm sizes (ca. 1 ha) in both areas meant that farmers in the more productive Qingyang area were easily able to meet household food needs and produce more cash income from sale of produce. They have reinvested this into their farms and

are now developing new enterprises, particularly livestock and co-operative trading arrangements. This has allowed many of these farmers to move away from subsistence grain production, such that 72% of household income is now derived from sale of farm produce. However, many farmers in Qingyang indicated a lack of technical agronomic support and limited access to reliable markets as barriers to diversification. In Dingxi, many farmers struggle to grow sufficient grain for household use and generate very little cash income, often insufficient to provide basic needs such as education. Potatoes, pea and oilseeds are the most common cash crops here, but livestock enterprises are poorly developed. In this area only 28% of household income is generated on farm, and young males often leave the farm to work in larger cities, leaving farming decisions to the elderly, women, and children, who are left behind to manage the farm. High illiteracy rates in this group reduce assimilation of new information. Farmers in Dingxi indicated that restricted access to capital, lack of technical agronomic support and little access to trading markets were serious impediments to the development of more profitable enterprises.

Keywords: Subsistence agriculture; Livestock; Adoption; Poverty

Relations between nitrogen leaching and food productivity in organic and conventional cropping systems in a long-term field study/Audun Korsaaeth

Agriculture, Ecosystems & Environment, Volume 127, Issues 3-4, September 2008, Pages 177-188, ISSN 0167-8809, DOI: 10.1016/j.agee.2008.03.014.

(<http://www.sciencedirect.com/science/article/pii/S0167880908001229>)

Abstract:

An ideal agricultural system should both maximize food production and minimize undesirable effects on the environment. The long-term Apelsvoll cropping system experiment, located in southeast Norway, was used in this study, to compare yields, major N flows (in particular measured leaching/runoff losses) and the N loss-to-food production ratios (LFP-ratios) in six different cropping systems over a 4-year period. The experiment included three systems with cash-cropping (CA1: conventional arable farming; CA2: arable farming practice with environmentally sound management; OA: organic arable farming with 25% of the area as green manure, and three systems with both arable and fodder crops, representing mixed dairy production (CM: conventional farming practice with 50% grass-clover ley; OM1: organic farming with 50% grass-clover ley; OM2: organic farming with 75% grass-clover ley). The forage production was assumed to be used for milk and meat production, in amounts calculated on the basis of available feed and estimated requirements for dairy cattle. All farm produce (cereals, potatoes, milk and meat) was converted into metabolizable energy for human consumption. Organic cropping gave significantly lower yields than conventional cropping, for both arable and mixed dairy systems, most likely due to sub-optimal plant nutrition and the lack of plant protection in the organic systems. The average net energy production in CA1 and CA2 was 2.4-5.3 times greater than that in the other systems, which illustrates the energy costs of taking 25% of the area out of food production to produce green manure (OA) and the energy cost of including an extra trophic level in the nutrient chain (CM, OM1 and OM2). Only CA2 and CM appeared to have a balanced N budget, whereas the other systems all had N deficits, in particular CA1 and OA. The total N losses to drainage were largest from CA1, but not significantly larger than those from OA, which had the largest N runoff of the systems, most

likely due to the green manure in its rotation. The conventional system with environmentally sound management (CA2) had the lowest LFP-ratios overall. Among the arable cropping systems, the organic system with 25% green manure (OA) had the highest LFP-ratios. The mixed dairy systems had generally higher LFP-ratios than the arable systems. Including leaching/runoff N losses in the LFP-ratio, CA1, CA2, OA, CM, OM1 and OM2 appeared to lose 0.6, 0.4, 1.1, 0.9, 1.2 and 1.1 kg N, respectively, per GJ of produced metabolizable energy for human consumption.

Keywords: Arable cropping systems; Cereal yields; Human nutrition; Food production; Loss-to-production ratios; Mixed dairy systems; Net energy production; Nitrogen budgets; Yields

Impact of low-level atmospheric ozone-enrichment on black spot and anthracnose rot of tomato fruit/Nikos Tzortzakis, Ian Singleton, Jeremy Barnes,

Postharvest Biology and Technology, Volume 47, Issue 1, January 2008, Pages 1-9, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.06.004. (<http://www.sciencedirect.com/science/article/pii/S0925521407002098>)

Abstract:

Tomato fruit (*Lycopersicon esculentum* L.) were exposed to ozone concentrations between 0.005 (control) and 5.0 [μ]mol mol⁻¹ up to 13 days at 13 [degree sign]C, prior to, or following, inoculation by *Alternaria alternata* or *Colletotrichum coccodes* (causes of black spot and anthracnose, respectively). Low-level atmospheric ozone-enrichment resulted in a modest, but statistically significant, reduction in fungal lesion development; higher concentrations of the gas resulting in greater effects. This finding implies concentration-specific impacts on fungal lesion development. A fluorescent lesion assay revealed that the ozone-induced inhibition of visible lesion development was reflected in a similar reduction in fungal biomass below the fruit surface. Fungal spore production in vivo, was markedly reduced when fruit were stored in an ozone-enriched atmosphere. Higher concentrations/duration of exposure resulted in greater reduction in spore production, with considerable benefits resulting from exposure to low levels of ozone (i.e. below the 0.2 [μ]mol mol⁻¹ European threshold used for the protection of human health). In vitro, effects of ozone on spore germination depended on concentration and duration of exposure. Studies performed on fungi exposed to ozone on Potato Dextrose Agar at 13 [degree sign]C and 95% relative humidity revealed no major effects on the growth of mycelia, implying the observed suppression of pathogen development was due in part to ozone-induced changes in fruit-pathogen interactions.

Keywords: *Alternaria alternata*; *Colletotrichum coccodes*; Lectin fluorescence assay; Ozone; Spoilage; Tomato fruit

Bacterial endophytes: *Bacillus* spp. from annual crops as potential biological control agents of black pod rot of cacao/Rachel L. Melnick, Nina K. Zidack, Bryan A. Bailey, Siela N. Maximova, Mark Gultinan, Paul A. Backman

Biological Control, Volume 46, Issue 1, Special Issue: Endophytes, July 2008, Pages 46-56, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2008.01.022.

(<http://www.sciencedirect.com/science/article/pii/S1049964408000431>)

Abstract:

Diseases are the most important factors limiting production of *Theobroma cacao* in South America. Because of high disease pressure and

environmental concerns, biological control is a pertinent area of research for cacao disease management. In this work, we evaluated the ability of four *Bacillus* spp. isolated from vegetable crops, for their ability to colonize *T. cacao* seedlings and reduce the severity of black pod rot (*Phytophthora capsici*). Of the *Bacillus* spp. tested, application of *B. cereus* isolates BT8 (from tomato) or BP24 (from potato) together with the polysilicon surfactant Silwet L-77 (0.24% vol/vol) resulted in long-term (>68 days) stable colonization of cacao leaves. Further investigation revealed that foliar colonization by BT8 and BP24 was primarily epiphytic, with endophytic populations typically representing 5-15% of total foliar bacteria. Significant reductions of disease severity (P [less-than-or-equals, slant] 0.05) on cacao leaf disks challenged with *P. capsici* were recorded from after day 26, and through 68 days following colonization with BT8. No bacterial colonists were observed in or on leaves that developed after bacteria application, suggesting that the bacteria were not capable of systemic movement through vascular tissues. These newly developed, non-colonized leaves from colonized plants exhibited disease suppression, which supports a probable disease suppression mechanism of induced systemic resistance for the BT8 isolate.

Keywords: *Bacillus*; Biological control; Induced systemic resistance; *Phytophthora capsici*; Pathogen; *Theobroma cacao*

Evaluating physical and nutritional stress during mycelial growth as inducers of tolerance to heat and UV-B radiation in *Metarhizium anisopliae* conidia/Drauzio E.N. Rangel, Anne J. Anderson, Donald W. Roberts

Mycological Research, Volume 112, Issue 11, November 2008, Pages 1362-1372, ISSN 0953-7562, DOI: 10.1016/j.mycres.2008.04.013.

(<http://www.sciencedirect.com/science/article/pii/S0953756208001159>)

Abstract:

Elevated tolerance to UV-B radiation and heat may be induced in conidia produced on fungi exposed during mycelial growth to sublethal stresses other than heat or UV-B. This is due to a phenomenon referred to as 'cross-protection'. Several mechanisms are associated with this increased conidial tolerance, one of which is the accumulation of trehalose and mannitol within conidia. In the present study, conidia of the insect-pathogenic fungus *Metarhizium anisopliae* var. *anisopliae* were produced on mycelium subjected to nutritive, heat-shock, osmotic, or oxidative stress. The tolerance levels to UV-B radiation and heat of the conidia from stressed mycelium were evaluated, and the amounts of trehalose and mannitol accumulated in conidia were quantified. Conidia produced under nutritive stress (carbon and nitrogen starvation) were two-times more heat and UV-B tolerant than conidia produced under rich (non-stress) nutrient conditions [potato-dextrose agar with yeast extract (PDAY)], and they also accumulated the highest concentrations of trehalose and mannitol. Conidia produced on heat-shock stressed PDAY cultures had higher tolerance to UV-B radiation and heat than conidia produced without heat shock; however, both the UV-B tolerance and trehalose/mannitol concentrations in conidia produced on heat-shocked mycelium were less than those of conidia produced under nutritive stress. Conidia produced under osmotic stress (sodium or potassium chloride added to PDAY) had elevated heat and UV-B tolerances similar to those of conidia produced under nutritive stress; however, they had the lowest levels of mannitol and trehalose, which indicates that accumulation of these compounds is not the only mechanism used by *M. anisopliae* for protection from heat and UV-B radiation. Oxidative

stress from UV-A irradiation or hydrogen peroxide did not produce conidia with elevated UV-B or heat tolerances. Conidia produced under oxidative stress generated by menadione had increased or unchanged tolerances to heat or UV-B, respectively. The levels of mannitol or trehalose in conidia were similar to those in the unstressed controls. Conidial yield was reduced, in some cases severely, by nutritive and osmotic stress; whereas oxidative and heat-shock stress did not alter levels of spore production.

Keywords: Biocontrol; Entomogenous fungi; Heat-shock stress; Mannitol; Nutritive stress; Osmotic stress; Oxidative stress; Trehalose

Effects of ambient pH and nutritional factors on antifungal activity of the mycoparasite *Coniothyrium minitans*/Rui Yang, Yongchao Han, Guoqing Li, Daohong Jiang, Hung-Chang Huang,

Biological Control, Volume 44, Issue 1, January 2008, Pages 116-127, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2007.08.008.

(<http://www.sciencedirect.com/science/article/pii/S1049964407001910>)

Abstract:

Antifungal activity (AA) of the mycoparasite *Coniothyrium minitans* (CM) against *Sclerotinia sclerotiorum* (SS), designated as AACM-SS, was detected by measuring the effect of cell-free cultural filtrates of CM on inhibition of growth (IG) of SS on potato dextrose agar. Using this bioassay method, effects of ambient pH and nutritional factors on AACM-SS in CM cultures grown in various liquid media were investigated. Results showed that production of AACM-SS by CM was closely related to ambient pH. After incubation for 9-15 days, AACM-SS was high in modified Czapek-Dox broth (MCD) with IG values being 78-90%, but low in potato dextrose broth (PDB) with IG values being 9-18%. In contrast, pH value was as low as 3.3-3.6 in the MCD cultures, whereas as high as 6.0-7.2 in the PDB cultures. In the pH-buffered experiment, AACM-SS was detected in MCD cultures of CM buffered at pH 2-8 with the optimum pH being 3-5, under which AACM-SS in PDB cultures of CM was greatly enhanced with the IG values reaching up to 46-67%. Results also indicated that AACM-SS in CM cultures can be affected by nutritional factors and their effects were also related to ambient pH. In the basal medium Czapek mineral salts, most carbon and nitrogen sources investigated were favourable to CM to produce AACM-SS with the IG values being 73-91% and the final pH values being 2.7-4.1. In the other basal medium potato extracts, a few carbon and nitrogen sources were favourable for CM to produce AACM-SS with the IG values being 40-60% and the final pH values being 2.7-5.5. In the pH-buffered experiments with selected carbon and nitrogen sources, or with mycelial or sclerotial extracts of SS, AACM-SS was much higher in CM cultures buffered at pH 3 than that buffered at pH 6. Additional experiments showed that AACM-SS could be induced by the phytotoxin oxalic acid (OA), but not by sodium oxalate, further suggesting the importance of acidic pH in production of AACM-SS by CM. Meanwhile, leaf blight incidence on Chinese cabbage caused by SS was greatly reduced in the treatment of CM conidia pre-germinated in PDB plus OA (16 mM) than that in the treatment of CM conidia pre-germinated in PDB alone. This study suggests that ambient pH plays an important role in regulation of the antifungal activity of CM against SS.

Keywords: *Coniothyrium minitans*; *Sclerotinia sclerotiorum*; Antifungal activity; Ambient pH; Nutritional factors; Oxalic acid; Biocontrol

Effects of physical and nutritional stress conditions during mycelial growth on conidial germination speed, adhesion to host cuticle, and virulence of *Metarhizium anisopliae*, an entomopathogenic fungus/Drauzio E.N. Rangel, Diane G. Alston, Donald W. Roberts

Mycological Research, Volume 112, Issue 11, November 2008, Pages 1355-1361, ISSN 0953-7562, DOI: 10.1016/j.mycres.2008.04.011.

(<http://www.sciencedirect.com/science/article/pii/S0953756208001135>)

Abstract:

Growth under stress may influence pathogen virulence and other phenotypic traits. Conidia of the entomopathogenic fungus *Metarhizium anisopliae* var. *anisopliae* (isolate ARSEF 2575) were produced under different stress conditions and then examined for influences on in vitro conidial germination speed, adhesion to the insect cuticle, and virulence to an insect host, *Tenebrio molitor*. Conidia were produced under non-stress conditions [on potato-dextrose agar plus 1 g l⁻¹ yeast extract (PDAY; control)], or under the following stress conditions: osmotic (PDAY + sodium chloride or potassium chloride, 0.6 or 0.8 m); oxidative [(PDAY + hydrogen peroxide, 5 mM) or UV-A (irradiation of mycelium on PDAY)]; heat shock (heat treatment of mycelium on PDAY at 45 [degree sign]C, 40 min); and nutritive [minimal medium (MM) with no carbon source, or on MM plus 3 g l⁻¹ lactose (MML)]. Conidia were most virulent (based on mortality at 3 d) and had the fastest germination rates when produced on MML, followed by MM. In addition, conidial adhesion to host cuticle was greatest when the conidia were produced on MML. Media with high osmolarity (0.8 m) produced conidia with slightly elevated virulence and faster germination rates than conidia produced on the control medium (PDAY), but this trend did not hold for media with the lower osmolarity, (0.6 m). Conidia produced from mycelium irradiated with UV-A while growing on PDAY had somewhat elevated virulence levels similar to that of conidia produced on MM, but their germination rate was not increased. Hydrogen peroxide and heat shock treatments did not alter virulence. These results demonstrate that the germination, adhesion and virulence of *M. anisopliae* conidia can be strongly influenced by culture conditions (including stresses) during production of the conidia.

Keywords: Biocontrol; Heat-shock stress; Lactose; Minimal medium; Nutritive stress; Osmotic stress; Oxidative stress; UV-A radiation

ScienceDirect 2009

Simultaneous saccharification and fermentation (SSF) of very high gravity (VHG) potato mash for the production of ethanol/Sathaporn Srichuwong, Maki Fujiwara, Xiaohui Wang, Tomoko Seyama, Riki Shiroma, Mitsuhiro Arakane, Nobuhiro Mukojima, Ken Tokuyasu

Biomass and Bioenergy, Volume 33, Issue 5, May 2009, Pages 890-898, ISSN 0961-9534, DOI: 10.1016/j.biombioe.2009.01.012.

(<http://www.sciencedirect.com/science/article/pii/S0961953409000233>)

Abstract:

Simultaneous saccharification and fermentation (SSF) of very high gravity (VHG) potato mash, containing 304 g L⁻¹ of dissolved carbohydrates, was carried out for ethanol production. Potato tubers were ground into a mash, which was highly viscous. Mash viscosity was reduced by the pretreatment with mixed enzyme preparations of pectinase, cellulase and hemicellulase. The enzymatic pretreatment established the use of VHG mash with a suitable viscosity. Starch in

the pretreated mash was liquefied to maltodextrins by the action of thermo-stable [α]-amylase at 85 [degree sign]C. SSF of liquefied mash was performed at 30 [degree sign]C with the simultaneous addition of glucoamylase, yeast (*Saccharomyces cerevisiae*) and ammonium sulfate as a nitrogen source for the yeast. The optimal glucoamylase loading, ammonium sulfate concentration and fermentation time were 1.65 AGU g⁻¹, 30.2 mM and 61.5 h, respectively, obtained using the response surface methodology (RSM). Ammonium sulfate supplementation was necessary to avoid stuck fermentation under VHG condition. Using the optimized condition, ethanol yield of 16.61% (v/v) was achieved, which was equivalent to 89.7% of the theoretical yield.

Keywords: Potato tuber; Bioethanol; Very high gravity (VHG); Simultaneous saccharification and fermentation (SSF); Starch

Comparative production of glucose and high fructose syrup from cassava and sweet potato roots by direct conversion techniques/Regy Johnson, G. Padmaja, S.N. Moorthy

Innovative Food Science & Emerging Technologies, Volume 10, Issue 4, October 2009, Pages 616-620, ISSN 1466-8564, DOI: 10.1016/j.ifset.2009.04.001.

(<http://www.sciencedirect.com/science/article/pii/S1466856409000368>)

Abstract:

High fructose syrup (HFS) is a highly valued liquid sweetener for beverage, confectionery and processed food industry, owing to its special attributes like high solubility and non-crystalline nature. Even though 85% HFS production is from corn, increased food demand has necessitated the search for alternative substrates and starchy root crops like cassava and sweet potato are potential raw materials. However, the economic production needs direct use of the roots and simplification of the cost-intensive steps. This study aims at the direct enzymatic conversion of roots for HFS production. Glucose yield was compared from six treatment systems viz., liquezyme-dextrozyme (T1), Stargen (T2), Stargen in two split doses (T3), Spezyme-Stargen (T4), Stargen (60 [degree sign]C; T5) and Spezyme-Stargen (60 [degree sign]C; T6). Glucose was higher (22-25%) from cassava than sweet potato (14.0-15.7%), owing to the high starch content in cassava. Conversion to glucose was higher in T1-T4 (95-98%) compared to 88-92% for T5 and T6. Although the fructose yield was more from cassava (8.36-9.78%) than sweet potato (5.2-6.0%), percentage conversion was similar (37-38%) for both the roots. The cost of production of HFS could be reduced by the direct hydrolysis of root slurry using Stargen. Industrial relevance The conventional process for HFS production involved three cost-intensive enzyme steps such as liquefaction, saccharification and isomerization and the major raw material is starch. Economic production using cheaper raw materials and simplification of the process are the decisive factors for the widespread use of HFS in the developing and less developed countries. The present study aimed at the direct conversion of cassava and sweet potato root slurry (without conversion to starch) through the use of improved enzymes like Spezyme and Stargen and mild operating conditions of pH and temperature. The cost of production of HFS could be reduced by using the wet root slurry and performing the Stargen aided saccharification at room temperature, followed by isomerization at 60 [degree sign]C using Sweetzyme T.

