No.	Records	Request
1	1398	LEGUME
2	1696	LEGUMES
3	2685	LEGUME or LEGUMES
4	16957	PY=2004
* 5	143	#3 and (PY=2004)

Record 1 of 143 - AGRICOLA 1998-2004/09
AU: Zhai,-T.; Mohtar,-R.H.; Karsten,-H.D.; Carlassare,-M.
TI: Modeling growth and competition of a multi-species pasture system.
SO: Transactions of the ASAE. 2004 Mar-Apr, v. 47, no. 2 p. 617-627.
AB: Pastures are often a mixture of different plant species. The growth patterns of these mixtures are determined by the interactions and competition among the coexisting species, as well as their response and interactions with the environment. Grassland management for economic and environmental sustainability should be based on the integrated view of the pasture system and the understanding of the processes involved. Computer models are ideal to study such complex systems. Most modeling efforts have focused on binary combinations of an agronomic crop and a major weed species in agricultural systems. In this research, the GRAzing SImulation Model (GRASIM) was extended to account for growth and interspecies competition among a mixture of plant species, including grasses, legumes, and weeds. In the multispecies GRASIM, a user-specified number of species grow separately on a daily time step, competing for light, soil water, and nitrogen. Forage experiments were conducted on a naturalized pasture at the Pennsylvania State University Beef Research Farm (University Park, Pa.). The pasture was divided and rotationally stocked at two intensities (high and low). Forage biomass data from 1998 and 1999 were used to develop and evaluate the multispecies GRASIM model. The multispecies GRASIM reasonably simulated the growth dynamics of multiple species on two grazing treatments across two seasons, despite the high variability of the pasture. The model-simulated and observed biomass data for the dominant species across the two treatments and the two growing seasons gave regression coefficients of determination (R2) ranging from 0.25 to 0.98. Model limitations and directions for future efforts are outlined and discussed. The multispecies GRASIM can be used to help evaluate coexisting species interaction and their response to the environment and provide insight into the complex mixed-species pasture ecosystem.

Record 2 of 143 - AGRICOLA 1998-2004/09
AU: Patreze,-C.M.; Cordeiro,-L.
TI: Nitrogen-fixing and vesicular-arbuscular mycorrhizal symbioses in some tropical legume trees of tribe Mimoseae.
SO: Forest ecology and management. 2004 July 26, v. 196, issue 2-3 p. 275-285.

Record 3 of 143 - AGRICOLA 1998-2004/09
AU: Castillejo,-M.A.; Amiour,-N.; Dumas-Gaudot,-E.; Rubiales,-D.; Jorrin,-J.V.
TI: A proteomic approach to studying plant response to crenate broomrape (Orobanche crenata) in pea (Pisum sativum).
SO: Phytochemistry. 2004 June, v. 65, no. 12 p. 1817-1828.

AB: Crenate broomrape (Orobanche crenata) is a parasitic plant that threatens legume production in Mediterranean areas. Pea (Pisum sativum) is severely affected, and only moderate levels of genetic resistance have so far been identified. In the present work we selected the most resistant accession available (Ps 624) and compared it with a susceptible (Messire) cultivar. Experiments were performed by using pot and Petri dish bioassays, showing little differences in the percentage of broomrape seed germination induced by both genotypes, but a significant hamper in the number of successfully installed tubercles and their developmental stage in the Ps 624 compared to Messire. The protein profile of healthy and infected P. sativum root tissue were analysed by two-dimensional electrophoresis. Approximately 500 individual protein spots could be detected on silver stained gels. At least 22 different protein spots differentiated control, non-infected, Messire and Ps 624 accessions. Some of them were identified by MALDI-TOF mass spectrometry and database searching as cysteine proteinase, beta-1,3-glucanase, endochitinase, profucosidase, and ABA-responsive protein. Both qualitative and quantitative differences have been found among infected and non-infected root extracts. Thus, in the infected susceptible Messire genotype 34 spots were decreased, one increased and three newly detected, while in Ps 624, 15 spots were increased, three decreased and one newly detected. In response to the inoculation, proteins that correspond to enzymes of the carbohydrate metabolism (fructokinase, fructose-bisphosphate aldolase), nitrogen metabolism (ferredoxin-NADP reductase) and mitochondrial electronic chain transport (alternative oxidase 2) decreased in the susceptible check, while proteins that correspond to enzymes of the nitrogen assimilation pathway (glutamine synthetase) or typical pathogen defence, PR proteins, including beta-1,3-glucanase and peroxidases, increased in Ps 624. Results are discussed in terms of changes in the carbohydrate and nitrogen metabolism an induction of defence proteins in response to broomrape parasitism.

Record 4 of 143 - AGRICOLA 1998-2004/09

AU: Watson,-B.S.; Lei,-Z.; Dixon,-R.A.; Sumner,-L.W.

TI: Proteomics of Medicago sativa cell walls.

SO: Phytochemistry. 2004 June, v. 65, no. 12 p. 1709-1720.

AB: A method for the sequential extraction and profiling by two-dimensional gel electrophoresis (2-DE) of Medicago sativa (alfalfa) stem cell wall proteins is described. Protein extraction included freezing, grinding in a sodium acetate buffer, separation by filtration of cell walls from cytosolic contents, and extensive washing. Cell wall proteins were then extracted sequentially with a solution containing 200 mM CaCl2 and 50 mM sodium acetate, followed by extraction with 3.0 M LiCl and 50 mM sodium acetate. Cell wall proteins from both the CaCl2 and LiCl fractions were profiled by 2-DE. Approximately 150 protein spots were extracted from these two gels, digested with trypsin, and analyzed using nanoscale HPLC coupled to a hybrid quadrupole time-of-flight (Q-tof) tandem mass spectrometer (LC/MS/MS). More than 100 proteins were identified and used in conjunction with the 2-DE profiles to generate proteomic reference maps for cell walls of this important legume. Identified proteins include classical cell wall proteins as well as proteins traditionally

considered as non-secreted. Two unique extracellular proteins were also identified.

Record 5 of 143 - AGRICOLA 1998-2004/09

AU: Romeis,-J.; Sharma,-H.C.; Sharma,-K.K.; Das,-S.; Sarmah,-B.K.

TI: The potential of transgenic chickpeas for pest control and possible effects on non-target arthropods.

SO: Crop protection. 2004 Oct., v. 23, issue 10 p. 923-938.

AB: Chickpea, Cicer arietinum, is the third most important grain legume crop in the world, with India being the largest producer. Insect pests are a major constraint to chickpea production. In India, the legume pod borer Helicoverpa armigera is the major insect pest of chickpeas. However, sap-sucking insects that act as vectors for viral diseases and bruchid beetles in storage are also considered important pests. Here we give an overview over the different management options to control these pests. There is a growing interest in the genetic modification of crops to enhance their resistance against insect pests. Here we present the state-of-the-art of chickpea transformation and give an overview on the available insecticidal genes that could be deployed to increase insect resistance in chickpea. Prior to commercialization, transgenic crops have to be assessed for their effects on the environment including the possible impact on non-target arthropods, many of which are important for biological pest control. Therefore, the arthropodÆfood web in the Indian chickpea system is described. Possible routes through which entomophagous insects could be exposed to insecticidal proteins expressed by genetically modified chickpeas are discussed, and species that could be selected for pre-release risk assessment are recommended.

Record 6 of 143 - AGRICOLA 1998-2004/09

AU: Denison,-R.F.; Kiers,-E.T.

TI: Lifestyle alternatives for rhizobia: mutualism, parasitism, and forgoing symbiosis.

SO: FEMS microbiology letters Federation of European Microbiological Societies. 2004 Aug. 15, v. 237, no. 2 p. 187-193.