Keywords: Glucose; High fructose syrup; Cassava; Sweet potato; Direct root hydrolysis

Sweet potato: A novel substrate for pullulan production by Aureobasidium pullulans/Shengjun Wu, Zhengyu Jin, Qunyi Tong, Hanqing Chen

Carbohydrate Polymers, Volume 76, Issue 4, 16 May 2009, Pages 645-649, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2008.11.034.

(<http://www.sciencedirect.com/science/article/pii/S014486170800547X>)

Abstract:

A strain Aureobasidium pullulans AP329, was used for the production of pullulan by employing hydrolysed sweet potato as cultivation media. Hydrolysis with [alpha]-amylase alone resulted in the lowest yields of pullulan. In contrast continuous hydrolysis with pullulanase and the [beta]-amylase in sweet potato itself gave higher yields, but prolonged hydrolysis with amyloglucosidase decreased the yield. The maximum pullulan yield (29.43 g/l) was achieved at the dextrose equivalent value of 45 and pH of 5.5 for 96 h. As a substitute of sucrose, hydrolysed sweet potato was found to be hopeful and the yield of pullulan was higher than that of glucose and sucrose. The molecular weight of pullulan obtained from hydrolysed sweet potato media was much higher than that of sucrose and glucose media. Results of this work indicated that sweet potato was a promising substrate for the economical production of pullulan.

Keywords: Sweet potato; Fermentation; Aureobasidium pullulans; Pullulan; Microbial; Biomass

Effect of a de-oiling mechanism on the production of high quality vacuum fried potato chips/Rosana G. Moreira, Paulo F. Da Silva, Carmen Gomes

Journal of Food Engineering, Volume 92, Issue 3, June 2009, Pages 297-304, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.11.012.

(<http://www.sciencedirect.com/science/article/pii/S0260877408005657>)

Abstract:

Ways of removing the adhered surface oil, while the product is still in the fryer, has been the subject of many studies and patents for deep-fat frying processes. In the case of vacuum frying, this problem is exacerbated by the pressurization step, which causes a quick increase in pressure in the pore space thus forcing most of the surface oil into the product pore spaces. Therefore, for vacuum frying, a de-oiling mechanism is required to reduce the excessive oil absorption at the surface of the product. The main objective of this study was to establish the effect of de-oiling and frying temperature on potato chips quality attributes and oil absorption.

Potato slices (30 g, 1.6 mm thick, 5 cm diameter) were fried for 360 s in a lab-scale vacuum fryer (P < 1.33 kPa (10 Torr); 8 L of fresh oil) at 120, 130, and 140 [degree sign]C. A centrifuging system (750 rpm (63g units) for 40 s) was used before pressurizing the vessel and its effect on the final oil content (FOC) and product quality attributes were evaluated using standard methods.

Samples fried at 120 [degree sign]C for 360 s (non-centrifuged) had a final oil content of 0.43 g/g product compared to 0.097 g/g product for the centrifuged ones. Most of the oil was absorbed in the product during first 180 s of frying; and by the end of frying only 14% of the total oil content (TOC) was internal oil (IOC) while 86% was surface oil (SOC). About 34% of the IOC and only 0.7% of the SOC was absorbed during the first 20 s of frying.

Oil content absorption kinetics increased exponentially during the first 120 s of frying followed by a slight drop until the end of frying. At the end of frying, bulk density and porosity values of the

non-centrifuged samples were around 800 kg/m³ and 0.36 and 564 kg/m³ and 0.61 for the centrifuged samples, respectively. No significant changes ($P < 0.05$) were observed in moisture loss, shrinkage, color, and texture for the two treatments.

Experimental data for color and oil distribution with temperature can be accurately predicted using a special case of the logistic model. The kinetics of oil distribution and porosity with temperature can be described using the fractional conversion exponential model. Vacuum frying with a de-oiling step produces superior quality fried products with lower oil content.

Keywords: Oil absorption; De-oiling; Vacuum frying; Texture

Evaluation of cassava, sweet potato and field corn as potential carbohydrate sources for bioethanol production in Alabama and Maryland/
Lewis H. Ziska, G. Brett Runion, Martha Tomecek, Stephen A. Prior, H. Allen Torbet, Richard Sicher

Biomass and Bioenergy, Volume 33, Issue 11, November 2009, Pages 1503-1508, ISSN 0961-9534, DOI: 10.1016/j.biombioe.2009.07.014.

(<http://www.sciencedirect.com/science/article/pii/S0961953409001536>)

Abstract:

The recent emphasis on corn production to meet the increasing demand for bioethanol has resulted in trepidation regarding the sustainability of the global food supply. To assess the potential of alternative crops as sources of bioethanol production, we grew sweet potato (*Ipomoea batatas*) and cassava (*Manihot esculentum*) at locations near Auburn, Alabama and Beltsville, Maryland in order to measure root carbohydrate (starch, sucrose, glucose) and root biomass. Averaged for both locations, sweet potato yielded the highest concentration of root carbohydrate (ca 80%), primarily in the form of starch (ca 50%) and sucrose (ca 30%); whereas cassava had root carbohydrate concentrations of (ca 55%), almost entirely as starch. For sweet potato, overall carbohydrate production was 9.4 and 12.7 Mg ha⁻¹ for the Alabama and Maryland sites, respectively. For cassava, carbohydrate production in Maryland was poor, yielding only 2.9 Mg ha⁻¹. However, in Alabama, carbohydrate production from cassava averaged ~10 Mg ha⁻¹. Relative to carbohydrate production from corn in each location, sweet potato and cassava yielded approximately 1.5x and 1.6x as much carbohydrate as corn in Alabama; 2.3x and 0.5x for the Maryland site. If economical harvesting and processing techniques could be developed, these data suggest that sweet potato in Maryland, and sweet potato and cassava in Alabama, have greater potential as ethanol sources than existing corn systems, and as such, could be used to replace or offset corn as a source of biofuels.

Keywords: Biofuels; Carbohydrate; Cassava (*Manihot esculenta*); Corn (*Zea mays*); Ethanol potential; Sweet potato (*Ipomoea batatas*); Yield

Potential of plastic barriers to control Andean potato weevil *Premnotrypes suturicallus* Kuschel/J. Kroschel, J. Alcazar, P. Poma, **Crop Protection**, Volume 28, Issue 6, June 2009, Pages 466-476, ISSN 0261-2194, DOI: 10.1016/j.cropro.2009.01.008.

(<http://www.sciencedirect.com/science/article/pii/S026121940900009X>)

Abstract:

In potato production systems of the high Andes, Andean potato weevils of the genus *Premnotrypes* and *Rhigopsidius* are the most important potato pests. The adults are flightless insects that migrate to potato fields during the potato-growing season, where the larvae damage a high

proportion of the tuber harvest. We tested the hypothesis that plastic barriers established at field borders at sowing time are effective management tools to stop Andean potato weevil migration into potato fields, with a consequent reduction in Andean potato weevil tuber damage. In addition, we studied the effect of barriers on carabids, which represent an important insect family in the Andes and are natural enemies of Andean potato weevils. The studies were carried out in 21 on-farm experiments in two villages in the Central Highlands of Peru. The effect of plastic barriers was compared to farmers' practice, consisting of 1-4 insecticide applications per potato-growing season, in participatory research in fallow-potato and potato-potato rotation systems in which the Andean potato weevil *Premnotrypes suturicallus* Kuschel is endemic. Plastic barriers proved to be highly effective in stopping weevil migration. In screen house experiments only a small proportion (13%) of weevils was able to escape from plastic heights of 25 cm. A height of 50 cm could not be overcome, which was the height used in the on-farm field experiments. The combination of plastic barriers with pitfall traps installed close to the plastic significantly increased the number of Andean potato weevil catches, and proved an effective technology for mass trapping of Andean potato weevil adults. Plastic barriers also affected and increased the number of carabids, mainly of the genus *Blennidus*, in the pitfall traps. The proportion of carabids was 4-5 times higher in the location in which a lower number of Andean potato weevils and damaged tubers were observed. The results suggest that carabids are important predators of Andean potato weevils. The plastic barriers effectively reduced Andean potato weevils-caused potato tuber damage at harvest. Compared to the farmers' practice of using insecticides, the barriers were equally effective in fallow-potato rotation systems. In potato-potato rotation systems the combination of plastic barrier with one application of insecticide was superior to farmers' practice using 3-4 insecticide applications. The costs for plastic barriers were calculated to be equivalent to two or three insecticide applications per hectare. Plastic barriers are proposed as a new effective component for Integrated Pest Management of Andean potato weevils.

Keywords: Potato; *Solanum tuberosum*; Integrated Pest Management; Physical control; Natural control; Carabids; Participatory research

Postharvest Quality and Physiological Behavior of Sweet Potato (*Ipomoea batatas* Lam.) Leaf Stalks Under Three Temperatures/Yan PENG, Yong-quan XU, Dao-fu DUAN, Lin-chun MAO

Agricultural Sciences in China, Volume 8, Issue 2, February 2009, Pages 244-248, ISSN 1671-2927, DOI: 10.1016/S1671-2927(09)60033-X.
(<http://www.sciencedirect.com/science/article/pii/S167129270960033X>)

Abstract:

Sweet potato (*Ipomoea batatas* Lam.) leaf stalks were cut into 20 cm length, and stored at 20, 6, and 2[degree sign]C. The respiration rate, ethylene production, ascorbic acid, free amino acid, total chlorophyll content, freshness, and shelf life were determined during storage to investigate the effect of storage temperatures on the quality and physiological responses in sweet potato leaf stalks. Wound responses were observed as high respiration rate and ethylene production immediately after cutting. Sweet potato leaf stalks were found to be sensitive to chilling injury manifested as browning and water-soaking on the surface at 2[degree sign]C. In contrast, sweet potato leaf stalks were susceptible to senescence, exhibited by etiolating and

yellowing, at 20[degree sign]C. Loss in weight and chlorophyll was minimized under low temperatures. High temperatures also caused the accumulation of amino acids with a significant loss of ascorbic acid and chlorophyll. Sweet potato leaf stalks had a storage life of 16 days at 6[degree sign]C, 8 days at 2[degree sign]C, and 6 days at 20[degree sign]C, respectively.

Keywords: sweet potato; leaf stalks; storage; quality

Influence of harvest date on nitrate contents of three potato varieties for off-season production/Anita Ierna

Journal of Food Composition and Analysis, Volume 22, Issue 6, International Year of the Potato, September 2009, Pages 551-555, ISSN 0889-1575, DOI: 10.1016/j.jfca.2008.11.007.

(<http://www.sciencedirect.com/science/article/pii/S0889157508001944>)

Abstract:

The influence of potato variety and harvest date was investigated on tuber nitrate content for off-season production in three varieties: Arinda (mid-early), Spunta (mid-late) and Mondial (late). Samples of tubers were harvested at 90, 105 and 120 days after planting in winter-spring crop and at 80, 95 and 110 days after planting in summer-autumn crop. Tuber nitrate content was determined by ion selective electrode (ISE) method. Investigated varieties differed in nitrate content. In both off-season crops, the highest quantities of nitrate were contained in the late Mondial, with respect to the middle early Arinda variety and Spunta. After a delay of the harvest date, nitrate contents in the investigated tuber samples significantly decreased in winter-spring crop, whereas they increased in summer-autumn crop in the three varieties, but to the greatest extent in the case of late Mondial variety. Regardless of variety and harvest time, the content of nitrate in tubers was within the guidelines proposed by some European countries.

Keywords: Nitrates; Potato; Solanum tuberosum; Cultivar variation; Harvest date; Off-season crop; Food safety; Food composition

Effects of plant density on the yield and yield components of true potato seed (TPS) hybrids in early and main crop potato production systems/Mehmet Emin Caliskan, Noyan Kusman, Sevgi Caliskan

Field Crops Research, Volume 114, Issue 2, 10 November 2009, Pages 223-232, ISSN 0378-4290, DOI: 10.1016/j.fcr.2009.08.002.

(<http://www.sciencedirect.com/science/article/pii/S0378429009002093>)

Abstract:

This study was conducted to evaluate true potato seed (TPS) technology for use in ware or seed potato production in two contrasting environments in Turkey during 2002 and 2003. The field experiments were carried out in the Hatay and Nevsehir provinces in Turkey, which represent a Mediterranean early crop potato production area and a temperate main crop potato production area, respectively. The plug seedlings of six TPS hybrids were transplanted to the fields at four densities (15, 20, 25 or 30 plants m⁻²). The seed tubers of the medium early cultivar Marfona were also planted in the experimental plots to compare the performance of the TPS hybrids with traditional seed tubers. Transplanting of the seedlings was significantly delayed in Hatay due to unsuitable weather conditions in both years. The seedlings needed an adaptation period of 2-4 weeks after transplanting depending on the location and the growing conditions. The adaptation period was longer in Hatay due to high air temperatures after transplanting. Although the yield performance of the TPS hybrids differed depending on

the location and year, the TPS hybrids produced noticeably higher total tuber yields in Nevsehir location (ranging from 43.1 to 62.5 t ha⁻¹ in 2002 and from 39.5 to 50.6 t ha⁻¹ in 2003) than in Hatay (ranging from 15.3 to 19.6 t ha⁻¹ in 2002 and from 15.1 to 19.1 t ha⁻¹ in 2003). The percentage of marketable tubers (>28 mm) was also considerably higher in Nevsehir. The optimal plant density varied between 25 and 30 plants m⁻² with regard to the total yield, while the optimal density with regard to the marketable yield was 20 or 25 plants m⁻² depending on hybrids in Nevsehir. However, none of the tested plant densities caused competition between plants in Hatay, where the environmental conditions during the growing period considerably restricted the growth of individual TPS seedlings.

It was concluded that transplanting of TPS seedlings can be considered a feasible alternative for ware or seed potato production in temperate environments like Nevsehir that have growing periods of at least 4 months. However, there are several obstacles, such as difficulties with the timing of transplanting, long adaptation period that threaten the practicability of TPS technology in Mediterranean-type environments. Further agronomical studies focused on reducing inter- and intra-plant competition are needed for both environments in order to improve the acceptability of TPS technology to farmers.

Keywords: TPS; Hybrid; Seedling transplanting; Mediterranean; Temperate; Turkey

Proportions of potatoes and fodder beets selected by dairy cows and the effects of feed choice on nitrogen metabolism/T. Eriksson, P. Ciszuk, E. Burstedt

Livestock Science, Volume 126, Issues 1-3, December 2009, Pages 168-175, ISSN 1871-1413, DOI: 10.1016/j.livsci.2009.06.018.
(<http://www.sciencedirect.com/science/article/pii/S187114130900242X>)

Abstract:

Twenty-three lactating dairy cows were switched from a standard diet to a ration of alfalfa/grass silage and 1 kg rapeseed cake supplemented with raw potatoes and fodder beets allowed on a semi-restricted basis. The effects of feed choice on urinary markers for nitrogen metabolism were evaluated by the Stepwise regression technique. Each kilogram dry matter of potatoes and fodder beets lowered milk urea concentration and also the urinary ratio urea/creatinine to a similar extent, but allantoin and fecal results suggested larger hindgut fermentation and hence lower ruminal microbial protein production with potatoes than with fodder beets. The variation for concentration of urinary constituents associated with animal, sampling day and sampling time suggests multiple sampling within a day as preferable for spot sampling. It is concluded that the reluctance to potatoes by some cows may cause initial difficulties when fed to high yielding cows naive to the feed.

Keywords: Fodder beets; Potatoes; Dairy cow; Allantoin; Creatinine; Urea

Sweetpotato ADP-glucose pyrophosphorylase gene (ibAGP1) promoter confers high-level expression of the GUS reporter gene in the potato tuber/Tae-Won Kim, Young-Min Goo, Cheol-Ho Lee, Byung-Hyun Lee, Jung-Myung Bae, Shin-Woo Lee

Comptes Rendus Biologies, Volume 332, Issue 10, October 2009, Pages 876-885, ISSN 1631-0691, DOI: 10.1016/j.crvi.2009.07.002.
(<http://www.sciencedirect.com/science/article/pii/S1631069109001863>)

Abstract:

Molecular farming refers to the process of creating bioengineered plants with the capability of producing potentially valuable products, such as drugs, vaccines, and chemicals. We have investigated the potential of the sweet potato ADP-glucose pyrophosphorylase gene (ibAGP1) promoter and its transit peptide (TP) as an expression system for the mass production of foreign proteins in potato. The ibAGP1 promoter and its TP sequence were transformed into potato along with [beta]-glucuronidase (GUS) as a reporter gene, and GUS activity was subsequently analyzed in the transgenic potato plants. In tuber tissues, GUS activity in transgenic plants carrying only the ibAGP1 promoter (ibAGP1::GUS) increased up to 15.6-fold compared with that of transgenic plants carrying only the CaMV35S promoter (CaMV35S::GUS). GUS activity in transgenic plants was further enhanced by the addition of the sweetpotato TP to the recombinant vector (ibAGP1::TP::GUS), with tuber tissues showing a 26-fold increase in activity compared with that in the CaMV35S::GUS-transgenic lines. In leaf tissues, the levels of GUS activity found in ibAGP1::GUS-transgenic lines were similar to those in CaMV35S::GUS-lines, but they were significantly enhanced in ibAGP1::TP::GUS-lines. GUS activity gradually increased with increasing tuber diameter in ibAGP1::GUS-transgenic plants, reaching a maximum level when the tuber was 35 mm in diameter. In contrast, extremely elevated levels of GUS activity - up to about 10-fold higher than that found in CaMV35S::GUS-lines - were found in ibAGP1::TP::GUS-transgenic lines at a much earlier stage of tuber development (diameter 4 mm), and these higher levels were maintained throughout the entire tuber developmental stage. These results suggest that the sweetpotato ibAGP1 promoter and its TP are a potentially strong foreign gene expression system that can be used for molecular farming in potato plants. To cite this article: T.-W. Kim et al., C. R. Biologies 332 (2009).

Keywords: ADP-glucose pyrophosphorylase; CaMV35S; Transit peptide; Sucrose induction; Developmental stage

Supplementing Guinea grass with fresh sweet potato foliage for milk production by Bunaji and N'Dama cows in early lactation/I. Etela, A. Larbi, U.J. Ikhatua, M.A. Bamikole

Livestock Science, Volume 120, Issues 1-2, January 2009, Pages 87-95, ISSN 1871-1413, DOI: 10.1016/j.livsci.2008.04.010.