AB: Strains of rhizobia within a single species can have three different genetically determined strategies. Mutualistic rhizobia provide their legume hosts with nitrogen. Parasitic rhizobia infect legumes, but fix little or no nitrogen. Nonsymbiotic strains are unable to infect legumes at all. Why have rhizobium strains with one of these three strategies not displaced the others? A symbiotic (mutualistic or parasitic) rhizobium that succeeds in founding a nodule may produce many millions of descendants. The chances of success can be so low, however, that nonsymbiotic rhizobia can have greater reproductive success. Legume sanctions against nodules that fix little or no nitrogen favor more mutualistic strains, but parasitic strains that use plant resources only for their own reproduction may do well when they share nodules with mutualistic strains.

Record 7 of 143 - AGRICOLA 1998-2004/09

AU: Rodriguez-Llorente,-I.D.; Perez-Hormaeche,-J.; El-Mounadi,-K.; Dary,-M.; Caviedes,-M.A.; Cosson,-V.; Kondorosi,-A.; Ratet,-P.; Palomares,-A.J.

TI: From pollen tubes to infection threads: recruitment of Medicago

floral pectic genes for symbiosis.
SO: Plant journal. 2004 Aug., v. 39, no. 4 p. 587-598.
AB: While the biology of nitrogen-fixing root nodules has been extensively studied, little is known about the evolutionary events that predisposed legume plants to form symbiosis with rhizobia. We have studied the presence and the expression of two pectic gene families in Medicago, polygalacturonases (PGs) and pectin methyl esterases (PMEs) during the early steps of the Sinorhizobium meliloti-Medicago interaction and compared them with related pollen-specific genes. First, we have compared the expression of MsPG3, a PG gene specifically expressed during the symbiotic interaction, with the expression of MsPG11, a highly homologous pollen-specific gene, using promoter-gus fusions in transgenic M. truncatula and tobacco plants. These results demonstrated that the symbiotic promoter functions as a pollen-specific promoter in the non-legume host. Second, we have identified the presence of a gene family of at least eight differentially expressed PMEs in Medicago. One subfamily is represented by one symbiotic gene (MtPER) and two pollen-expressed genes (MtPEF1 and MtPEF2) that are clustered in the M. truncatula genome. The promoter-gus studies presented in this work and the homology between plant PGs, together with the analysis of the PME locus structure and MtPER expression studies, suggest that the symbiotic MsPG3 and MtPER could have as ancestors pollen-expressed genes involved in polar tip growth processes during pollen tube elongation. Moreover, they could have been recruited after gene duplication in the symbiotic interaction to facilitate polar tip growth during infection thread formation.

Record 8 of 143 - AGRICOLA 1998-2004/09
AU: Colebatch,-G.; Desbrosses,-G.; Ott,-T.; Krusell,-L.; Montanari,-O. ; Kloska,-S.; Kopka,-J.; Udvardi,-M.K.
TI: Global changes in transcription orchestrate metabolic differentiation during symbiotic nitrogen fixation in Lotus japonicus.
SO: Plant journal. 2004 Aug., v. 39, no. 4 p. 487-512.
AB: Research on legume nodule metabolism has contributed greatly to our knowledge of primary carbon and nitrogen metabolism in plants in general, and in symbiotic nitrogen fixation in particular. However, most previous studies focused on one or a few genes/ enzymes involved in selected metabolic pathways in many different legume species. We utilized the tools of transcriptomics and metabolomics to obtain an unprecedented overview of the metabolic differentiation that results from nodule development in the model legume, Lotus japonicus. Using an array of more than 5000 nodule cDNA clones, representing 2500 different genes, we identified approximately 860 genes that were more highly expressed in nodules than in roots. One-third of these are involved in metabolism and transport, and over 100 encode proteins that are likely to be involved in signalling, or regulation of gene expression at the transcriptional or post-transcriptional level. Several metabolic pathways appeared to be co-ordinately upregulated in nodules, including glycolysis, CO2 fixation, amino acid biosynthesis, and purine, haem, and redox metabolism. Insight into the physiological conditions that prevail within nodules was obtained from specific sets of induced genes. In

addition to the expected signs of hypoxia, numerous indications were obtained that nodule cells also experience P-limitation and osmotic stress. Several potential regulators of these stress responses were identified. Metabolite profiling by gas chromatography coupled to mass spectrometry revealed a distinct metabolic phenotype for nodules that reflected the global changes in metabolism inferred from transcriptome analysis.

Record 9 of 143 - AGRICOLA 1998-2004/09

AU: Jia,-Y.; Gray,-V.M.; Straker,-C.J.

TI: The influence of Rhizobium and arbuscular mycorrhizal fungi on nitrogen and phosphorus accumulation by Vicia faba.

SO: Annals of botany. 2004 Aug., v. 94, no. 2 p. 251-258.

AB: Background and Aims The aim of this study was to investigate the effects of the interactions between the microbial symbionts, Rhizobium and arbuscular mycorrhizal fungi (AMF) on N and P accumulation by broad bean (Vicia faba) and how increased N and P content influence biomass production, leaf area and net photosynthetic rate. Methods A multi-factorial experiment consisting of four different legume-microbial symbiotic associations and two nitrogen treatments was used to investigate the influence of the different microbial symbiotic associations on P accumulation, total N accumulation, biomass, leaf area and net photosynthesis in broad bean grown under low P conditions. Key Results AMF promoted biomass production and photosynthetic rates by increasing the ratio of P to N accumulation. An increase in P was consistently associated with an increase in N accumulation and N productivity, expressed in terms of biomass and leaf area. Photosynthetic N use efficiency, irrespective of the inorganic source of N (e.g. NO3- or N2), was enhanced by increased P supply due to AMF. The presence of Rhizobium resulted in a significant decline in AMF colonization levels irrespective of N supply. Without Rhizobium, AMF colonization levels were higher in low N treatments. Presence or absence of AMF did not have a significant effect on nodule mass but high N with or without AMF led to a significant decline in nodule biomass. Plants with the Rhizobium and AMF symbiotic associations had higher photosynthetic rates per unit leaf area. Conclusions The results indicated that the synergistic or additive interactions among the components of the tripartite symbiotic association (Rhizobium-AMF-broad bean) increased plant productivity.

Record 10 of 143 - AGRICOLA 1998-2004/09

AU: Ma,-F.; Cholewa,-E.; Mohamed,-T.; Peterson,-C.A.; Gijzen,-M.

TI: Cracks in the palisade cuticle of soybean seed coats correlate with their permeability to water.

SO: Annals of botany. 2004 Aug., v. 94, no. 2 p. 213-228.

AB: Background and Aims Soybean (Glycine max) is among the many legumes that are well known for 'hardseededness'. This feature can be beneficial for long-term seed survival, but is undesirable for the food processing industry. There is substantial disagreement concerning the mechanisms and related structures that control the permeability properties of soybean seed coats. In this work, the structural component that controls water entry into the seed is identified. Methods Six soybean cultivars were tested for their seed coat permeabilities to water. To identify the structural feature(s) that may contribute to the

determination of these permeabilities, fluorescent tracer dyes, and light and electron microscopic techniques were used. Key Results The cultivar 'Tachanagaha' has the most permeable seed coat, 'OX 951' the least permeable seed coat, and the permeabilities of the rest ('Harovinton', 'Williams', 'Clark L 67-3469', and 'Harosoy 63') are intermediate. All seeds have surface deposits, depressions, a light line, and a cuticle about 0.2 m thick overlaying the palisade layer. In permeable cultivars the cuticle tends to break, whereas in impermeable seeds of 'OX 951' it remains intact. In the case of permeable seed coats, the majority of the cracks are from 1 to 5 m wide and from 20 to 200 m long, and occur more frequently on the dorsal side than in other regions of the seed coat, a position that correlates with the site of initial water uptake. Conclusions The cuticle of the palisade layer is the key factor that determines the permeability property of a soybean seed coat. The cuticle of a permeable seed coat is mechanically weak and develops small cracks through which water can pass. The cuticle of an impermeable seed coat is mechanically strong and does not crack under normal circumstances.