(<http://www.sciencedirect.com/science/article/pii/S1871141308001224>)

Abstract:

Forage from three sweet potato cultivars (A = TIS-87/0087; B = TIS-8164; C = TIS-2532.OP.1.13 at 30% daily dry matter intake), dried brewers' grains (DBG) and cottonseed meal (CSM) each at 2.5 kg were supplemented to Guinea grass (GG) to form four diets: Diet A = GG + TIS-87/0087; Diet B = GG + TIS-8164; Diet C = GG + TIS-2532.OP.1.13, and Diet D = GG + DBG + CSM (as control). Treatments were assigned as 4 x 4 Latin squares design over 60 days (10-day adaptation and 5-day sampling) using Bunaji and N'Dama cows in early lactation. The 48-h rumen dry matter (DM) degradation ranged ($P < 0.01$) from 407 g kg⁻¹ DM for GG to 791 g kg⁻¹ DM for sweet potato cultivar TIS-87/0087. Bunaji dry matter intake varied ($P < 0.05$) between 7.1 kg day⁻¹ in Diet B and 8.9 kg day⁻¹ in Diet D, but was similar ($P > 0.05$) among diets for the N'Dama cows. The metabolisable energy (ME) intakes were higher for Diet D although, it recorded the least efficiency of ME utilization for milk production. Milk yields were significantly ($P < 0.01$) higher in the Bunaji than the N'Dama cows, which is typical of their true breed differences. Total solids, ash, protein, fat, and sugar contents of the milk were similar among diets for both cow breeds, except Bunaji ash

contents that ranged ($P < 0.05$) from 0.77 g 100 g⁻¹ for Diet B to 0.83 g 100 g⁻¹ for Diet D. The results suggest that sweet potato forage could be utilized as whole or partial replacement for DBG and CSM to save cost under smallholder farming systems.

Keywords: Bunaji; Cows; Lactation; Milk yield; N'Dama; Supplementation

Bromoethane induces dormancy breakage and metabolic changes in tubers derived from true potato seed/Alexios A. Alexopoulos, George Aivalakis, Konstantinos A. Akoumianakis, Harold C. Passam

Postharvest Biology and Technology, Volume 54, Issue 3, December 2009, Pages 165-171, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2009.07.004. (<http://www.sciencedirect.com/science/article/pii/S0925521409001380>)

Abstract:

Bromoethane breaks the dormancy of potato tubers thus enabling early planting after harvest. Because of the increasing importance of true potato seed (TPS) for potato propagation in tropical and subtropical regions, we examined the efficacy of bromoethane on the dormancy breakage of mini-tubers grown from TPS, as well as the physiological changes induced. Bromoethane treatment of mini-tubers induced a rapid increase in respiration and ethylene production, which subsequently declined. Bromoethane stimulated the rate of sprouting and increased tuber weight loss. There was also a transient increase in the sucrose and glucose concentration in the tissues near the buds and in the parenchyma of bromoethane-treated tubers, whereas a transient increase in fructose was observed only in the tissues near the buds. Of the enzymes studied, invertase (acid and alkaline), fructokinase and glucose 6 phosphate dehydrogenase showed no change in activity following bromoethane treatment. However, hexokinase, UGPase and AGPase were more active in bromoethane-treated tubers than in the corresponding controls, while [alpha]-glucosidase showed a higher level of activity in bromoethane treated tubers, especially 2 d after treatment. It is concluded that bromoethane induces dormancy breakage in potato mini-tubers, partly through the exertion of stress, and significant metabolic changes within the tubers may be detected before the visible onset of sprouting.

Keywords: Carbohydrate metabolism; Enzyme activity; Ethylene; Respiration

Stable cytosolic expression of VH antibody fragment directed against PVY NIa protein in transgenic potato plant confers partial protection against the virus/Donia Bouaziz, Malika Ayadi, Amira Bidani, Souad Rouis, Oumema Nouri-Ellouz, Raida Jellouli, Nouredine Drira, Radhia Gargouri-Bouzid

Plant Science, Volume 176, Issue 4, April 2009, Pages 489-496, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2009.01.004. (<http://www.sciencedirect.com/science/article/pii/S0168945209000089>)

Abstract:

The expression of recombinant antibodies in transgenic plants has been proved to be an efficient approach for large-scale production. However, the stability of these molecules and their accumulation level depend on their molecular properties and cellular targeting.

The expression of single-domain antibody fragment (VH) can be advantageous since it offers small length, high expression, solubility and stability. It can therefore be preferred to other antibody derivatives avoiding the expression difficulties related to immunoglobulin domain folding via the formation of disulfide bridge.

This report describes the production of transgenic potato plants expressing a VH antibody directed against the NIa protease of potato virus Y. The antibody was driven by the constitutive CaMV 35S RNA promoter. The expression cassette was transferred into potato plants via *Agrobacterium tumefaciens* mediated transformation. All transgenic lines showed detectable levels of VH protein confirming the efficient translation and stability of this protein. The cellular localisation of the VH antibody was investigated. Transgenic and control plants were transferred in the greenhouse and mechanically inoculated by PVYo suspension. Some of the transgenic lines showed delayed symptoms at the first period post inoculation and then displayed a recovery phenomenon while the virions were still detected in the leaves.

Keywords: PVY; NIa protease; Recombinant VH antibody; *Solanum tuberosum*; Transgenic plants

Effect of *Zataria multiflora* Boiss. essential oil on growth and aflatoxin formation by *Aspergillus flavus* in culture media and cheese/ Hassan Gandomi, Ali Misaghi, Afshin Akhondzadeh Basti, Saeed Bokaei, Alireza Khosravi, Arash Abbasifar, Ashkan Jebelli Javan ***Food and Chemical Toxicology***, Volume 47, Issue 10, October 2009, Pages 2397-2400, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.05.024. (<http://www.sciencedirect.com/science/article/pii/S0278691509002531>)

Abstract:

The effect of *Zataria multiflora* Boiss. essential oil (EO) against growth, spore production and aflatoxin formation by *Aspergillus flavus* ATCC 15546 was investigated in synthetic media as well as Iranian ultra-filtered white cheese in brine. EO effectively inhibited radial growth and spore production on potato dextrose agar (PDA) in a dose-dependent manner. At 200 ppm, the radial growth and sporulation reduced by 79.4% and 92.5%, respectively. The growth was completely prevented at EO [greater-or-equal, slanted] 400 ppm on PDA, and minimum fungicidal concentration (MFC) of the oil was estimated at 1000 ppm. The oil also significantly suppressed mycelial growth and aflatoxin synthesis in broth medium at all concentrations tested ($P < 0.05$). At 150 ppm of EO, the mycelial growth and aflatoxin accumulation reduced by 90% and 99.4%, respectively. The EO at all concentrations tested, had an inhibitory effect against radial fungal growth and aflatoxin production by *A. flavus* in cheese. However, no concentration of EO examined was able to completely inhibit the growth and aflatoxin production in cheese. The results suggested the potential substitution of the antifungal chemicals by this EO as a natural inhibitor to control the growth of molds in foods such as cheese.

Keywords: *Zataria multiflora* Boiss. essential oil; *Aspergillus flavus*; Antifungal effect; Aflatoxin; Cheese

Growth and mycotoxin production by food spoilage fungi under high carbon dioxide and low oxygen atmospheres/M.H. Taniwaki, A.D. Hocking, J.I. Pitt, G.H. Fleet

International Journal of Food Microbiology, Volume 132, Issues 2-3, 30 June 2009, Pages 100-108, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2009.04.005.

(<http://www.sciencedirect.com/science/article/pii/S0168160509002189>)

Abstract:

The influence of high carbon dioxide and low oxygen concentrations on growth by the foodborne fungal species, *Mucor plumbeus*, *Fusarium oxysporum*, *Byssoschlamys fulva*, *Byssoschlamys nivea*, *Penicillium commune*,

Penicillium roqueforti, *Aspergillus flavus*, *Eurotium chevalieri* and *Xeromyces bisporus* was investigated. Production of aflatoxin by *A. flavus*, patulin by *B. nivea* and roquefortine C by *P. roqueforti* was also studied. Fungal growth was evaluated under atmospheres consisting of 20, 40 and 60% CO₂ plus < 0.5% O₂, on two media, Czapek Yeast Extract agar and Potato Dextrose agar. Several methods for measuring fungal growth were used: colony diameter, ergosterol content, hyphal length and/or mycelium dry weight. Among the nine species, three groups were distinguished with respect to their growth responses under modified atmospheres: (i) species which did not grow in 20% CO₂ < 0.5% O₂ (*P. commune*, *E. chevalieri* and *X. bisporus*); (ii) species which grew in 20% CO₂ < 0.5% O₂, but not 40% CO₂ < 0.5% O₂ (*P. roqueforti* and *A. flavus*); (iii) species which grew in 20%, 40% and 60% CO₂ < 0.5% O₂ (*M. plumbeus*, *F. oxysporum*, *B. fulva* and *B. nivea*). Facultatively anaerobic behaviour was observed in these last four species, which grew under the same conditions as the obligate anaerobe, *Clostridium sporogenes*. The production of aflatoxin, patulin, and roquefortine C was greatly reduced under all of the atmospheres tested.

Keywords: Fungi; Mycotoxins; Modified atmospheres; Food

Comparison of protein fermentation characteristics in rumen fluid determined with the gas production technique and the nylon bag technique/J.W. Cone, M.A.M. Rodrigues, C.M. Guedes, M.C. Blok, ***Animal Feed Science and Technology***, Volume 153, Issues 1-2, 26 August 2009, Pages 28-38, ISSN 0377-8401, DOI: 10.1016/j.anifeeds.2009.05.008.

(<http://www.sciencedirect.com/science/article/pii/S0377840109001898>)

Abstract:

In this study, a modified version of the gas production technique was used to determine protein fermentation characteristics in rumen fluid of 19 feedstuffs. Performing the incubations in a N-free environment, and with an excess of rapidly fermentable carbohydrates, made N the limiting factor to microbial growth, and so gas production profiles reflected the availability of N from the feed samples. Results showed that fermentation of protein in rumen fluid can be determined with this modified gas production technique, and that there were distinct differences in protein fermentation between the feed samples. Availability of protein for fermentation was highest in wheat, potato pieces and lupin, and lowest in Rumiraap, a formaldehyde treated rapeseed meal, palm kernel expeller and brewery grains. The protein degradation characteristics of the 19 feed ingredients were also determined with the in situ nylon bag technique. With the obtained results, the amount of rumen escape protein (REP) was calculated for each feedstuff. The results showed that the rate of degradation ranged from 0.010/h for Rumiraap to 0.151/h for wheat. The amount of REP ranged from 197 g/kg CP for lupin to 840 g/kg CP for Rumiraap. Comparing the gas production results with the results obtained with the nylon bag technique showed that there was a good relationship between the gas production after 12-25 h of incubation and the calculated amount of REP ($r^2 = 0.83-0.85$). The results show that the adapted gas production technique, being depleted of N and using an excess of rapidly fermentable carbohydrates, is suitable to recognize differences in N availability between feed samples and can be used as an alternative to the nylon bag technique and other in vitro techniques.

Keywords: Gas production; In vitro; Protein fermentation; Rumen undegradable protein

Nutritive value of some non-conventional feed resources of Ethiopia determined by chemical analyses and an in vitro gas method/T. Negesse, H.P.S. Makkar, K. Becker

Animal Feed Science and Technology, Volume 154, Issues 3-4, 26 November 2009, Pages 204-217, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2009.09.010.

(<http://www.sciencedirect.com/science/article/pii/S0377840109002946>)

Abstract:

To contribute to the feed supply and help solve the critical livestock feed deficit in Ethiopia; the DM, CP, NDF, ADF, lignin(sa), ash, non-protein N (NPN); total tannin, total phenol, condensed tannins, phytate, saponins, organic matter degradability (OMD), metabolizable energy (ME) and short chain fatty acids (SCFA) production of 3 forages and 16 agro-industrial by-products were determined. Fishmeal (FM), duckweed (DW), mature cactus (MC), sisal waste (SW) and banana peel (BP) had high ash (235-163 g/kg DM) and lignin(sa) (142-77 g/kg DM). Cabbage leftover (CL), young cactus (YC), onion peel (OnP), distillery by-product (DB), brewery by-product (BB), papaya peel (PaP), DW, *Moringa stenopetala* (MS) and FM had high amounts of CP (137-490 g/kg DM) and NPN (10-225 g CP/kg DM). BB, DB and DW had high NDF (>384 g/kg DM) while CL, YC, OnP, PaP, MS and FM had low NDF (<240 g/kg DM). BB and coffee parchment (CPa) had high lignin(sa) (214 and 170) and NDF (535 and 744) g/kg DM, respectively with resultant low OMD (507 and 322 g/kg DM, respectively). CPa, SW and DW had low ME (<6.5 MJ/kg DM); the rest had between 7.5 and 13.6 MJ ME/kg DM with similar trends in OMD and SCFA production. Avocado peel (AP), with a high ME (13.6 MJ/kg DM), had a low OMD (365 g/kg DM) because of its high fat. CPa, FM, AP and DW had the lowest SCFA concentrations (9.9-16.6 mM); MP, SW, OrP, PiP and CL had moderate to high ratios of acetate:propionate. YC, Coffee pulp (CPu), MS, CL and MP had high levels of total phenolics (112-151 g/kg DM) and tannin (42-121 g/kg DM). AP contained 22 g/kg DM condensed tannin and, YC and MC had none, and the rest had negligible levels. All feeds contained phytate and MC, YC, MS, DW and BP had large amounts (62-24 g/kg DM). Haemolytic activity (saponin) was detected in FM, DW, potato peel, SW, CPa, MC and CL. Some of the feeds can be used as sources of feed ME and CP, but because of the presence of secondary compounds, the amounts of the feedstuffs added in the diets of livestock should be decided through further research.

Keywords: Agro-industrial by-products; Secondary compounds; Metabolizable energy; Nutritive value; Organic matter digestion

Isolation, purification and antibacterial effects of fusaproliferin produced by *Fusarium subglutinans* in submerged culture/G. Meca, I.

Sospedra, J.M. Soriano, A. Ritieni, M.A. Valero, J. Manes

Food and Chemical Toxicology, Volume 47, Issue 10, October 2009, Pages 2539-2543, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.07.014.

(<http://www.sciencedirect.com/science/article/pii/S0278691509003408>)

Abstract:

To evaluate the fusaproliferin (FUS) production, *Fusarium subglutinans* ITEM 2404 was grown in a liquid medium of potato being this mycotoxin purified by high-performance liquid chromatography (HPLC) with a C18 semipreparative column using a mobile phase of acetonitrile/H₂O using gradient conditions. The purity of the fusaproliferin was verified by analytical HPLC, ultraviolet absorbance measurements, LC/MS-MS, ¹H NMR spectroscopy. The isolated FUS was shown to be free of impurities and can be used as a standard for routine analysis. The pure fusaproliferin

was utilized to study the biological activity on *Escherichia coli* and *Staphylococcus aureus*. This study demonstrated that FUS not showed significant antimicrobial activity against these microorganisms.

Keywords: Fusaproliferin; *Fusarium subglutinans*; Semipreparative column; High-performance liquid chromatography; Mass spectrometry

Use of spent mushroom substrates from *Agaricus subrufescens* (syn. *A. blazei*, *A. brasiliensis*) and *Lentinula edodes* productions in the enrichment of a soil-based potting media for lettuce (*Lactuca sativa*) cultivation: Growth promotion and soil bioremediation/L.C.C. Ribas, M.M. de Mendonca, C.M. Camellini, C.H.L. Soares

Bioresource Technology, Volume 100, Issue 20, October 2009, Pages 4750-4757, ISSN 0960-8524, DOI: 10.1016/j.biortech.2008.10.059.

(<http://www.sciencedirect.com/science/article/pii/S0960852409003721>)

Abstract:

This study aimed to assess physicochemical and microbiological properties of fresh spent mushroom substrates (SMSs) - without post-crop heat treatment - from *Agaricus subrufescens* and *Lentinula edodes* production to optimize the use of these residues in the soil enrichment for lettuce growth promotion and soil remediation. Organic matter and C content of both SMSs were high. Fresh *A. subrufescens* SMS was a good source of N, P and K. On the other hand, *L. edodes* SMS presented a lower concentration of these nutrients and a high level of immaturity. Both SMSs presented high electric conductivity values (2.5-3.4 mS/cm). Microbiological analysis, based upon enumeration of culturable bacteria (thermophilic and mesophilic) and fungi, and also evolution of CO₂, showed that SMSs played higher microbial diversity than soil control. Laccase activity from *A. subrufescens* SMS tended to remain constant during a 2-month period, while *L. edodes* SMS presented low laccase activity throughout the same period. *Agaricus subrufescens* and *L. edodes* were able to grow on a PDA (Potato Dextrose Agar) media supplemented with different concentrations of atrazine (1-50 [μg/ml]), degraded the herbicide, attaining rates of 35% and 26%, respectively. On experiments of lettuce growth promotion using a soil-based potting media with different SMS rates, 5% and 10% (dw) rates of *A. subrufescens* SMS resulted in higher lettuce aerial dry weights than the rates of 25% and 40%, the chemical fertilization (NPK) and the control (soil). At 10% supplementation, lettuce aerial dry weight increased 2.2 and 1.3 times compared to the control and the NPK treatment, respectively. Protein content increased along with SMS rates. Fresh *A. subrufescens* SMS was an excellent supplement for lettuce growth promotion and showed potential for remediation of biocides possibly due to improved microbial diversity and enzymatic activity. Fresh *L. edodes* SMS was not a good fertilizer, at least under the conditions tested. However, microbiological analysis showed that promising results may be achieved when using fresh *L. edodes* SMS for soil remediation.

Keywords: Spent mushroom substrate; *Agaricus subrufescens*; *Lentinula edodes*; *Lactuca sativa*; Atrazine

Potential link between exposure to fungicides chlorothalonil and mancozeb and haemic neoplasia development in the soft-shell clam *Mya arenaria*: A laboratory experiment/Julie Pariseau, Richard Saint-Louis, Maryse Delaporte, Mohammed Abo El Khair, Patricia McKenna, Rejean Tremblay, T. Jeffrey Davidson, Emilien Pelletier, Franck C.J. Berthe
Marine Pollution Bulletin, Volume 58, Issue 4, April 2009, Pages 503-514, ISSN 0025-326X, DOI: 10.1016/j.marpolbul.2008.12.011.

(<http://www.sciencedirect.com/science/article/pii/S0025326X08005560>)

Abstract:

The aetiology of haemic neoplasia (HN) is unknown, so far but many causative factors are suggested such as viral, pollution and genetics. The aim of this study was to determine if, under chronic exposure, two major pesticides (chlorothalonil and mancozeb) which are used in potato production could induce HN in soft-shell clams (*Mya arenaria*). Short-term experiments with acute exposure were also performed. Clams were collected from an epizootic site (North River, PEI) and from a site free of the disease (Magdalen Islands, Quebec). The tetraploid level of haemocytes was assessed by flow cytometry for each clam to determine the HN status. The bioaccumulation of pesticides in tissues was quantified by gas chromatography/mass spectrometry (GC/MS) for chlorothalonil while mancozeb and manganese were quantified by inductively coupled plasma-mass spectrometer (ICP/MS). Long term exposure to fungicide Bravo 500(R) did not induce high tetraploid levels on negative clam from North River and the analysis of the digestive gland and the mantle did not reveal any detectable level of chlorothalonil. In the Manzate 200 DF(R), some clams revealed high level of tetraploid cells but no difference were observed between the treatments and the control. The analysis of the digestive gland and the mantle for manganese did not highlight any significant difference in tissue concentration ($p = 0.05$). For the acute exposure, chlorothalonil analysis showed that the active ingredient is distributed between four chlorinated compounds: 99.5% for chlorothalonil isomers, 0.4% for pentachlorothalonil and 0.1% for trichlorothalonil isomers. For a 72 h experiment, the accumulation was within 4 h; the higher tissue concentration of chlorothalonil was 59.2 [$\mu\text{g g}^{-1}$] in the mantle after 48 h, following by a decrease to an undetectable level at the end. For the manganese, the accumulation was detected after 4 h; the higher tissue concentration was 48.8 [$\mu\text{g g}^{-1}$] in the mantle after 24 h and, over the following 48 h, the accumulation decreased until the end of the trial. Based on the data, the accumulation of these fungicides seems to be transitory. Chlorothalonil and mancozeb are both oxidative-stress promoters and could have induced cell dysfunction while in the tissue. Study on the effect of these fungicides on the p53 protein system is an example of strategy that would provide information on cellular events promoting neoplasia.