Record 11 of 143 - AGRICOLA 1998-2004/09

AU: Suzuki,-A.; Akune,-M.; Kogiso,-M.; Imagama,-Y.; Osuki,-K.; Uchiumi,-T.; Higashi,-S.; Han,-S.Y.; Yoshida,-S.; Asami,-T.

TI: Control of nodule number by the phytohormone abscisic acid in the roots of two leguminous species.

SO: Plant and cell physiology. 2004 July, v. 45, no. 7 p. 914-922.

AB: The effects of the phytohormone abscisic acid (ABA) on plant growth and root nodule formation were analyzed in Trifolium repense (white clover) and Lotus japonicus, which form indeterminate and determinate nodules, respectively. In T. repense, although the number of nodules formed after inoculation with Rhizobium leguminosarum bv. trifolii strain 4S (wild type) was slightly affected by exogenous ABA, those formed by strain H1(pC4S8), which forms ineffective nodules, were dramatically reduced 28 days after inoculation (DAI). At 14 and 21 DAI, the number of nodules formed with the wild-type strain was decreased by exogenous ABA. In L. japonicus, the number of nodules was also reduced by ABA treatment. Thus, exogenous ABA inhibits root nodule formation after inoculation with rhizobia. Observation of root hair deformation revealed that ABA blocked the step between root hair swelling and curling. When the ABA concentration in plants was decreased by using abamine, a specific inhibitor of 9-cis-epoxycarotenoid dioxygenase, the number of nodules on lateral roots of abamine-treated L. japonicus increased dramatically, indicating that lower-than-normal concentrations of endogenous ABA enhance nodule formation. We hypothesize that the ABA concentration controls the number of root nodules.

Record 12 of 143 - AGRICOLA 1998-2004/09

AU: Papastylianou,-I.

TI: Effect of rotation system and N fertilizer on barley and vetch grown in various crop combinations and cycle lengths.

SO: Journal of agricultural science. 2004 Feb., v. 142, pt. 1 p. 41-48.

AB: Under rainfed Mediterranean conditions the dominant crops are cereals and legumes, with the most common crops being barley (

Hordeum vulgare) and vetch (Vicia sativa). These two species are grown in rotation, where the cycle length depends on the productivity and the value of the products in the market. In order to study the productivity of cereals and legumes growing in various rotation combinations, an experiment was conducted during the 1982-2000 period, at Athalassa. The experimental site had a calcareous soil and is located in the central plane of Cyprus. The average rainfall is 250 mm per year. The rotation treatments tested were: (a) continuous barley, (b) continuous vetch, (c) vetch-barley, (d) vetch-barley-barley, (e) vetch-vetch-barley-barley and (f) vetch-vetch-vetch-barley-barley. Barley plots were equally divided to accommodate two rates of N fertilizer (0 and 60 kg N/ha) which were applied at seeding. Production of both vetch and barley was lower in monocultures than when the two species were grown in rotation. Vetch yield was similar in all rotations, irrespective of the position in the cycle. Productivity of barley was increased by nitrogen application only when grown as a second barley after vetch. However, in years with low productivity due to the rainfall amount and distribution, barley did not respond to nitrogen application. The first crop of barley after vetch gave maximum production without any nitrogen fertilizer application. Nitrogen fertilizer had a decreasing effect on the size and weight of barley grains. These results enable the farmers to select any of the rotation systems studied, based on the economics of the two species, without risking productivity. Nitrogen fertilizer should be applied only to the second crop after vetch in years with high rainfall.