Keywords: *Mya arenaria*; Soft-shell clam; Fungicides; Chlorothalonil; Mancozeb; Manganese; Haemic neoplasia; Acute exposure; Chronic exposure

Beyond resource constraints - Exploring the biophysical feasibility of options for the intensification of smallholder crop-livestock systems in Vihiga district, Kenya/P. Tittonell, M.T. van Wijk, M. Herrero, M.C. Rufino, N. de Ridder, K.E. Giller

Agricultural Systems, Volume 101, Issues 1-2, June 2009, Pages 1-19, ISSN 0308-521X, DOI: 10.1016/j.agsy.2009.02.003.

(<http://www.sciencedirect.com/science/article/pii/S0308521X09000298>)

Abstract:

During participatory prototyping activities in Vihiga, western Kenya, farmers designed what they considered to be the ideal farm [Waithaka, M.M., Thornton, P.K., Herrero, M., Shepherd, K.D., 2006. Bio-economic evaluation of farmers' perceptions of viable farms in western Kenya. *Agric. Syst.* 90, 243-271]: one in which high productivity is achieved through optimising crop-livestock interactions. We selected four case study crop-livestock farms of different resource endowment (Type 1-4 -

excluding the poorest farmers, Type 5, who do not own livestock) and quantified all relevant physical flows through and within them. With this information we parameterised a dynamic, farm-scale simulation model to investigate (i) current differences in resource use efficiencies and degree of crop-livestock interactions across farm types; and (ii) the impact of different interventions in farm Types 3 and 4 on producing the desired shifts in productivity towards the ideal farm. Assuming no resource constraints, changes in the current farm systems were introduced stepwise, as both intensification of external input use (fertilisers and fodder) and qualitative changes in the configuration of the farms (i.e. changing land use towards fodder production, improving manure handling and/or changing cattle breeds). In 10-year simulations of the baseline, current scenario using historical weather data the wealthiest farms Type 2 achieved food self-sufficiency (FSS) in 20% of the seasons due to rainfall variability, whereas the poorer Type 4 only achieved FSS in 0 to 30% of the seasons; soil organic C decreased during the simulations at annual rates of -0.54, -0.73, -0.85 and -0.84 t C ha⁻¹ on farms of Type 1-4, respectively; large differences in productivity and recycling efficiency between farm types indicated that there is ample room to improve the physical performance of the poorer farms (e.g. light and water use efficiency was 2-3 times larger on wealthier farms). Simulating different intensification scenarios indicated that household FSS can be achieved in all farm types through input intensification, e.g. using P fertilisers at rates as small as 15 kg farm⁻¹ season⁻¹ (i.e. from 7 to 28 kg ha⁻¹). Increasing the area under Napier grass from c. 20 to 40% and reducing the area of maize, beans and sweet potato in farms of Type 3 and 4 increased their primary productivity by c. 1 t ha⁻¹ season⁻¹, their milk production by 156 and 45 L season⁻¹, respectively, but decreased the production of edible energy (by 2000 and 250 MJ ha⁻¹ season⁻¹) and protein (by 20 and 3 kg ha⁻¹ season⁻¹). By bringing in a more productive cow the primary productivity increased even further in Farm Type 3 (up to 5 t ha⁻¹ season⁻¹), as did milk production (up to c. 1000 L season⁻¹), edible energy (up to c. 10,000 MJ ha⁻¹ season⁻¹) and protein (up to c. 100 kg ha⁻¹ season⁻¹). The impact of livestock management on the recycling of nutrients and on the efficiency of nutrient use at farm scale can be large, provided that enough nutrients are present in or enter the system to be redistributed. An increase in N cycling efficiency through improved manure handling from 25 to 50% would increase the amount of N cycled in the case study farms of Type 1 and 2 by only ca. 10 kg season⁻¹, and only 1-2 kg season⁻¹ in Type 3 and 4. The various alternatives simulated when disregarding resource constraints contributed to narrow the productivity and efficiency gaps between poorer and wealthier farms. However, the feasibility of implementing such interventions on a large number of farms is questionable. Implications for system (re-)design and intensification strategies are discussed.

Keywords: Sub-Saharan Africa; Farming systems design; Smallholder farms; Farm-scale modelling; Food security; Resource use efficiency

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Site-directed mutagenesis improves the thermostability of a recombinant *Picrophilus torridus* trehalose synthase and efficiency for the

production of trehalose from sweet potato starch/Hsin-Hung Chou, Shu-Wei Chang, Guan-Chiun Lee, Yi-Shan Chen, Tzunuan Yeh, Casimir C. Akoh, Jei-Fu Shaw

Food Chemistry, Volume 119, Issue 3, 1 April 2010, Pages 1017-1022, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.08.010.
(<http://www.sciencedirect.com/science/article/pii/S0308814609009790>)

Abstract:

A new recombinant *Picrophilus torridus* TSase (PTTS) has the catalytic ability for the conversion of maltose to trehalose by intramolecular transglucosylation. For industrial applications, the high thermostability of the enzyme would be the most important property for reducing the microbial contamination and lower the production cost. Therefore, in this study, we substituted ten selected proline residues of PTTS which differ from two well-known thermostable TSases. Interestingly, we found that the N503 mutant type, namely N503P-PTTS, showed about 39% higher relative activity than that of the wild type at 65 [degree sign]C for 120 min. The trehalose yield of mutant N503P-PTTS was 1.3-fold higher than that of the wild type with sweet potato starch as substrate at 50 [degree sign]C for 4 h. This suggests that the proline site substitution technology used in this study is useful for altering enzyme properties and catalytic efficiency for possible industrial applications.

Keywords: Amylase; Maltose; Mutation; Proline; Sweet potato; Thermostability; Trehalose; Trehalose synthase

Inhibitory effects of sweet potato leaves on nitric oxide production and protein nitration/Ming-Hsing Huang, Heuy-Ling Chu, Lih-Jeng Juang, Bor-Sen Wang

Food Chemistry, Volume 121, Issue 2, 15 July 2010, Pages 480-486, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.12.068.
(<http://www.sciencedirect.com/science/article/pii/S0308814609014885>)

Abstract:

The inhibitory effects of a water extract of sweet potato leaves (WSPL) on nitric oxide (NO) production and protein tyrosine residue nitration were investigated. The results showed that WSPL inhibited NO production in a concentration-dependent manner. In the range of 0-1.0 mg/ml, the inhibitory effect on NO generation in macrophages increased with increasing concentration of WSPL. Meanwhile, the protein tyrosine residue nitration in mouse heart homogenates was inhibited by 1 mg/ml WSPL. In addition, WSPL, in the range of 0-0.4 mg/ml, also exhibited radical scavenging, reducing and chelating activities and protected liposomes against oxidative damage. A high performance liquid chromatography analysis revealed that phenolic acids and flavonols such as chlorogenic acid, caffeic acid, and quercetin were present in the WSPL, which could contribute to the protective effect against oxidative damage. Thus, WSPL might be useful in preventing protein nitration and oxidative stress.

Keywords: Sweet potato leaves; Nitric oxide; Macrophages; Protein nitration; High performance liquid chromatography

Farmers' incentives to save water with new irrigation systems and water taxation--A case study of Serbian potato production/Jens Erik Orum, Mads Vejlbj Boesen, Zorica Jovanovic, Soren Marcus Pedersen

Agricultural Water Management, Volume 98, Issue 3, SAFIR - Safe and high quality food production using low quality waters and improved irrigation systems and management, 30 December 2010, Pages 465-471, ISSN 0378-3774, DOI: 10.1016/j.agwat.2010.10.019.

(<http://www.sciencedirect.com/science/article/pii/S0378377410003483>)

Abstract:

Drip irrigation systems and irrigation strategies like deficit irrigation (DI) and partial root drying (PRD) are potential water saving irrigation systems and strategies. This paper analyses the Serbian farmer's economic incentive to use these water saving systems and strategies instead of the present sprinkler irrigation. The analysis is a partial budgeting analysis, based on irrigation application efficiency from the literature, standard figures for power requirements, pumping efficiency and friction losses for various sources of water and pressure requirements, yields and water use from recent Serbian field experiments, as well as prices and cost structures for potatoes collected in the Belgrade region. The analysis shows that changing the present system and strategy can save a significant amount of water (almost 50%). At the same time, however, irrigation costs are also significantly increased (more than doubled), and the total production costs are increased by 10% (deficit drip irrigation) and 23% (PRD). Increased taxes on water, investment subsidies, increased energy prices, and an increased yield or yield quality may provide incentives for farmers to change to new systems and strategies. The analysis indicates that a 0.80 to 1.97 [euro] m⁻³ water tax is needed to make deficit drip irrigation and PRD profitable. The socioeconomic cost of providing water for irrigation and the alternative value of saved water are probably not that high. Thus, water taxation may not be a socioeconomic efficient means to improve the irrigation water productivity of Serbian potato production. Drip irrigation and PRD may, however, also increase the yield quality, and a 10-23% quality premium (price increase) is needed to make deficit drip irrigation and PRD profitable.

Keywords: Irrigation system; Irrigation strategy; Water tax; Potatoes; PRD; Serbia

Effects of irrigation strategies and soils on field grown potatoes: Yield and water productivity/Seyed Hamid Ahmadi, Mathias N. Andersen, Finn Plauborg, Rolf T. Poulsen, Christian R. Jensen, Ali Reza Sepaskhah, Soren Hansen

Agricultural Water Management, Volume 97, Issue 11, 1 November 2010, Pages 1923-1930, ISSN 0378-3774, DOI: 10.1016/j.agwat.2010.07.007.

(<http://www.sciencedirect.com/science/article/pii/S0378377410002386>)

Abstract:

Yield and water productivity of potatoes grown in 4.32 m² lysimeters were measured in coarse sand, loamy sand, and sandy loam and imposed to full (FI), deficit (DI), and partial root-zone drying (PRD) irrigation strategies. PRD and DI as water-saving irrigation treatments received 65% of FI after tuber bulking and lasted for 6 weeks until final harvest. Analysis across the soil textures showed that fresh yields were not significant between the irrigation treatments. However, the same analysis across the irrigation treatments revealed that the effect of soil texture was significant on the fresh yield and loamy sand produced significantly higher fresh yield than the other two soils, probably because of higher leaf area index, higher photosynthesis rates, and 'stay-green' effect late in the growing season. More analysis showed that there was a significant interaction between the irrigation treatments and soil textures that the highest fresh yield was obtained under FI in loamy sand. Furthermore, analysis across the soil textures showed that water productivities, WP (kg ha⁻¹ fresh tuber yield mm⁻¹ ET) were not significantly different between the irrigation

treatments. However, across the irrigation treatments, the soil textures were significantly different. This showed that the interaction between irrigation treatments and soil textures was significant that the highest significant WP was obtained under DI in sandy loam. While PRD and DI treatments increased WP by, respectively, 11 and 5% in coarse sand and 28 and 36% in sandy loam relative to FI, they decreased WP in loamy sand by 15 and 13%. The reduced WP in loamy sand was due to nearly 28% fresh tuber yield loss in PRD and DI relative to FI even though ET was reduced by 9 and 11% in these irrigation treatments. This study showed that different soils will affect water-saving irrigation strategies that are worth knowing for suitable agricultural water management. So, under non-limited water resources conditions, loamy sand produces the highest yield under full irrigation but water-saving irrigations (PRD and DI) are not recommended due to considerable loss (28%) in yield. However, under restricted water resources, it is recommended to apply water-saving irrigations in sandy loam and coarse sand to achieve the highest water productivity.

Keywords: Potato tuber yield; Water productivity; Partial root-zone drying irrigation; Deficit irrigation; Full irrigation; Soil textures

Selection of stress-tolerant yeasts for simultaneous saccharification and fermentation (SSF) of very high gravity (VHG) potato mash to ethanol/Takashi Watanabe, Sathaporn Srichuwong, Mitsuhiro Arakane, Seiji Tamiya, Masaru Yoshinaga, Itsuki Watanabe, Mami Yamamoto, Akira Ando, Ken Tokuyasu, Toshihide Nakamura

Bioresource Technology, Volume 101, Issue 24, December 2010, Pages 9710-9714, ISSN 0960-8524, DOI: 10.1016/j.biortech.2010.07.079. (<http://www.sciencedirect.com/science/article/pii/S0960852410012903>)

Abstract:

Highly concentrated bioethanol production requires less volume in fermentation tanks and conserves distillery energy. We screened osmotolerant yeasts from a collection of 1699 yeast strains at our institute and found that three strains, NFRI3062, NFRI3213, and NFRI3225, were candidates for use in bioethanol production. All of these strains belonged to *Saccharomyces cerevisiae*. NFRI3062 produced 15.0% (w/v) of ethanol from YPD medium containing 35% glucose cultivated at 30 [degree sign]C for 60 h, while *S. cerevisiae* NBRC0224, which has previously been reported suitable for ethanol production, only produced 13.0% (w/v). The thermotolerances of NFRI3213 and NFRI3225 were also superior to those of NBRC0224 and NFRI3062. We also demonstrated the simultaneous saccharification and fermentation (SSF) of very high gravity (VHG) potato mash and sweet-potato mash. NFRI3225 produced ethanol from potato mash at the fastest rate and in the highest volume (13.7% (w/v)) among the tested strains. The maximum productivity and ethanol yields were 9.1 g/L/h and 92.3%, respectively. Although the potato mash was not sterilized, bacterial contamination was not observed. This may have been due to the growth inhibition of bacteria by the rapid glucose consumption and ethanol production of NFRI3225 during the VHG-SSF process.

Keywords: Bioethanol; Very high gravity (VHG); Osmotolerant; Thermotolerant; Simultaneous saccharification and fermentation (SSF)

Duration of plastic mulch for potato growth under drip irrigation in an arid region of Northwest China/Xiao-Yan Hou, Feng-Xin Wang, Jiang-Jiang Han, Shao-Zhong Kang, Shao-Yuan Feng

Agricultural and Forest Meteorology, Volume 150, Issue 1, 15 January 2010, Pages 115-121, ISSN 0168-1923, DOI: 10.1016/j.agrformet.2009.09.007.

(<http://www.sciencedirect.com/science/article/pii/S0168192309002238>)

Abstract:

Field experiments were conducted to examine the effect the duration of plastic mulching has on soil temperature, evapotranspiration, potato (*Solanum tuberosum* L.) growth and yields, and water use efficiency (WUE), under drip irrigation in an arid region of Northwest China in 2006 and 2007. The duration of coverage with 0.0075 mm thick, transparent plastic mulch on potato beds varied from zero days (i.e. no cover) to the entire season. The average daily air temperature during the two growing seasons was adequate for potato growth, but there were days when the maximum air temperature was above 30 [degree sign]C. Daily mean soil temperature under the plastic mulch was 2-9 [degree sign]C higher than for non-mulching conditions. The mulch effect on soil temperature was greatest during the early growth and became less as the plant canopy increased. Differences in the air and soil temperature between years could explain the difference of potato growth under different mulch durations for the two growing seasons. Mulch reduced irrigation water required and evapotranspiration; however, extending mulch duration beyond 60 days had little effect on evapotranspiration. Both tuber yield and WUE demonstrated benefiting from early plastic mulching. Mulch cover for 60 days was favorable for potato production in both years compared to potatoes grown without mulch.

Keywords: Potato; Soil temperature; Evapotranspiration; Water use efficiency

Multivariate analysis of relationship between potato (*Solanum tuberosum* L.) yield, amount of applied elements, their concentrations in tubers and uptake in a long-term fertilizer experiment/Petr Srek, Michal Hejcman, Eva Kunzova

Field Crops Research, Volume 118, Issue 2, 8 August 2010, Pages 183-193, ISSN 0378-4290, DOI: 10.1016/j.fcr.2010.05.009.

(<http://www.sciencedirect.com/science/article/pii/S0378429010001334>)

Abstract:

The aim of this study was to investigate how potato yield, the concentrations of elements (N, P, K, Ca, Mg, S, As, Cd, Cr, Cu, Fe, Mn, Ni, Pb and Zn) in tubers and their uptake are affected by mineral N, P and K fertilizers, straw and pig slurry application. Potatoes were collected in 2008 from the Ruzyně Fertilizer Experiment (RFE, the Czech Republic, 24 fertilizer treatments), which was established on a permanent arable field (Illimerized Luvisol) in 1955. Fifty-three years of fertilizer application have resulted in highly contrasting levels of P and K availability in the different treatments. A plant available (Mehlich III) soil P concentration below 30 mg kg⁻¹ and a K concentration below 150 mg kg⁻¹ were not adequate for satisfactory tuber production. No positive effect of long-term straw application on tuber yield was recorded. The optimal application rate of mineral fertilizers resulting in a tuber yield above 30 t ha⁻¹ was 140 kg N ha⁻¹, 63 kg P ha⁻¹ and 186 kg K ha⁻¹. The highest environmentally acceptable N application rate for potatoes was 120 kg N ha⁻¹, applied in the form of mineral fertilizer. Substantially higher production efficiency was recorded for mineral N, P and K fertilizers than for pig slurry. The concentrations of As, Cd, Cr, Cu, Fe, Mn, Pb and Zn in tubers were not significantly affected by fertilizer

treatment although pig slurry supplied substantially higher amounts of Cu and Zn to the soil than were taken up by the tubers. The concentration of Pb exceeded the Czech legislation DM limit (0.61 mg kg⁻¹) in 83% of samples, but there was no significant effect of fertilizer treatment. Therefore normal cropping practices do not significantly increase the concentrations of trace elements in potatoes.

Keywords: Arsenic and lead; Heavy metals; Nitrogen, phosphorus and potassium fertilizers; Pig slurry; Redundancy analysis; Illimerized Luvisol; Trace and risk elements

Deficit irrigation based on drought tolerance and root signalling in potatoes and tomatoes/Christian R. Jensen, Adriano Battilani, Finn Plauborg, Georgios Psarras, Kostas Chartzoulakis, Franciszek Janowiak, Radmila Stikic, Zorica Jovanovic, Guitong Li, Xuebin Qi, Fulai Liu, Sven-Erik Jacobsen, Mathias N. Andersen

Agricultural Water Management, Volume 98, Issue 3, SAFIR - Safe and high quality food production using low quality waters and improved irrigation systems and management, 30 December 2010, Pages 403-413, ISSN 0378-3774, DOI: 10.1016/j.agwat.2010.10.018.

(<http://www.sciencedirect.com/science/article/pii/S0378377410003471>)

Abstract:

Agriculture is a big consumer of fresh water in competition with other sectors of the society. Within the EU-project SAFIR new water-saving irrigation strategies were developed based on pot, semi-field and field experiments with potatoes (*Solanum tuberosum* L.), fresh tomatoes (*Lycopersicon esculentum* Mill.) and processing tomatoes as model plants. From the pot and semi-field experiments an ABA production model was developed for potatoes to optimize the ABA signalling; this was obtained by modelling the optimal level of soil drying for ABA production before re-irrigation in a crop growth model. The field irrigation guidelines were developed under temperate (Denmark), Mediterranean (Greece, Italy) and continental (Serbia, China) climatic conditions during summer. The field investigations on processing tomatoes were undertaken only in the Po valley (North Italy) on fine, textured soil. The investigations from several studies showed that gradual soil drying imposed by deficit irrigation (DI) or partial root zone drying irrigation (PRD) induced hydraulic and chemical signals from the root system resulting in partial stomatal closure, an increase in photosynthetic water use efficiency, and a slight reduction in top vegetative growth. Further PRD increased N-mineralization significantly beyond that from DI, causing a stay-green effect late in the growing season. In field potato and tomato experiments the water-saving irrigation strategies DI and PRD were able to save about 20-30% of the water used in fully irrigated plants. PRD increased marketable yield in potatoes significantly by 15% due to improved tuber size distribution. PRD increased antioxidant content significantly by approximately 10% in both potatoes and fresh tomatoes. Under a high temperature regime, full irrigation (FI) should be undertaken, as was clear from field observations in tomatoes. For tomatoes full irrigation should be undertaken for cooling effects when the night/day average temperature >26.5 [degree sign]C or when air temperature >40 [degree sign]C to avoid flower-dropping. The temperature threshold for potatoes is not clear. From three-year field drip irrigation experiments we found that under the establishment phase, both potatoes and tomatoes should be fully irrigated; however, during the later phases deficit irrigation

might be applied as outlined below without causing significant yield reduction:

- Potatoes

[ring operator] After the end of tuber initiation, DI or PRD is applied at 70% of FI. During the last 14 days of the growth period, DI or PRD is applied at 50% of FI.

- Fresh tomatoes

[ring operator] From the moment the 1st truce is developed, DI is applied at 85-80% of FI for two weeks. In the middle period, DI or PRD is applied at 70% of FI. During the last 14 days of the growth period, DI or PRD is applied at 50% of FI.

- Processing tomatoes

[ring operator] From transplanting to fruit setting at 4th-5th cluster, the PRD and DI threshold for re-irrigation is when the plant-available soil water content (ASWC) equals 0.7 (soil water potential, [Psi]soil = -90 kPa). During the late fruit development/ripening stage, 10% of red fruits, the threshold for re-irrigation for DI is when ASWC = 0.5 ([Psi]soil = -185 kPa) and for PRD when ASWC (dry side) = 0.4 ([Psi]soil, dry side = -270 kPa).

The findings during the SAFIR project might be used as a framework for implementing water-saving deficit irrigation under different local soil and climatic conditions.

Keywords: ABA modelling; Antioxidants; Drip irrigation; Partial root zone drying; Processing tomatoes; Quality; Soil nitrogen

Amino acid content in traditional potato cultivars from the Canary Islands/B. Rodriguez Galdon, D. Rios Mesa, E.M. Rodriguez Rodriguez, C. Diaz Romero

Journal of Food Composition and Analysis, Volume 23, Issue 2, March 2010, Pages 148-153, ISSN 0889-1575, DOI: 10.1016/j.jfca.2009.08.009. (<http://www.sciencedirect.com/science/article/pii/S0889157509002476>)

Abstract:

The amino acid profile, amino acid score and total protein content were determined in ten traditional potato (*Solanum tuberosum*) cultivars from Tenerife (Bonita, Bonita negra, Azucena negra, Mora, Borralla, Terrenta, Colorada de бага, Negra, Peluca blanca and Palmera lagarteada). There were significant differences among the potato cultivars in total protein content, and in the amino acids that were studied, except methionine. Azucena negra and Negra cultivars showed the highest mean protein content, while the Colorada de бага cultivar showed the lowest. In general, the Colorada de бага and Palmera lagarteada cultivars had the highest content of amino acids, and the Bonita cultivar the lowest. The production region did not influence the concentrations of amino acids. The chemical score of the potato protein varied considerably among the potato cultivars, ranging from 26.2% for the Palmera lagarteada to 66.5% for the Bonita negra. Sulphur amino acids were the limiting amino acids for all the potato cultivars, except Borralla. Lysine was the limiting amino acid for the Borralla cultivar, and the second limiting amino acid in the rest of the potato cultivars. After application of stepwise discriminant analysis, 93.1% (65.5%, after cross-validation) of the potato samples were correctly classified according to the cultivar, when the variables selected were glycine, histidine, leucine and total proteins.

Keywords: Potatoes; *Solanum tuberosum*; Traditional cultivars; Amino acids; Amino acid profile; Proteins; Chemical score; Discriminant analysis; Genetic characteristic determination;

Canary Islands; Biodiversity; Cultivar differences; Food analysis; Food composition

Influence of variety and growth environment on [beta]-amylase activity of flour from sweet potato (*Ipomea batatas*)/N.T. Dziedzoave, A.J.

Graffham, A. Westby, J. Otoo, G. Komlaga

Food Control, Volume 21, Issue 2, February 2010, Pages 162-165, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2009.05.005.

(<http://www.sciencedirect.com/science/article/pii/S0956713509001455>)

Abstract:

In order to select a suitable Ghanaian variety of sweet potato as enzyme source for the production of glucose syrups, four varieties of sweet potatoes - Sauti, Santom pona, Faara and Okumkom - cultivated in two different agro-ecological zones of Ghana were evaluated for [beta]-amylase activity. Faara and Okumkom varieties harvested at 5 months maturity from the forest zone showed the highest [beta]-amylase activity and consequently the most suitable potential enzyme source for the hydrolysis of starchy materials in glucose syrup production. Enhancing [beta]-amylase levels in sweet potatoes has potential cost efficiency advantages in glucose syrup production.

Keywords: [beta]-amylase; Sweet potato; Varieties

Effects of ensiling totally mixed potato hash ration with or without a heterofermentative bacterial inoculant on silage fermentation, aerobic stability, growth performance and digestibility in lambs/B.D. Nkosi, R. Meeske

Animal Feed Science and Technology, Volume 161, Issues 1-2, 13 October 2010, Pages 38-48, ISSN 0377-8401, DOI:

10.1016/j.anifeedsci.2010.07.015.

(<http://www.sciencedirect.com/science/article/pii/S0377840110002373>)

Abstract:

Totally mixed rations (TMRs) that contained 804 g/kg potato hash (PH) were ensiled in 1.5 L jars with or without a heterofermentative inoculant, Lalsil Fresh *Lactobacillus buchneri* (LB) for 3 months. Jars were opened on days, 0, 3, 7, 10, 21, 45, 60 and 90 of ensiling and sampled for fermentation and chemical composition determinations. Aerobic stability was determined on day 90 of ensiling. Treatments were LB treated TMR (LB-TMR) and untreated TMR (U-TMR). Furthermore, three TMRs that contained 801 g/kg of either maize (320 g DM/kg) or PH (as fed basis) were ensiled for 90 days in 210 L drums for lamb growth and digestibility studies. The ensiled TMRs were: Maize TMR (M-TMR), U-TMR and LB-TMR and were fed to 24 South African Dorper lambs (20+/- 0.152 kg live weight) that were randomly allocated to the three TMR treatments (8 lambs/pretreatment). Inoculation with LB decreased ($P < 0.05$) pH, butyric acid, $\text{NH}_3\text{-N}$, fibre fractions, CO_2 production and yeast population while lactic acid, acetic acid and propionic acid concentrations were increased ($P < 0.05$) compared to U-TMR silage. The ensiled LB-TMR was aerobically more stable than U-TMR silage as indicated by lower ($P < 0.05$) CO_2 production and yeast population and higher concentrations of acetic acid. Higher ($P < 0.05$) feed intake, average daily gain (ADG), nutrient digestibility and N retention occurred in LB-TMR silage compared to the other silages. It was concluded that LB was effective in producing a better quality PHS as indicated by improved fermentation, aerobic stability, lamb growth performance and digestibility of LB-TMR silage.

Keywords: Potato hash; Silage; Inoculants; Fermentation; Aerobic stability; Digestibility

Faecal contamination and hygiene aspect associated with the use of treated wastewater and canal water for irrigation of potatoes (*Solanum tuberosum*)/A. Forslund, J.H.J. Ensink, A. Battilani, I. Kljujev, S. Gola, V. Raicevic, Z. Jovanovic, R. Stikic, L. Sandei, T. Fletcher, A. Dalsgaard

Agricultural Water Management, Volume 98, Issue 3, SAFIR - Safe and high quality food production using low quality waters and improved irrigation systems and management, 30 December 2010, Pages 440-450, ISSN 0378-3774, DOI: 10.1016/j.agwat.2010.10.007. (<http://www.sciencedirect.com/science/article/pii/S0378377410003288>)

Abstract:

Clean water has become one of the main limiting factors in agricultural food production in Europe, especially for countries around the Mediterranean, who now face more severe and frequent seasonal water shortages. In order to overcome water shortages the European Water Framework Directive encourages and promotes the use of treated urban wastewater in agriculture. However, the use of poor quality water in agriculture poses potential health risks. The application of wastewater through subsurface drip irrigation lines could possibly overcome public health concerns by minimizing contact with wastewater by farmers, farm workers but it is uncertain if the risk for consumers of wastewater irrigated produces would be acceptable. The objective of the current study was therefore to assess whether subsurface irrigation of potatoes with low quality water was associated with higher food safety and reduced human health risks as compared with surface irrigation. The microbial quality of soil and potatoes irrigated by sprinkler, furrow and subsurface drip irrigation, using treated urban wastewater, canal water and tap water were compared at experimental sites near Belgrade, Serbia and in Bologna, Italy. Water, soil and potato samples were collected from March 2007 to September 2008 and their faecal contamination estimated by enumeration of the faecal indicator *Escherichia coli*. In addition, water and potatoes in Italy were analysed for the presence of helminth eggs, another important indicator of faecal pollution. A quantitative microbial risk assessment (QMRA) model combined with Monte Carlo simulations was used to assess whether the different irrigation practices and associated health risks complied with guidelines set by the World Health Organization (WHO). The study found low levels of *E. coli* in irrigation water (Italy mean value: 1.7 colony forming units (cfu)/ml and Serbia 11 cfu/ml), as well as in soil (Italy mean: 1.0 cfu/g and Serbia 1.1 cfu/g). Similar low concentrations of *E. coli* were found on potatoes (Italy mean: 1.0 cfu/g and Serbia 0.0 cfu/g). The vast majority (442/516) of the collected different samples were free of *E. coli*. No helminth eggs were found in any types of irrigation water or on the surface of potatoes. The risk assessment models found the use of treated wastewater to exceed the levels of risks for gastro-intestinal disease (1.0×10^{-3} disease risk) as recommended by the World Health Organization (WHO) for the accidental ingestion of soil by farmers (Serbia: 0.22 and Italy: 5.7×10^{-2}). However, samples that exceeded disease risks set by the WHO were collected before initiation of wastewater irrigation and were limited to a few numbers of samples, which would indicate environmental contamination not linked to irrigation practice. Disease risk from consumption of potatoes in Italy and in Serbia was found to be within acceptable levels. No relationship was found between *E. coli* concentrations in irrigation water, soil and produce. Similar lack of association was found for *E. coli* findings in sprinkler, furrow or

subsurface drip irrigated soils and produce. This indicates that subsurface drip irrigation can be practiced while ensuring food safety and protecting the health of consumers and farmers.

Keywords: Irrigation; Wastewater; Potato; Microbial contamination; Risk assessment

Substrate contribution on carotenoids production in *Blakeslea trispora* cultivations/E.H. Papaioannou, M. Liakopoulou-Kyriakides

Food and Bioprocess Technology, Volume 88, Issues 2-3, June-September 2010, Pages 305-311, ISSN 0960-3085, DOI: 10.1016/j.fbp.2009.03.001. (<http://www.sciencedirect.com/science/article/pii/S0960308509000170>)

Abstract:

The present report gives an insight into the specific changes in the three main carotenoids (lycopene, [gamma]-carotene and [beta]-carotene) occurring in *Blakeslea trispora* cultures, with regard to medium composition. Various carbon sources and refined natural vegetable oils as co-substrates were used. The different carbon sources greatly affect the final composition of carotenoids, with lactose medium to preferentially accumulate the all-trans-[beta]-carotene. Furthermore, the use of lactose and starch as carbon sources, respectively, gives a first indication that *B. trispora* is able to metabolise various homo- and hetero-saccharides, thus leading to different carotenoid percentages. The presence of oils as co-substrates resulted in enhanced fungus growth and subsequent higher carotenoid production. Substrates containing linoleic acid or other oils rich in it led to less lycopene accumulation. The data showed that the biosynthesis of lycopene, [gamma]-carotene and [beta]-carotene starts in most cases simultaneously in the early growth phase even in trace amounts and thus may play a role also as antioxidants for the *B. trispora* cells.

Keywords: [beta]-Carotene; [gamma]-Carotene; Lycopene; Carotenoid; *Blakeslea trispora*; RP-HPLC-DAD

Alkali-aided enzymatic viscosity reduction of sugar beet mash for novel bioethanol production process/Sathaporn Srichuwong, Mitsuhiro Arakane, Maki Fujiwara, Zilian Zhang, Hiroyuki Takahashi, Ken Tokuyasu

Biomass and Bioenergy, Volume 34, Issue 9, September 2010, Pages 1336-1341, ISSN 0961-9534, DOI: 10.1016/j.biombioe.2010.04.024. (<http://www.sciencedirect.com/science/article/pii/S0961953410001571>)

Abstract:

Ethanol fermentation of fresh sugar beet mash (SBM) could give a benefit on reducing energy input for sugar diffusion, juice separation, and water evaporation as used in conventional practices, thus offering promise as a low energy process. Actions of cell-wall degrading enzymes provide a mash with low viscosity, which can be easily fermented to ethanol. However, a several-fold higher enzyme loading was required for viscosity reduction of SBM compared with that of potato mash. In this study, the use of dilute alkali treatment (0.025-0.15 N NaOH, 25 [degree sign]C, 1 h) in enhancing enzymatic viscosity reduction of SBM was evaluated. The results showed that higher NaOH concentration enhanced demethylation and deacetylation of SBM, resulting in greater performances of the enzymes on reducing viscosity. Efficient enzymatic viscosity reduction of SBM was observed with the 0.1 N NaOH treatment. On the other hand, untreated SBM was highly resistant to viscosity reduction, even though a 20-fold more enzyme loading was used. The resulting mash containing 12-13% (w/v) sucrose yielded 7-8% (v/v) ethanol after 24 h of fermentation (90% efficiency). Accordingly,

alkali treatment can be applied for facilitating the use of fresh sugar beet for ethanol production.

Keywords: Sugar beet; Bioethanol; Pectin; Deacetylation; Alkali treatment; Biomass

Pseudomonas cannabina pv. *cannabina* pv. nov., and *Pseudomonas cannabina* pv. *alisalensis* (Cintas Koike and Bull, 2000) comb. nov., are members of the emended species *Pseudomonas cannabina* (ex Sutic & Dowson 1959) Gardan, Shafik, Belouin, Brosch, Grimont & Grimont 1999/Carolee T. Bull, Charles Manceau, John Lydon, Hyesuk Kong, Boris A. Vinatzer, Marion Fischer-Le Saux

Systematic and Applied Microbiology, Volume 33, Issue 3, April 2010, Pages 105-115, ISSN 0723-2020, DOI: 10.1016/j.syapm.2010.02.001. (<http://www.sciencedirect.com/science/article/pii/S072320201000024X>)

Abstract:

Sequence similarity in the 16S rDNA gene confirmed that crucifer pathogen *Pseudomonas syringae* pv. *alisalensis* belongs to *P. syringae* sensu lato. In reciprocal DNA/DNA hybridization experiments, DNA relatedness was high (69-100%) between *P. syringae* pv. *alisalensis* strains and the type strain of *P. cannabina* (genomospecies 9). In contrast, DNA relatedness was low (below 48%) between *P. syringae* pv. *alisalensis* and reference strains from the remaining genomospecies of *P. syringae* including the type strain of *P. syringae* and reference strain of genomospecies 3 (*P. syringae* pv. *tomato*) although the well-known crucifer pathogen, *P. syringae* pv. *maculicola*, also belongs to genomospecies 3. Additional evidence that *P. syringae* pv. *alisalensis* belongs to *P. cannabina* was sequence similarity in five gene fragments used in multilocus sequence typing, as well as similar rep-PCR patterns when using the BOX-A1R primers. The description of *P. cannabina* has been emended to include *P. syringae* pv. *alisalensis*. Host range testing demonstrated that *P. syringae* pv. *alisalensis* strains, originally isolated from broccoli, broccoli raab or arugula, were not pathogenic on *Cannabis sativa* (family Cannabinaceae). Additionally, *P. cannabina* strains, originally isolated from the *C. sativa* were not pathogenic on broccoli raab or oat while *P. syringae* pv. *alisalensis* strains were pathogenic on these hosts. Distinct host ranges for these two groups indicate that *P. cannabina* emend. consists of at least two distinct pathovars, *P. cannabina* pv. *cannabina* pv. nov., and *P. cannabina* pv. *alisalensis* comb. nov. *Pseudomonas syringae* pv. *maculicola* strain CFBP 1637 is a member of *P. cannabina*.

Keywords: *Cannabis sativa*; Hops; Marijuana; Host range; *Brassica rapa*; Broccoli raab; Broccoli; *Pseudomonas syringae* pv. *maculicola*; *Pseudomonas syringae* pv. *tomato*

Production and application of the bioherbicide agent *Dactylaria higginsii* on organic solid substrates/Yasser M. Shabana, R. Charudattan, Ayman H. Abou Tabl, J. Pablo Morales-Payan, Erin N. Roskopf, Waldemar Klassen

Biological Control, Volume 54, Issue 3, September 2010, Pages 159-165, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2010.05.002. (<http://www.sciencedirect.com/science/article/pii/S1049964410000952>)

Abstract:

Purple nutsedge and yellow nutsedge are serious weeds in Florida and in many parts of the world. *Dactylaria higginsii* is a promising bioherbicide candidate for these weeds. This fungus does not sporulate in liquid culture. Thus, for mass production of *D. higginsii*, 19 solid substrates were tested, including dried, cut culms or foliage of 14

different plants prepared as hays, sugarcane bagasse, a commercial peat-based microbe carrier (BioAPT), and two recycled papers (kraft paper and newspaper). These substrates were tested alone or amended either with 0.01% indole butyric acid (IBA), which enhances growth and/or sporulation of *D. higginsii*, potato dextrose broth (PDB) for nutrient amendment, or PDB + IBA. Yield of *D. higginsii* conidia produced on these substrates was measured 4 and 12 weeks after inoculation. Conidia were tested for virulence on purple and yellow nutsedges in the greenhouse. Hays without amendments or amended with PDB yielded more conidia which were also more virulent than those produced on hays amended with IBA. Conidial yields were highest when the fungus was grown on purple nutsedge hay without amendments for 4 weeks but conidia produced on this medium had low virulence. Conidia produced on sorghum x sudangrass and cogongrass hays were slightly larger and thicker walled than those produced on other substrates. Conidia produced on sorghum x sudangrass were the most virulent on nutsedge seedlings. Purple nutsedge was more susceptible to *D. higginsii* than yellow nutsedge. Cogongrass and sorghum x sudangrass hay substrates offer a suitable and easy medium for large-scale production of *D. higginsii*.