Record 13 of 143 - AGRICOLA 1998-2004/09

AU: Ayaz,-S.; McKenzie,-B.A.; Hill,-G.D.; McNeil,-D.L.

TI: Variability in yield of four grain legume species in a subhumid temperate environment. II. Yield components.

SO: Journal of agricultural science. 2004 Feb., v. 142, pt. 1 p. 21-28.

AB: The effects of plant population (one-tenth of the optimum to four times the optimum populations in 1998/99 and 10-400 plants/m2 in 1999/2000) and sowing depth (2, 5 and 10 cm) on yield and yield components of four grain-legumes (Cicer arietinum, Lens culinaris, Lupinus angustifolius and Pisum sativum) were studied. Seed yields were strongly positively correlated with the number of pods and seeds/m2 in both years in all species. The mean seed weight and number of branches/plant were inversely related to plant population. There was a nearly six-fold reduction in the number of branches/plant as plant population increased, which was due to restricted branching, and not to branch senescence. Generally, the variation in yield components was species dependent. However, for all species the number of pods/m2 and seeds/m2 could be used as primary criteria for selection in a breeding programme.

Record 14 of 143 - AGRICOLA 1998-2004/09

AU: Ayaz,-S.; McKenzie,-B.A.; Hill,-G.D.; McNeil,-D.L.

TI: Variability in yield of four grain legume species in a subhumid temperate environment. I. Yields and harvest index.

SO: Journal of agricultural science. 2004 Feb., v. 142, pt. 1 p. 9-19.

AB: In 1998/99 and 1999/2000, field trials were conducted to try to explain why grain legume yields and harvest index are more variable than many other crops. Treatments involved varying plant populations and sowing depths and were selected to maximize plant variability. Both yields and harvest index were variable. Total dry matter (TDM) production generally increased as plant population increased up to twice the optimum population. Increases ranged from 80 to 130% with lupins producing the highest yields of 878 and 972 g/m2 of TDM in 1998/99 and 1999/2000 respectively. While plants sown at 10 cm depth produced more TDM than did plants sown at 2 cm, the difference was only 3%. Seed yields followed similar trends to TDM, with maximum yields (mean of 403 g seed/m2) produced at twice the optimum population. Crop harvest index (CHI) was quite variable and ranged from 0.31 to 0.66. Crop HI was lowest (0.43) at the lowest population and increased to 0.55 at twice the optimum plant population. In both seasons, lentil had the highest CHI and lupin the lowest. While CHI was variable there were very close relationships between seed yield and TDM which suggested that maximum seed yield depends on maximizing TDM production. The results also suggest that growers should increase population by a factor of two to obtain maximum seed yields.

Record 15 of 143 - AGRICOLA 1998-2004/09

AU: Berry,-A.M.; Murphy,-T.M.; Okubara,-P.A.; Jacobsen,-K.R.; Swensen, -S.M.; Pawlowski,-K.

TI: Novel expression pattern of cytosolic Gln synthetase in nitrogen-fixing root nodules of the actinorhizal host, Datisca glomerata.

SO: Plant physiology. 2004 July, v. 135, no. 3 p. 1849-1862.