Keywords: Spore production; Organic substrates; Solid substrates; *Dactylaria higginsii*; Bioherbicides; Nutsedge

Sustainability of winter wheat production on sandy-loamy Cambisol in the Czech Republic: Results from a long-term fertilizer and crop rotation experiment/Michal Hejzman, Eva Kunzova

Field Crops Research, Volume 115, Issue 2, 20 January 2010, Pages 191-199, ISSN 0378-4290, DOI: 10.1016/j.fcr.2009.11.004.

(<http://www.sciencedirect.com/science/article/pii/S0378429009003141>)

Abstract:

Although Cambisols are the predominant soil type in Central Europe, especially in less favoured mountain areas, the long-term sustainability of winter wheat production on such soils has not been examined. In this paper, the yield of winter wheat over 50 years of farmyard manure, N, P and K fertilizer application (12 treatments altogether) was analysed in the Lukavec Crop Rotation Experiment (LCRE), which was established in 1955 in a potato-growing area (mean annual precipitation and temperature 686 mm and 6.8 [degree sign]C, respectively).

In the unfertilized control, low plant available P, K and Mg concentrations were recorded after 50 years. The annual yield growth (AYG) of grain was negative in the control as well as in low N treatments and positive in the 46 kg N ha⁻¹ treatment. The mean AYG ranged from 7.1 to 72.8 kg ha⁻¹ following the application of 46 to 121 kg N ha⁻¹, respectively. In the first decade of the experiment, the increase in grain yield per 1 kg of applied N was 7.3 kg ha⁻¹ while in the last decade it was 27.1 kg ha⁻¹. The mean grain yield of long-straw and short-straw varieties was 3.9 and 4.7 t ha⁻¹, respectively. In the control, the grain yields were 4.3, 3.2 and 2.4 t ha⁻¹ after root crops, legumes and cereals, respectively.

To summarize the 50 years' results of winter wheat production in the LCRE, grain yield was the most affected by mineral fertilizers, followed by the effect of variety, the preceding crop and farmyard manure application. The long-term sustainability of winter wheat production on low productive sandy-loamy Cambisols can be achieved only by adequate application of N, P and K fertilizers. High year-to-year variation in grain yield stresses the necessity of long-term studies in

crop research, which are able to separate real trends from inter-annual fluctuations.

Keywords: Yield; Variety; Grain production; Long-term fertilizer experiment; Preceding crop; Triticum aestivum; Farmyard manure--FYM

Aspergillus section Flavi and aflatoxins in Algerian wheat and derived products/Amar Riba, Nouredine Bouras, Salim Mokrane, Florence Mathieu, Ahmed Lebrihi, Nasseridine Sabaou

Food and Chemical Toxicology, Volume 48, Issue 10, October 2010, Pages 2772-2777, ISSN 0278-6915, DOI: 10.1016/j.fct.2010.07.005.

(<http://www.sciencedirect.com/science/article/pii/S0278691510004527>)

Abstract:

Wheat and its derivatives are a very important staple food for North African populations. The aim of this study was to analyze populations of Aspergillus section Flavi from local wheat based on aflatoxins (AFs), cyclopiazonic acid (CPA) and sclerotia production, and also to evaluate AFs-contaminated wheat collected from two different climatic regions in Algeria. A total of 108 samples of wheat were collected during the following phases: pre-harvest, storage in silos and after processing. The results revealed that among the Aspergillus species isolated, those belonging to section Flavi were predominant. Of the 150 strains of Aspergillus section Flavi isolated, 144 were identified as Aspergillus flavus and 6 as Aspergillus tamaris. We showed that 72% and 10% of the A. flavus strains produced AFs and CPA, respectively. Among the 150 strains tested, 60 produced amounts of AFB1 ranging from 12.1 to 234.6 [μ]g/g of CYA medium. Also, we showed that most strains produced large sclerotia. AFB1 was detected by HPLC in 56.6% of the wheat samples and derived products (flour, semolina and bran) with contamination levels ranging from 0.13 to 37.42 [μ]g/kg.

Keywords: Aspergillus; Section Flavi; Aflatoxin; Cyclopiazonic acid; Sclerotia; Algerian wheat

Kinetic evaluation and performance of a mesophilic anaerobic contact reactor treating medium-strength food-processing wastewater/E. Senturk, M. Ince, G. Onkal Engin

Bioresource Technology, Volume 101, Issue 11, June 2010, Pages 3970-3977, ISSN 0960-8524, DOI: 10.1016/j.biortech.2010.01.034.

(<http://www.sciencedirect.com/science/article/pii/S096085241000091X>)

Abstract:

High rate mesophilic anaerobic contact reactors (MACR) represent a proven sustainable technology for a wide range of different industrial effluents. These reactors demonstrate quite similar features to their aerobic counterparts, activated sludge systems. A lab-scale high rate mesophilic anaerobic contact reactor was operated with wastewater originated from a potato-processing plant, at six different loading rates of 1.1-5 g COD/L per day. The operational performance of MACR was monitored from start-up by assessing COD removal efficiency, total volatile fatty acid production and biogas composition. Furthermore, various kinetic models have been successfully applied to the experimental data to determine substrate balance, maximum utilization rate and volumetric methane production. The COD removal efficiencies were found to be 78-92% and the methane percentage of the biogas produced was 80-89%. Additionally, the methane yield coefficient was found to be 0.394 L CH₄/gTCODrem.

Keywords: Mesophilic; Anaerobic contact reactor; Kinetic evaluation; Organic loading rate; Volatile fatty acids

Population dynamics of arthropods associated with early-season tomato plants as influenced by soil surface microenvironment/Charles G. Summers, Albert S. Newton, Jeffrey P. Mitchell, James J. Stapleton **Crop Protection**, Volume 29, Issue 3, March 2010, Pages 249-254, ISSN 0261-2194, DOI: 10.1016/j.cropro.2009.11.012.

(<http://www.sciencedirect.com/science/article/pii/S0261219409002944>)

Abstract:

Two field studies were conducted in the San Joaquin Valley (SJV) of California in order to describe the association of arthropods and possible virus diseases with the plant canopy of early-season, bush-trained, fresh-market tomato (*Lycopersicon esculentum* L. cv. Shady Lady) over three soil surface microenvironments. The experimental treatments were based on alterations to planting bed surfaces, as follow: 1) soil covered with silver metalized, light-reflective plastic mulch; 2) soil covered with biological mulch consisting of killed, chopped, cool-season cover crop residues [mixture of triticale (*X Triticosecale* Wittm.), rye (*Secale cereale* L. cv. Merced), and common vetch (*Vicia sativa* L.)]; or 3) bare soil (not covered) - the SJV standard tomato production practice. In both studies, the predominant arthropods encountered in all treatments were the aphid species *Aphis craccivora* Koch, *Macrosiphum euphorbiae* Thomas, and *Myzus persicae* Sulzer; the western flower thrips (*Frankliniella occidentalis* Pergande), and the false chinch bug (*Nysius raphanus* Howard). These are all considered to be pests of cultivated tomato plants. Spiders were the most prevalent arthropod predator group recovered from foliage samples. All monitored arthropods, except spiders, were most abundant in tomato plants grown over the conventional, bare soil surface, and least abundant ($P < 0.05$) in plants grown over the silver plastic mulch. Spider numbers were highest in plant foliage over the biological mulch. Other arthropods commonly found on tomato plants in the SJV, including leafhoppers, whiteflies, various caterpillars, and predaceous taxa, were not commonly nor consistently encountered. This was likely due to the early-season timeframe of these studies. Similarly, foliar virus disease symptoms, which were originally targeted for monitoring, were virtually nonexistent. The only arthropod pest species encountered which consistently caused economically important damage to tomato fruit was *N. raphanus*. In both experiments, tomato fruits grown over the reflective plastic mulch had significantly less (69.5% and 39.7%, respectively) damage due to this pest than those over bare soil. The biological mulch gave inconsistent, intermediate damage reductions. Results from these two field studies showed that reflective plastic bed mulch suppressed populations of a variety of tomato canopy-associated arthropod taxa in early-season plantings, as compared to conventional, bare-soil beds. The biological bed mulch results were more inconsistent, but gave indications that killed cover crop residues, as well as the light-reflective plastic, may be of value in integrated pest management programs for fresh-market tomato production.

Keywords: Aphids; *Aphis craccivora*; Biological mulch; Cover crop; Cowpea aphid; False chinch bug; *Frankliniella occidentalis*; Integrated pest management; Light-reflective mulch; *Macrosiphum euphorbiae*; *Nysius raphanus*; Potato aphid; Spiders; Western flower thrips

Effect of *Matricaria chamomilla* L. flower essential oil on the growth and ultrastructure of *Aspergillus niger* van Tieghem/Marziyeh Tolouee, Soheil Alinezhad, Reza Saberi, Ali Eslamifar, Seyed Javad Zad, Kamkar

Jaimand, Jaleh Taeb, Mohammad-Bagher Rezaee, Masanobu Kawachi, Masoomeh Shams-Ghahfarokhi, Mehdi Razzaghi-Abyaneh

International Journal of Food Microbiology, Volume 139, Issue 3, 15 May 2010, Pages 127-133, ISSN 0168-1605, DOI:

10.1016/j.ijfoodmicro.2010.03.032.

(<http://www.sciencedirect.com/science/article/pii/S0168160510001753>)

Abstract:

The antifungal activity of *Matricaria chamomilla* L. flower essential oil was evaluated against *Aspergillus niger* with the emphasis on the plant's mode of action at the electron microscopy level. A total of 21 compounds were identified in the plant oil using gas chromatography/mass spectrometry (GC/MS) accounting for 92.86% of the oil composition. The main compounds identified were [α]-bisabolol (56.86%), trans-trans-farnesol (15.64%), cis-[β]-farnesene (7.12%), guaiazulene (4.24%), [α]-cubebene (2.69%), [α]-bisabolol oxide A (2.19%) and chamazulene (2.18%). In the bioassay, *A. niger* was cultured on Potato Dextrose Broth medium in 6-well microplates in the presence of serial two fold concentrations of plant oil (15.62 to 1000 [μ g/mL]) for 96 h at 28 [°C]. Based on the results obtained, *A. niger* growth was inhibited dose dependently with a maximum of ~ 92.50% at the highest oil concentration. A marked retardation in conidial production by the fungus was noticed in relation to the inhibition of hyphal growth. The main changes of hyphae observed by transmission electron microscopy were disruption of cytoplasmic membranes and intracellular organelles, detachment of plasma membrane from the cell wall, cytoplasm depletion, and complete disorganization of hyphal compartments. In scanning electron microscopy, swelling and deformation of hyphal tips, formation of short branches, and collapse of entire hyphae were the major changes observed. Morphological alterations might be due to the effect on cell permeability through direct interaction of *M. chamomilla* essential oil with the fungal plasma membrane. These findings indicate the potential of *M. chamomilla* L. essential oil in preventing fungal contamination and subsequent deterioration of stored food and other susceptible materials.

Keywords: *Aspergillus niger*; *Matricaria chamomilla*; Essential oil; Ultrastructure; Growth inhibition; Electron microscopy

Opposing developmental functions of *Agrocybe aegerita* galectin (AAL) during mycelia differentiation/Rong Luan, Yi Liang, Yijie Chen, Honghong Liu, Shuai Jiang, Tao Che, Barry Wong, Hui Sun

Fungal Biology, Volume 114, Issue 8, August 2010, Pages 599-608, ISSN 1878-6146, DOI: 10.1016/j.funbio.2010.05.001.

(<http://www.sciencedirect.com/science/article/pii/S187861461000070X>)

Abstract:

Mycelia of basidiomycetes differentiating into fruiting body is a controlled developmental process, however the underlying molecular mechanism remains unknown. In previous work, a novel fungal *Agrocybe aegerita* galectin (AAL) was isolated from *A. aegerita* in our laboratory. AAL was shown to promote mycelial differentiation in *A. aegerita* and *Auricularia polytricha*, indicating that AAL might function as a conserved fruiting initiator during basidiomycete mycelia development. In the current work, we investigate the role of AAL in mycelia differentiation and fruiting body formation. First, the expression and localization of AAL in mycelia, primordium and fruiting body were assessed by Western blotting and immunohistochemistry. AAL was found to be ubiquitously expressed in the primordium and fruiting body but not in the mycelia. AAL facilitated mycelia congregation and

promoted fruiting body production when AAL was applied on mycelia. At the same time, when AAL was spread on potato dextrose agar (PDA) medium prior to mycelia inoculation, mycelia exhibited slowed growth rates, resulting in mycelia cords formation and inhibition of fruiting body formation. The 5' regulatory sequence of aal was cloned by 'genome walking'. Here, we show that aal lack introns in the coding region and the upstream 740 bp sequence was characterized by the existence of core promoter elements, which included: two CCAAT boxes (-535/-280), a GC box (-145), a TATA box (-30) and a fungal leader intron within the 5' UTR. The identification of regulatory expression elements may provide an explanation to the stage-specific and high-level expression of aal during fruiting development.

Keywords: Basidiomycetes; Differentiation; Galectin; Mushroom; Mycelia

Effect of Mitovirus infection on formation of infection cushions and virulence of *Botrytis cinerea*/Lei Zhang, Ming De Wu, Guo Qing Li, Dao Hong Jiang, Hung Chang Huang

Physiological and Molecular Plant Pathology, Volume 75, Issues 1-2, December 2010, Pages 71-80, ISSN 0885-5765, DOI: 10.1016/j.pmp.2010.09.001.

(<http://www.sciencedirect.com/science/article/pii/S0885576510000743>)

Abstract:

This study was conducted to investigate mechanisms involved in hypovirulence of strain CanBc-1 of *Botrytis cinerea*. The hypovirulent strain CanBc-1 was compared with the virulent strains CanBc-1c-66 and CanBc-2 of *B. cinerea* for formation of infection cushions on onion bulbs and on leaves of oilseed rape and tomato, as well as for production of pectinase, toxic metabolites, oxalic acid and laccase in different growth media. Results showed that formation of infection cushions was common on epidermis of onion bulbs and on leaves of oilseed rape and tomato inoculated with strains CanBc-1c-66 or CanBc-2, but was rare on these plant tissues inoculated with strain CanBc-1. The three strains could produce pectinase, toxic metabolites, oxalic acid and laccase in pure cultures. Strain CanBc-1 produced less pectinase in 9-day-old cultures in pectin-containing liquid medium than strains CanBc-1c-66 and CanBc-2. The yield of oxalic acid (OA) produced by strain CanBc-1 in 15-day-old cultures in Maxwell liquid medium was lower than that produced by strain CanBc-2, but was higher than that produced by strain CanBc-1c-66. Strain CanBc-1 produced more laccase than strains CanBc-1c-66 and CanBc-2 in 8-day-old cultures in potato dextrose broth (PDB). Cultural filtrates of strains CanBc-1, CanBc-1c-66 and CanBc-2 from 21-day-old PDB cultures suppressed growth of roots and hypocotyls of barley, and the suppressive efficacy was not significantly different ($P > 0.05$) among the three investigated strains of *B. cinerea*. These results suggest that rare formation of infection cushions and attenuated mycelial growth are probably responsible for hypovirulence of strain CanBc-1 of *B. cinerea* infected by the mitovirus BcMV1.

Keywords: *Botrytis cinerea*; Hypovirulence; Mitovirus; BcMV1; Infection cushions

Differential fluctuation in virulence and VOC profiles among different cultures of entomopathogenic fungi/Abid Hussain, Ming-Yi Tian, Yu-Rong He, Yan-Yuan Lei

Journal of Invertebrate Pathology, Volume 104, Issue 3, July 2010, Pages 166-171, ISSN 0022-2011, DOI: 10.1016/j.jip.2010.03.004.

(<http://www.sciencedirect.com/science/article/pii/S0022201110000649>)

Abstract:

Insect-passaged cultures of entomopathogenic fungi grown on potato dextrose agar media have been shown to have altered virulence and profiles of volatile compounds. The present study demonstrated the pathogenic status of FS0 (in vitro) and FS1 and FS2 (insect-passaged cultures grown on PDA) cultures of *Metarhizium anisopliae* (strains 406 and 02049) and *Beauveria bassiana* by a non-choice assay, in which filter paper was inoculated with fungal spores at a concentration of 1×10^7 spores/ml. The FS1 and FS2 cultures of *M. anisopliae* strain 02049 and *B. bassiana* produced conidia with high virulence, and the volatile profiles of these conidia comprised relatively lower percentages of branched-alkanes than conidia from the FS0 cultures. In contrast, the conidia from an FS0 culture of *M. anisopliae* strain 406 had somewhat elevated virulence levels, but their volatile profile had <2% branched-alkanes. The FS1 and FS2 cultures of *M. anisopliae* strain 406 did not gain virulence, and these cultures showed a decline in virulence along with major alteration of their volatile profiles. Their volatile profiles mainly comprised branched-alkanes. The volatile profiles of the FS1 and FS2 cultures lacked n-tetradecane, which was an important component of all the virulent cultures. Four compounds, 2-phenylpropenal, 2,5,5-trimethyl-1-hexene, n-tetradecane and 2,6-dimethylheptadecane, were detected only from the virulent cultures, suggesting that low LT50 values were probably due to the production of these compounds. This is the first report to characterize volatiles from FS0, FS1 and FS2 cultures of entomopathogenic fungi; its utility in different aspects opens an interesting area for further investigations.

Keywords: *Beauveria bassiana*; *Coptotermes formosanus*; HS-SPME/GC-MS; *Metarhizium anisopliae*; n-tetradecane; Virulence; Volatiles

ScienceDirect 2011

Biogas production from potato-juice, a by-product from potato-starch processing, in upflow anaerobic sludge blanket (UASB) and expanded granular sludge bed (EGSB) reactors/Cheng Fang, Kanokwan Boe, Irini Angelidaki

Bioresourc *Technology*, Volume 102, Issue 10, May 2011, Pages 5734-5741, ISSN 0960-8524, DOI: 10.1016/j.biortech.2011.03.013.
(<http://www.sciencedirect.com/science/article/pii/S0960852411003555>)

Abstract:

In this study, the utilization of potato-juice, the organic by-product from potato-starch processing, for biogas production was investigated in batch assay and in high rate anaerobic reactors. The maximum methane potential of the potato-juice determined by batch assay was 470 mL-CH₄/gVS-added. Anaerobic digestion of potato-juice in an EGSB reactor could obtain a methane yield of 380 mL-CH₄/gVS-added at the organic loading rate of 3.2 gCOD/(L-reactor.d). In a UASB reactor, higher organic loading rate of 5.1 gCOD/(L-reactor.d) could be tolerated, however, it resulted in a lower methane yield of 240 mL-CH₄/gVS-added. The treatment of reactor effluent was also investigated. By acidification with sulfuric acid to pH lower than 5, almost 100% of the ammonia content in the effluent could be retained during the successive up-concentration process step. The reactor effluent could be up-concentrated by evaporation to minimize its volume, and later be utilized as fertilizer.