AB: Gln synthetase (GS) is the key enzyme of primary ammonia assimilation in nitrogen-fixing root nodules of legumes and actinorhizal (Frankia-nodulated) plants. In root nodules of Datisca glomerata (Datiscaceae), transcripts hybridizing to a conserved coding region of the abundant nodule isoform, DgGS1-1, are abundant in uninfected nodule cortical tissue, but expression was not detectable in the infected zone or in the nodule meristem. Similarly, the GS holoprotein is immunolocalized exclusively to the uninfected nodule tissue. Phylogenetic analysis of the full-length cDNA of DgGS1-1 indicates affinities with cytosolic GS genes from legumes, the actinorhizal species Alnus glutinosa, and nonnodulating species, Vitis vinifera and Hevea brasilensis. The D. glomerata nodule GS expression pattern is a new variant among reported root nodule symbioses and may reflect an unusual nitrogen transfer pathway from the Frankia nodule microsymbiont to the plant infected tissue, coupled to a distinctive nitrogen cycle in the uninfected cortical tissue. Arg, Gln, and Glu are the major amino acids present in D. glomerata nodules, but Arg was not detected at high levels in leaves or roots. Arg as a major nodule nitrogen storage form is not found in other root nodule types except in the phylogenetically related Coriaria. Catabolism of Arg through the urea cycle could generate free ammonium in the uninfected tissue where GS is expressed.

Record 16 of 143 - AGRICOLA 1998-2004/09

AU: Kirkegaard,-J.A.; Simpfendorfer,-S.; Holland,-J.; Bambach,-R.; Moore,-K.J.; Rebetzke,-G.J.

TI: Effect of previous crops on crown rot and yield of durum and bread wheat in northern NSW.
SO: Australian journal of agricultural research. 2004, v. 55, no. 3 p. 321-334.

Record 17 of 143 - AGRICOLA 1998-2004/09
AU: Graham,-M.A.; Silverstein,-K.A.T.; Cannon,-S.B.; VandenBosch,-K.A.
TI: Computational identification and characterization of novel genes from legumes.
SO: Plant physiology. 2004 July, v. 135, no. 3 p. 1179-1197.
AB: The Fabaceae, the third largest family of plants and the source of many crops, has been the target of many genomic studies. Currently, only the grasses surpass the legumes for the number of publicly available expressed sequence tags (ESTs). The quantity of sequences from diverse plants enables the use of computational approaches to identify novel genes in specific taxa. We used BLAST algorithms to compare unigene sets from Medicago truncatula, Lotus japonicus, and soybean (Glycine max and Glycine soja) to nonlegume unigene sets, to GenBank's nonredundant and EST databases, and to the genomic sequences of rice (Oryza sativa) and Arabidopsis. As a working definition, putatively legume-specific genes had no sequence homology, below a specified threshold, to publicly available sequences of nonlegumes. Using this approach, 2,525 legume-specific EST contigs were identified, of which less than three percent had clear homology to previously characterized legume genes. As a first step toward predicting function, related sequences were clustered to build motifs that could be searched against protein databases. Three families of interest were more deeply characterized: F-box related proteins, Pro-rich proteins, and Cys cluster proteins (CCPs). Of particular interest were the >300 CCPs, primarily from nodules or seeds, with predicted similarity to defensins. Motif searching also identified several previously unknown CCP-like open reading frames in Arabidopsis. Evolutionary analyses of the genomic sequences of several CCPs in M. truncatula suggest that this family has evolved by local duplications and divergent selection.

Record 18 of 143 - AGRICOLA 1998-2004/09
AU: Allan,-G.L.; Booth,-M.A.
TI: Effects of extrusion processing on digestibility of peas, lupins, canola meal and soybean meal in silver perch Bidyanus bidyanus (Mitchell) diets.
SO: Aquaculture research. 2004 Aug. 20, v. 35, no. 10 p. 981-991.
AB: Two experiments were conducted to investigate effects of processing on apparent digestibility coefficients (ADCs) of legumes and oilseeds for juvenile silver perch, Bidyanus bidyanus (approximately 49 g). The first experiment evaluated interactive effects of ingredients (lupins or field peas), processing (whole seed; hulls on or hulls off) and extrusion cooking (raw or extruded) on ADCs for juvenile silver perch (approximately 4 g fish-1). The second experiment was a three-fixed-factor anova designed to evaluate interactive effects of ingredients (soybean meal or canola meal), extrusion cooking (raw or extruded) and inclusion content (30% or 50% of the diet) on ADCs for juvenile silver perch (approximately 4 g fish-1). Lupin protein was more digestible than that of peas (ADC for crude protein 91% vs. 85% for peas) but the organic matter was less digestible (ADC for