Keywords: Anaerobic digestion; Methane potential; Potato-juice; UASB; EGSB

Effect of water activity on the production of volatile organic compounds by *Muscodora albus* and their effect on three pathogens in stored potato/Ronan Corcuff, Julien Mercier, Russell Tweddell, Joseph Arul

Fungal Biology, Volume 115, Issue 3, March 2011, Pages 220-227, ISSN 1878-6146, DOI: 10.1016/j.funbio.2010.12.005.
(<http://www.sciencedirect.com/science/article/pii/S1878614610001923>)

Abstract:

Muscodora albus (Xylariaceae, Ascomycetes) isolate CZ-620 produces antimicrobial volatile organic compounds (VOC), which appear to have potential for the control of various postharvest diseases. The effect of water activity (A_w) on the production of VOC by *M. albus* culture, and their inhibitory effects on the growth of three pathogens of potato tuber (*Fusarium sambucinum*, *Helminthosporium solani*, and *Pectobacterium atrosepticum*) and the development of diseases caused by the three pathogens (dry rot, silver scurf, and bacterial soft rot, respectively) were investigated. Rye grain culture of the fungus produced six alcohols, three aldehydes, five acids or esters, and two terpenoids. The most abundant VOC were: isobutyric acid; bulnesene, a sesquiterpene; an unidentified terpene; 2 and 3-methyl-1-butanol; and ethanol. However, the level of each of those VOC varied with A_w of the culture. Emission activity occurred mainly at A_w above 0.75 and high emission of most VOC occurred only at A_w above 0.90. The aldehydes (2-methyl-propanal and 3-methyl-butanal) were the only VOC produced in quantities below an A_w of 0.90. An A_w value of 0.96 favored maximum emission of acids, esters, and terpenoids. There was a higher production of alcohols and a decrease in aldehydes with increase in A_w . Isobutyric acid, which has been the main *M. albus* VOC monitored in previous studies as an indicator of antifungal activity, had a rather narrow optimum, peaking at A_w of 0.96 and declining sharply above 0.98. Results showed that substrate A_w affects the production dynamics of each group of VOC by the fungus, and suggest that VOC production can be prolonged by maintaining *M. albus* culture at a constant optimum A_w . The VOC was inhibitory to *F. sambucinum*, *H. solani*, and *P. atrosepticum*; and biofumigation with *M. albus* significantly reduced dry rot and soft rot development, and completely controlled silver scurf in inoculated tubers incubated at both 8 [degree sign]C and 22 [degree sign]C. The results show that A_w of grain culture affects the production of VOC by *M. albus*; and that the VOC inhibit the growth of the tested pathogens and the diseases caused by them in potato tubers.

Keywords: Antimicrobial volatile organic compounds; *Fusarium sambucinum*; *Helminthosporium solani*; *Muscodora albus*; *Pectobacterium atrosepticum*; Potato; VOC; Water activity

Influence of headspace and dissolved oxygen level on growth and haemolytic BL enterotoxin production of a psychrotolerant *Bacillus weihenstephanensis* isolate on potato based ready-to-eat food products/S. Samapundo, H. Everaert, J.N. Wandutu, A. Rajkovic, M. Uyttendaele, F. Devlieghere

Food Microbiology, Volume 28, Issue 2, April 2011, Pages 298-304, ISSN 0740-0020, DOI: 10.1016/j.fm.2010.04.013.
(<http://www.sciencedirect.com/science/article/pii/S0740002010000870>)

Abstract:

The major objective of this study was to determine the influence of the initial headspace and dissolved O₂ level and vacuum packaging on growth and diarrhoeal enterotoxin production by *Bacillus weihenstephanensis* on potato based ready-to-eat food products. In general, the lower the initial headspace or dissolved O₂ level the slower the maximum growth rate (μ_{max} , log₁₀ CFU g⁻¹ d⁻¹), the longer the lag phase duration (λ , d) and the smaller the maximum population density (N_{max}, log₁₀ CFU g⁻¹) became. The slowest μ_{max} , the longest λ and the smallest N_{max} were generally found for growth under vacuum packaging. This implies shorter shelf-lives will occur at higher initial headspace or dissolved O₂ levels as the growth of *B. weihenstephanensis* to the infective dose of 10⁵ CFU g⁻¹ in such atmospheres takes a shorter time. Significant consumption of dissolved O₂ only occurred when growth shifted from the lag to the exponential phase and growth generally transitioned from the exponential to the stationary phase when the dissolved O₂ levels fell below ca. 75 ppb. Diarrhoeal enterotoxin production (determined via detection of the L2 component of haemolytic BL) was similar for growth under initial headspace O₂ levels of 1-20.9%, and was only reduced when growth took place under vacuum packaging. The reduction in L2 production when growth took place under vacuum was most probably related to the low final cell densities observed under this condition. Both growth and L2 production were inhibited over a 32-day incubation period at 7 [degree sign]C by 40% CO₂ irrespective of the headspace or dissolved O₂ levels. The results illustrate the importance of residual O₂ and CO₂ on the shelf-stability and safety of modified atmosphere packaged potato based ready-to-eat food products with regards to *B. weihenstephanensis*.

Keywords: *Bacillus weihenstephanensis*; Modified atmosphere packaging; Oxygen; Diarrhoeal enterotoxin; Potato puree; Ready-to-eat foods

Applications of xerophytophysiology in plant production - The potato crop improved by partial root zone drying of early season but not whole season/Hui-lian Xu, Feifei Qin, Qicong Xu, Junyi Tan, Guanming Liu *Scientia Horticulturae*, Volume 129, Issue 4, 27 July 2011, Pages 528-534, ISSN 0304-4238, DOI: 10.1016/j.scienta.2011.04.016. (<http://www.sciencedirect.com/science/article/pii/S0304423811002044>)

Abstract:

Partial root zone drying (PRD) has been used as a technique in the production of many crops. However, the extent or duration of the drying treatment would change the effect and the mechanisms in terms of plant water relations are not clear enough. The aim of this research was to evaluate the PRD effect with shorter or longer drying duration in a potato crop and elucidate the mechanisms based on plant water relations. Potato (*Solanum tuberosum* L. cv. May Queen) was grown in experimental plots under plastic rainout shelters. Three treatments: (1) whole-season PRD, (2) early-season PRD for 8 weeks and then return to normal irrigation for the remainder of the season and (3) normal irrigation as control, were arranged in a Latin square design in 9 plots. Water was supplied by drip irrigation to one side of the potato row once every 5 days on average, and the other side of the row was allowed to dry for 15 days, and then the irrigation line was moved to the dry side and the wet side allowed to dry. Pressure-volume curves were used to analyze the osmotic adjustment induced by PRD and a modified mathematic equation, was used to compare the pressure-volume relations. As shown by the results, tuber yield and photosynthetic activity were increased by the early-season PRD treatment, but not by

the whole-season PRD treatment because the whole-season PRD treatment reduced the leaf area index. By analyzing the pressure-volume curves, it was found that osmotic adjustment occurred and the turgor potential was higher in potato leaves in the PRD treatments. The fraction of water in the cell symplasm was higher and that in apoplasm was smaller in PRD-treated potato leaves. Both the osmotic potential and relative water content at the point of incipient plasmolysis were lower in potato leaves in the PRD treatments, suggesting that the plants in the PRD plots were more resistant to water stress, which was also confirmed by the analysis of transpiration declining curve of excised leaves. In conclusion, the PRD treatment was effective in improving potato tuber yield, but early-season treatment rather than the whole-season treatment should be adopted.

Keywords: Drought; Osmotic adjustment; Photosynthesis; Signal transduction; Symplasm and apoplasm water

Response of two sweet potato cultivars to weed interference/Howard F. Harrison Jr., D. Michael Jackson

Crop Protection, Volume 30, Issue 10, October 2011, Pages 1291-1296, ISSN 0261-2194, DOI: 10.1016/j.cropro.2011.05.002.

(<http://www.sciencedirect.com/science/article/pii/S0261219411001669>)

Abstract:

Field experiments were conducted at the U.S. Vegetable Laboratory, Charleston, SC, U.S.A in 2000, 2001, and 2004 to assess the effect of different durations of weed interference on two sweet potato cultivars with different shoot growth habits. The cultivars were Beauregard, which has a spreading growth habit that is typical of U.S. sweet potato cultivars and Carolina Bunch, with an erect growth habit. Weed interference treatments included control plots that were maintained weed free throughout the growing season and plots that were maintained weed free for 0, 10, 20, and 30 days after transplanting. In general, Carolina Bunch was more tolerant of weed interference than was Beauregard. In two of three years Carolina Bunch storage root yields were higher than Beauregard yields in plots that received no weeding; whereas, yields of the two cultivars in weed free plots were not different. Weed interference affected shoot growth to a greater extent than it affected storage root production. At the end of the growing season, Carolina Bunch shoot biomass was greater than Beauregard shoot biomass in plots receiving no weeding and in plots that were maintained weed free for 10 days in all three years. Shoot biomasses of the two cultivars were not different in weed-free plots. Weed shoot biomasses were greater in Beauregard plots than in Carolina Bunch plots in several instances. These results demonstrate that sweet potato cultivars with a vigorous, erect shoot growth habit (with shorter stems, greater branching, and a denser and taller canopy early in the growing season) may be less susceptible to weed interference than cultivars with spreading shoot growth. This study also confirmed previous observations that sweet potato productivity is not greatly affected by moderate weed interference; thus, it may not require intense weed management to produce high yields.

Keywords: Weed interference; Sweet potato (*Ipomoea batatas* L.); Weed competition

Optimization of pullulan production from hydrolysed potato starch waste by response surface methodology/Yekta Goksungur, Purlen Uzunogullari, Seval Dagbagli

Carbohydrate Polymers, Volume 83, Issue 3, 30 January 2011, Pages 1330-1337, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2010.09.047.
(<http://www.sciencedirect.com/science/article/pii/S0144861710007800>)

Abstract:

The production of pullulan from hydrolysed potato starch waste by *Aureobasidium pullulans* P56 was investigated. The liquefaction of potato starch was done by Ca-alginate immobilized amyloglucosidase and pullulanase enzymes in a packed bed bioreactor. Various organic nitrogen sources were tested and none of the nitrogen sources gave pullulan concentrations as high as that obtained with yeast extract. Response surface methodology was used to investigate the effects of three factors (incubation time, initial substrate concentration and initial pH) on the concentration of pullulan in batch cultures of *A. pullulans*. No previous work has used statistical analysis on the optimization of process parameters in pullulan production from hydrolysed potato starch waste. Maximum pullulan concentration of 19.2 g/l was obtained at the optimum levels of process variables (incubation time 111.8 h, initial substrate concentration 79.4 g/l, initial pH 7.26). The optimization led to a 20% increase in pullulan concentration.

Keywords: Pullulan; Polysaccharide; Calcium alginate; Immobilization; *A. pullulans*; Response surface methodology; Amyloglucosidase; Pullulanase

Changes in phenolic antioxidants during chuno production (traditional Andean freeze and sun-dried potato)/J. Mauricio Penarrieta, Trinidad Salluca, Leslie Tejada, J. Antonio Alvarado, Bjorn Bergenstahl

Journal of Food Composition and Analysis, Volume 24, Issues 4-5, 8th International Food Data Conference: Quality food composition data, key for health and trade, June-August 2011, Pages 580-587, ISSN 0889-1575, DOI: 10.1016/j.jfca.2010.10.006.

(<http://www.sciencedirect.com/science/article/pii/S0889157510003054>)

Abstract:

Total antioxidant capacity (TAC), total phenolic compounds (TPH), total flavonoids (TF) and the amounts of individual phenolic compounds were assessed in Bolivian potato cultivars (various *Solanum* species) before, during and after the traditional freezing and sun-drying of potatoes known as chunos. The TAC of chunos ranged from 0.4 to 2.7 [μ]mol Trolox equivalents/g dry matter using 2,2'-azino-bis(3-ethylbenzthiazoline-6-sulphonic acid) (ABTS) and from 0.7 to 3.0 according to the ferric reduction antioxidant power (FRAP). The values of TAC obtained using FRAP were about 70% lower after freeze-drying while they remained essentially constant when measured using ABTS. High-performance liquid chromatography showed the presence of epicatechin, chlorogenic acid, gallic acid, syringaldehyde and protocatechuic acid in both potato and chuno samples although the values were lower in the chuno samples. The results suggest that the antioxidant capacity and the content of individual phenolics are somewhat decreased but far from eliminated during the process. Chuno can therefore still be considered an important source of antioxidants in the diet.

Keywords: Antioxidant capacity; Phenolic compounds; Chuno; Bolivia; Food composition

Pulsed electric fields and their impact on the diffusion characteristics of potato slices/A. Janositz, A.-K. Noack, D. Knorr

LWT - Food Science and Technology, Volume 44, Issue 9, November 2011, Pages 1939-1945, ISSN 0023-6438, DOI: 10.1016/j.lwt.2011.04.006. (<http://www.sciencedirect.com/science/article/pii/S0023643811001319>)

Abstract:

Mass transfer in potato slices and strips after Pulsed Electric Fields (PEF) treatment was examined to evaluate potential application of PEF in potato processing. PEF treatment on cell material leads to pore formation in cell membrane and thus modifies diffusion of intra- and extracellular media. Results showed enhanced release of intracellular molecules from permeabilized tissue as well as improved uptake of low molecular substances into the sample. Sugar, one substrate for the Maillard reaction, was decreased in PEF treated potatoes, while conductivity increased after electroporation and soaking in sodium chloride solution, indicating the improved diffusion of salt caused by PEF. Higher release of cell liquid during drying of PEF treated potatoes was noticed in comparison to untreated potato slices. This effect increased with the treatment intensity. Furthermore, it was revealed that PEF application leads to a distinct reduction of fat content after deep fat frying and thus provides a potential for the production of low-fat French fries. It can be presumed that PEF is a capable assistance to thermal treatments in the processing of potato chips or French fries for the achievement of structural modifications and improved process conditions.

Keywords: Pulsed electric fields (PEF); Potato; Diffusion; Reducing sugars; Drying

Considering sink strength to model crop production under elevated atmospheric CO₂/Eline Vanuytrecht, Dirk Raes, Patrick Willems

Agricultural and Forest Meteorology, In Press, Corrected Proof, Available online 12 August 2011, ISSN 0168-1923, DOI: 10.1016/j.agrformet.2011.07.011.

(<http://www.sciencedirect.com/science/article/pii/S0168192311002462>)

Abstract:

Climatic changes and elevated atmospheric CO₂ concentrations will affect crop growth and production in the near future. Rising CO₂ concentration is a novel environmental aspect that should be considered when projections for future agricultural productivity are made. In addition to a reducing effect on stomatal conductance and crop transpiration, elevated CO₂ concentration can stimulate crop production. The magnitude of this stimulatory effect ('CO₂ fertilization') is subject of discussion. In this study, different calculation procedures of the generic crop model AquaCrop based on a foregoing theoretical framework and a meta-analysis of field responses, respectively, were evaluated against experimental data of free air CO₂ enrichment (FACE) environments. A flexible response of the water productivity parameter of the model to CO₂ concentration was introduced as the best option to consider crop sink strength and responsiveness to CO₂. By varying the response factor, differences in crop sink capacity and trends in breeding and management, which alter crop responsiveness, can be addressed. Projections of maize (*Zea mays* L.) and potato (*Solanum tuberosum* L.) production reflecting the differences in responsiveness were simulated for future time horizons when elevated CO₂ concentrations and climatic changes are expected. Variation in future yield potential associated with sink strength could be as high as 27% of the total production. Thus, taking into account crop sink strength and variation in responsiveness is equally relevant to considering climatic changes and elevated CO₂ concentration when

assessing future crop production. Indicative values representing the crop responsiveness to elevated CO₂ concentration were proposed for all crops currently available in the database of AquaCrop as a first step in reducing part of the uncertainty involved in modeling future agricultural production.

Keywords: AquaCrop model; Carbon dioxide; Climate change; Crop production; Sink strength; Water productivity

Properties of retrograded and acetylated starch preparations: Part 1. Structure, susceptibility to amylase, and pasting characteristics/Tomasz Zieba, Antoni Szumny, Malgorzata Kapelko
LWT - Food Science and Technology, Volume 44, Issue 5, June 2011, Pages 1314-1320, ISSN 0023-6438, DOI: 10.1016/j.lwt.2010.12.018.
(<http://www.sciencedirect.com/science/article/pii/S0023643810004421>)

Abstract:

The aim of the study was to produce a retrograded starch preparation from potato starch using various methods, to modify it by acetylation, and then to estimate the effect of these modifications on its selected properties. The chemical structure of modifiers and the degree of substitution achieved with acetic acid were determined by nuclear magnetic resonance (NMR). The resistance of starch to amyloglucosidase and digestive amylases was determined as well. Also, the thermal characteristics of gelatinization of the starch preparations were studied by differential scanning calorimetry (DSC); the method of starch paste production was investigated by a Brabender viscograph, and morphological and structural differences were visualized using scanning electron microscopy (SEM). Retrograded starch preparations were porous and stratified in structure; with their properties resulting from the method of their production. Their chemical structure did not differ from that of native starch, but they displayed a different course of pasting characteristics and increased susceptibility to acetylation as well as resistance to amylases (by approximately 10 g/100 g). Acetylation contributed to a decrease in the temperature of reaching maximum viscosity, an increase in the maximum viscosity, and a decrease in the amount of heat needed for thermal transition of the produced preparations. Acetylated retrograded starch was characterized by a higher degree of substitution and an increased activity of acetyl groups substituted at carbon atoms 2 and 3 compared to the acetylated native starch, thereby triggering a significant increase in resistance to amylases (approximately 40 g/100 g). Combining the resistance of starch samples RS3 and RS4 may be a new method to obtain resistant starch from potato starch.

Keywords: Potato starch; Retrogradation; Acetylation; Resistant starch

Quantitating carbon monoxide production from heme by vascular plant preparations in vitro/Hendrik J. Vreman, Ronald J. Wong, David K. Stevenson

Plant Physiology and Biochemistry, Volume 49, Issue 1, January 2011, Pages 61-68, ISSN 0981-9428, DOI: 10.1016/j.plaphy.2010.09.021.
(<http://www.sciencedirect.com/science/article/pii/S0981942810002111>)

Abstract:

Heme in animals is mainly degraded enzymatically, producing a predictable amount of carbon monoxide (CO). Under some conditions, alternative sources of CO production are important, such as lipid peroxidation and photo-oxidation. Less is known about CO production in plants as a reflection of enzymatic activity or coupled oxidation, but a sensitive assay for CO production in plants would be a valuable tool

to explore the various sources in plants as the conditions of the reactions and mechanisms are defined. Using gas chromatography, we determined the requirements for heme-supported in vitro CO generation by exogenous reactants (NADPH, tissue supernatant, oxygen), optimum reaction conditions (time, temperature, pH, light), and effects of various cofactors and substrates using supernatants from *Spinacia oleracea* (spinach) leaf and *Solanum tuberosa* (potato) tuber homogenates. We then determined the CO production rate distribution between organ (root, stem, leaf, flower, fruit) supernatants in a number of commercially available plant species. CO production ranged from 4-65 nmol CO/h/g fresh weight and occurred in all vascular plant tissues examined, with the highest rates in chloroplast-containing tissues. In spinach leaves, CO production was concentrated (>2-fold) in the particulate fraction, whereas in potato tubers, the particulate fraction accounted for <50% of the rates in homogenates. We conclude that gas chromatography is uniquely suited for the determination of CO production in pigmented, heterogeneous plant tissue preparations.

Keywords: Heme oxygenase; Plant organs; Coupled oxidation; Gas chromatography

Enhanced biomass production of *Pycnoporus sanguineus* and alterations in the physiochemical properties of its polysaccharides/Tun-Tschu Chang, Chi-Hsein Chao, Mei-Kuang Lu

Carbohydrate Polymers, Volume 83, Issue 2, 10 January 2011, Pages 796-801, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2010.08.055.

(<http://www.sciencedirect.com/science/article/pii/S0144861710006922>)

Abstract:

The purpose of this research was to physiochemically characterize the expression profiles of polysaccharides produced by *Pycnoporus sanguineus* using different cultural conditions including media utilizing different carbohydrate sources and pH values. Polysaccharides were characterized by size-exclusion chromatography (SEC) and high-performance anion-exchange chromatography (HPAEC). The maximum mycelial growth reached a value of 16.52 +/- 1.03 g/l when *P. sanguineus* was fed 20 g/l sucrose with 20 g/l potato dextrose broth (PDB). Medium-high-molecular-weight polysaccharides (50-100 kDa) were largely synthesized by glucose feeding. The synthesis of low-molecular-weight polysaccharides (<30 kDa) decreased when the pH of the medium increased. Fucose, galactose, glucose, and mannose were the dominant sugars in the *P. sanguineus* polysaccharide mixture. We determined correlations between sugar components in the polysaccharides and the type of carbon source in the medium. Feeding with sucrose or glucose resulted in a direct dosage effects on the fucose and mannose components of the polysaccharides.

Keywords: *Pycnoporus sanguineus*; Polysaccharides; Carbohydrates; Molecular-weight distribution

In vitro cytotoxicity of fungi spoiling maize silage/R.R. Rasmussen, P.H. Rasmussen, T.O. Larsen, T.T. Bladt, M.L. Binderup

Food and Chemical Toxicology, Volume 49, Issue 1, January 2011, Pages 31-44, ISSN 0278-6915, DOI: 10.1016/j.fct.2010.09.007.

(<http://www.sciencedirect.com/science/article/pii/S0278691510005703>)

Abstract:

Penicillium roqueforti, *Penicillium paneum*, *Monascus ruber*, *Alternaria tenuissima*, *Fusarium graminearum*, *Fusarium avenaceum*, *Byssoschlamys nivea* and *Aspergillus fumigatus* have previously been identified as major fungal contaminants of Danish maize silage. In the present study

their metabolite production and in vitro cytotoxicity have been determined for fungal agar and silage extracts. All 8 fungal species significantly affected Caco-2 cell viability in the resazurin assay, with large variations for each species and growth medium. The 50% inhibition concentrations (IC50) of the major *P. roqueforti* metabolites roquefortine C (48 [μg/mL], andrastin A (>50 [μg/mL], mycophenolic acid (>100 [μg/mL] and 1-hydroxyeremophil-7(11),9(10)-dien-8-one (>280 [μg/mL] were high. Fractionating of agar extracts identified PR-toxin as an important cytotoxic *P. roqueforti* metabolite, also detectable in maize silage. The strongly cytotoxic *B. nivea* and *P. paneum* agar extracts contained patulin above the IC50 of 0.6 [μg/mL], however inoculated onto maize silage *B. nivea* and *P. paneum* did not produce patulin (>371 [μg/kg]). Still *B. nivea* infected maize silage containing mycophenolic acid (~50 mg/kg), byssochlamic acid and other metabolites, was cytotoxic. In contrast hot-spots of *P. roqueforti*, *P. paneum*, *M. ruber* and *A. fumigatus* were not more cytotoxic than uninoculated silage.

Keywords: Mycotoxins; Maize silage; Caco-2; Cytotoxicity; Mass spectrometry; Fungal metabolites

Life cycle assessment of Swiss farming systems: I. Integrated and organic farming/Thomas Nemecek, David Dubois, Olivier Huguenin-Elie, Gerard Gaillard

Agricultural Systems, Volume 104, Issue 3, March 2011, Pages 217-232, ISSN 0308-521X, DOI: 10.1016/j.agsy.2010.10.002.

(<http://www.sciencedirect.com/science/article/pii/S0308521X10001381>)

Abstract:

Organic farming (OF) is considered a promising solution for reducing environmental burdens related to intensive agricultural management practices. The question arises whether OF really reduces the environmental impacts once lower yields and all the changes in farming methods are taken into consideration. This question is addressed in a comprehensive study of Swiss arable cropping and forage production systems comparing OF to integrated production (IP) systems by means of the life cycle assessment (LCA) method.

The LCA study investigated the environmental impacts of two long-term farming system experiments: the DOC experiment comparing bio-dynamic, bio-organic and conventional/integrated farming and the 'Burgrain' experiment encompassing integrated intensive, integrated extensive and organic production. All treatments received similar amounts of farmyard manure. The system boundary encompasses the plant production system; storage and application of farmyard manure is included in the system boundary, the animal husbandry is not included. The Swiss Agricultural Life Cycle Assessment method (SALCA) was used to analyse the environmental impacts.

In the overall assessment OF was revealed to be either superior or similar to IP in environmental terms. OF has its main strengths in better resource conservation, since the farming system relies mainly on farm-internal resources and limits the input of external auxiliary materials. This results in less fossil and mineral resources being consumed. Moreover the greatly restricted use of pesticides makes it possible to markedly reduce ecotoxicity potentials on the one hand, and to achieve a higher biodiversity potential on the other. This overall positive assessment is not valid for all organic products: some products such as potatoes had higher environmental burdens than their counterparts from IP.

The main drawbacks identified for Swiss OF systems are lower yields. As a consequence some production factors are used less efficiently, thus partly negating the advantages of OF. Furthermore, the different manure management strategy leads to relatively high nutrient losses in relation to yield. These two points were shown to be the main priorities for the environmental optimisation of OF systems. The differences between the bio-organic and the bio-dynamic farming systems consisted in a slightly higher input of organic matter, a few applications of mineral fertilisers and copper applications in the former.

The eco-efficiency analysis led to the conclusion that the optimisation of OF is mainly output-driven, i.e. that higher yields of good quality should be achieved with the available (limited) resources. On the contrary, optimisation of IP was found to be input-driven; the inputs should be used in a quantity and manner which minimise the environmental burdens per unit produced. The study showed that despite the efforts of recent years, there is still considerable room for the environmental optimisation of Swiss farming systems.

Keywords: Integrated production; Organic farming; Life cycle assessment; Farming systems; Environmental impacts

Enterolignans enterolactone and enterodiol formation from their precursors by the action of intestinal microflora and their relationship with non-starch polysaccharides in various berries and vegetables/Elena Bartkiene, Grazina Juodeikiene, Loreta Basinskiene, Kirsi-Helena Liukkonen, Herman Adlercreutz, Holger Kluge

LWT - Food Science and Technology, Volume 44, Issue 1, January 2011, Pages 48-53, ISSN 0023-6438, DOI: 10.1016/j.lwt.2010.06.018.
(<http://www.sciencedirect.com/science/article/pii/S0023643810002367>)

Abstract:

The aim of this work was to investigate the production of enterolactone (ENL) and enterodiol (END) both enterolignans, from their precursors by the action of intestinal microflora and their relationship with non-starch polysaccharides (NSP) in common plant foods such as berries and vegetables. For the investigation of the bioconversion of plant lignans the technique of in vitro fermentation was used and the quantitative analysis of their metabolites ENL and END was performed by HPLC with coulometric electrode array detection. The enterolignan production from various berries ranged from 7.8 to 382.8 nmol/g as well as from vegetables - from 10.5 till 91.2 nmol/g. By comparing different kind of berries, the cloudberry, raspberry, and strawberry were the best enterolignan producers. Considering vegetables, potatoes produced the highest quantity of total enterolignans. Garlic, zucchini and broccoli were the other good producers of enterolignans in this product group. The quantitative relationship between NSP components and their associated lignan metabolites were determined. The results showed that there is a correlation between the particularities of fermented food matrices and the production of enterolignans. For berries, an intermediate correlation was found between the total NSP and ENL values. For vegetables, higher correlations between NSP and END were found.

Keywords: Enterolignans; Enterolactone; Enterodiol; Non-starch polysaccharides; In vitro fermentation; Plant foods

Hyperphosphorylation of cereal starch/Massimiliano Carciofi, Shahnoor S. Shaik, Susanne L. Jensen, Andreas Blennow, Jan T. Svenson, Eva Vinzce, Kim H. Hebelstrup

Journal of Cereal Science, In Press, Accepted Manuscript, Available online 10 August 2011, ISSN 0733-5210, DOI: 10.1016/j.jcs.2011.06.013. (<http://www.sciencedirect.com/science/article/pii/S0733521011001238>)

Abstract:

Plant starch is naturally phosphorylated at a fraction of the C6 and the C3 hydroxyl groups during its biosynthesis in plastids. Starch phosphate esters are important in starch metabolism and they also generate specific industrial functionality. Cereal grains starch contains little starch bound phosphate compared with potato tuber starch and in order to investigate the effect of increased endosperm starch phosphate, the potato starch phosphorylating enzyme glucan water dikinase (StGWD) was overexpressed specifically in the developing barley endosperm. StGWD overexpressors showed wild-type phenotype. Transgenic cereal grains synthesized starch with higher starch bound phosphate content (7.5 (+/-0.67) nmol / mg) compared to control lines (0.8 (+/-0.05) nmol / mg) with starch granules showing altered morphology and lower melting enthalpy. Our data indicate specific action of GWD during starch biosynthesis and demonstrates the possibility for in planta production of highly phosphorylated cereal starch.

Keywords: Starch; Phosphorylation; Glucan Water Dikinase (GWD); Transgenic barley

Acrylamide kinetic in plantain during heating process: Precursors and effect of water activity/J. Bassama, P. Brat, P. Bohuon, B. Hocine, R. Boulanger, Z. Gunata

Food Research International, Volume 44, Issue 5, June 2011, Pages 1452-1458, ISSN 0963-9969, DOI: 10.1016/j.foodres.2011.03.018. (<http://www.sciencedirect.com/science/article/pii/S096399691100175X>)

Abstract:

Almost two thirds of plantain world production is processed by means of deep frying which place it in the same occurrence as potatoes-based food in some tropical regions (Latin America, Central Africa and Southeast Asia). Asparagine content and effect of water activity on acrylamide kinetic in a plantain matrix was surprisingly investigated for the first time. Asparagine content was analyzed in ten edible Musa L., and 'Cooking bananas' were found (maximum of 70 mg/100 g db) to be less concentrated than 'dessert bananas' (maximum of 321 mg/100 g db). Moreover, asparagine content decreased by 75% after 11 days of post-harvest ripening. Acrylamide formation/elimination kinetics were determined in plantain paste at three different initial water activity values (0.972, 0.904, and 0.430) measured at 25 [degree sign]C and heated at high temperatures (140-200 [degree sign]C) in a closed reactor. Acrylamide in plantain was formed at the same magnitude as for potatoes, rye and wheat-based products (max ~ 0.9 ppm, wb). Kinetic parameter estimation was performed using a single response modeling. The reaction kinetic and the estimated kinetic parameters revealed an increase in acrylamide formation and elimination reaction rates with decreasing water activity. The corresponding activation energies of the rate constants remained unaffected.

Keywords: Acrylamide; Plantain; Water activity; Asparagine; Kinetic modeling

Expression of a [beta]-1,3-glucanase from a biocontrol fungus in transgenic pearl millet/M.M. O'Kennedy, B.G. Crampton, M. Lorito, E. Chakauya, W.A. Breese, J.T. Burger, F.C. Botha

South African Journal of Botany, Volume 77, Issue 2, April 2011, Pages 335-345, ISSN 0254-6299, DOI: 10.1016/j.sajb.2010.09.016.
(<http://www.sciencedirect.com/science/article/pii/S0254629910002449>)

Abstract:

Sclerospora graminicola is an oomycete (heterotrophic Stramenopiles), fungal-like obligate phytopathogen, the causal agent of downy mildew in pearl millet (*Pennisetum glaucum* [L.] R. Br.), and a major constraint in the production of this cereal crop. In this study a hydrolytic enzyme, [beta]-1,3-glucanase (gluc78), from the biocontrol fungus *Trichoderma atroviride*, was introduced into the genome of a pearl millet breeding line, 842B, by particle bombardment. Constructs were prepared containing the gluc78 gene, encoding the 78 kDa [beta]-1,3-glucanase protein, downstream of either the constitutive ubiquitin promoter or the wound inducible potato proteinase inhibitor IIK gene promoter (pin2). The positive selectable marker gene, manA, encoding mannose-6-phosphate isomerase (phosphomannose isomerase) under the control of the ubiquitin promoter, was used for co-transformation. Transgenic plants were obtained harbouring the manA selectable marker gene and the antifungal gene gluc78 downstream of either the ubiquitin or pin2 promoter. Full constructs or minimal transgene expression cassettes containing the genes of interest were successfully introduced into the genome of pearl millet. Progeny of stably transformed plants, harbouring the gluc78 transgene which is driven by the pin2 promoter and followed by the rice Act1 intron sequences, was subjected to pathogenicity trials. One transgenic event exhibited a reduction of 58% in the incidence of *S. graminicola* infection, however other transgenic pearl millet events showed no resistance to this phytopathogen. The event conferring decreased susceptibility to *S. graminicola* had high levels of the glucanase transcript especially in transgenic plants showing higher levels of downy mildew infection.

Keywords: Fungal resistance; *Sclerospora graminicola*; Transgenic pearl millet; [beta]-1,3-Glucanase

Sensitivity of *Sclerotinia sclerotiorum* to fludioxonil: In vitro determination of baseline sensitivity and resistance risk/Jing Kuang, Yi-Ping Hou, Jian-Xin Wang, Ming-Guo Zhou

Crop Protection, Volume 30, Issue 7, July 2011, Pages 876-882, ISSN 0261-2194, DOI: 10.1016/j.cropro.2011.02.029.

(<http://www.sciencedirect.com/science/article/pii/S0261219411000846>)

Abstract:

This work determined the sensitivity of field populations of *Sclerotinia sclerotiorum* (Lib.) de Bary before exposure to the fungicide fludioxonil (= baseline sensitivity) and assessed the risk of fludioxonil resistance. The mean EC50 (Effective Concentration) and Minimum inhibitory concentration (MIC) values for fludioxonil based on inhibition of mycelial growth of 120 wild-type isolates were 0.015 +/- 0.005 [mu]g/ml and <0.05 [mu]g/ml, respectively. Positive cross-resistance was not detected between fludioxonil and benzimidazole fungicides but was detected between fludioxonil and dicarboximide fungicides which are considered as high resistance risk fungicides by FRAC, even though these fungicides have different molecular structures. By growing wild-type isolates on potato dextrose agar (PDA) containing sublethal concentrations of the fungicide, we obtained four fludioxonil-resistant mutants with resistance factors (EC50 resistant/EC50 sensitive phenotypes) >2000. The laboratory fludioxonil mutants were less fitter than their parental isolates in terms of mycelial radial growth, pathogenicity and sclerotial production.

Moreover, on PDA amended with NaCl, the laboratory fludioxonil mutants grew more slowly than their fludioxonil-sensitive parents, especially at lower concentrations of NaCl. According to the fitness of mutants and the cross-resistance between fludioxonil and dicarboximide fungicides, phenylpyrroles can be considered to pose a moderate resistance risk. In a field trial, fludioxonil provided greater control (over 90% disease control) of *S. sclerotiorum* than iprodione.

Keywords: Fludioxonil; *Sclerotinia sclerotiorum*; Baseline sensitivity; Resistance

Analyzing the effects of risk and uncertainty on optimal tillage and nitrogen fertilizer intensity for field crops in Germany/Markus Gandorfer, David Pannell, Andreas Meyer-Aurich

Agricultural Systems, In Press, Corrected Proof, Available online 30 July 2011, ISSN 0308-521X, DOI: 10.1016/j.agsy.2011.06.004. (<http://www.sciencedirect.com/science/article/pii/S0308521X11000874>)

Abstract:

This study provides a risk analysis of long-term field experiments in Germany (Bavaria) on various field crops (potato, wheat and corn), grown in rotation, under a variety of different tillage and nitrogen management systems. The field experiment provided yield and input data for the analysis, and was combined with market data relevant to the case-study region. The emphasis of the analysis is on the interaction between risk and tillage and nitrogen strategies. Over the whole rotation (corn-wheat-potato-wheat), conventional tillage combined with conventional nitrogen rates is optimal, both for risk-neutral and risk-averse farmers. Although less intensive management practices involve lower risk, the decrease in risk premium is not sufficient to alter the ranking of strategies, even for farmers with higher levels of risk aversion. Reducing nitrogen rates would be costly to farmers, especially under reduced or shallow tillage. Decoupled farm subsidies within the expected utility model show that even for a scenario with no subsidies our conclusions do not change.

Keywords: Tillage; Nitrogen management; Risk analysis; Expected utility; Stochastic dominance

Repression of mineral phosphate solubilizing phenotype in the presence of weak organic acids in plant growth promoting fluorescent pseudomonads/Divya K. Patel, Prayag Murawala, G. Archana, G. Naresh Kumar

Bioresource Technology, Volume 102, Issue 3, February 2011, Pages 3055-3061, ISSN 0960-8524, DOI:10.1016/j.biortech.2010.10.041. (<http://www.sciencedirect.com/science/article/pii/S0960852410016974>)

Abstract:

Two phosphate solubilizing bacteria (PSB), M3 and SP1, were obtained from the rhizosphere of mungbean and sweet potato, respectively and identified as strains of *Pseudomonas aeruginosa*. Their rock phosphate (RP) solubilizing abilities were found to be due to secretion high amount of gluconic acid. In the presence of malate and succinate, individually and as mixture, the P solubilizing ability of both the strains was considerably reduced. This was correlated with a nearly 80% decrease in the activity of the glucose dehydrogenase (GDH) but not gluconate dehydrogenase (GAD) in both the isolates. Thus, GDH enzyme, catalyzing the periplasmic production of gluconic acid, is under reverse catabolite repression control by organic acids in *P. aeruginosa* M3 and SP1. This is of relevance in rhizospheric conditions and is a new explanation for the lack of field efficacy of such PSB.

Keywords: Catabolite repression control; Mineral phosphate solubilization; Organic acids; Glucose dehydrogenase; Plant growth promoting rhizobacteria