organic matter 50% vs. 67% for peas). Dehulling lupins significantly improved ADCs for all indices (dry matter, organic matter, energy and crude protein), but extrusion had no effect because lupins do not contain starch or heat-labile anti-nutrients. Conversely, for starch-rich peas that contain heat-labile trypsin inhibitors, both dehulling and extrusion significantly improved ADCs. Digestibility of soybean meal was much higher than that of canola meal. For soybean meal, neither processing, content nor their interaction affected digestibility but extrusion improved ADCs for dry matter, organic matter and energy but there was an interaction with content. Although higher overall, digestibility for these indices declined with increasing content for extruded product while there were only minor effects of inclusion for raw product. Benefits of extrusion were attributed to reductions in anti-nutrients, including phytic acid. For canola, there were no interactions between extrusion and content for any ADC. Increasing content reduced ADCs for crude protein, dry matter and organic matter but did not effect energy. Surprisingly, extrusion of canola also reduced digestibility for all ADCs. Dehulling improved both lupins and peas. Crude protein for all ingredients was well digested with ingredients ranked: lupins>soybean meal>peas>canola meal. Energy digestibility was best for soybean meal and worst for lupins. Extrusion greatly improved digestibility of peas and to a lesser extent soybean meal, gave no benefits to lupins and was detrimental for canola.

Record 19 of 143 - AGRICOLA 1998-2004/09

AU: Riely,-B.K.; Ane,-J.M.; Penmetsa,-R.V.; Cook,-D.R.

TI: Genetic and genomic analysis in model legumes bring Nod-factor signaling to center stage.

SO: Current opinion in plant biology. 2004 Aug., v. 7, no. 4 p. 408-413.

Record 20 of 143 - AGRICOLA 1998-2004/09

AU: Newby,-P.K.; Muller,-D.; Hallfrisch,-J.; Andres,-R.; Tucker,-K.L.

TI: Food patterns measured by factor analysis and anthropometric changes in adults.

SO: American journal of clinical nutrition. 2004 Aug., v. 80, no. 2 p. 504-513.

AB: Background: Sixty-five percent of US adults are overweight, and 31% of these adults are obese. Obesity results from weight gains over time; however, dietary determinants of weight gain remain controversial. Objective: Our objective was to examine whether food patterns derived from exploratory factor analysis are related to anthropometric changes. We hypothesized that we would derive a healthy food pattern and that it would predict smaller changes in body mass index (BMI; in kg/m2) and waist circumference (in cm) than would other food patterns in models adjusted for baseline anthropometric measures. Design: The subjects were 459 healthy men and women participating in the Baltimore Longitudinal Study of Aging. Diet was assessed by using 7-d dietary records, from which 40 food groups were formed and entered into a factor analysis. Results: Six food patterns were derived. Factor 1 (reduced-fat dairy products, fruit, and fiber) was most strongly associated with fiber (r = 0.39) and loaded heavily on reduced-fat dairy products, cereal, and fruit and

loaded moderately on fruit juice, nonwhite bread, nuts and seeds, whole grains, and beans and legumes. In a multivariate-adjusted model in which the highest and lowest quintiles were compared, factor 1 was inversely associated with annual change in BMI (beta= -0.51; 95% CI: -0.82, -0.20; P < 0.05; P for trend < 0.01) in women and inversely associated with annual change in waist circumference (beta = -1.06 cm; 95% CI: -1.88, -0.24 cm; P < 0.05; P for trend = 0.04) in both sexes. Conclusion: Our results suggest that a pattern rich in reduced-fat dairy products and high-fiber foods may lead to smaller gains in BMI in women and smaller gains in waist circumference in both women and men.

Record 21 of 143 - AGRICOLA 1998-2004/09

AU: Dalal,-R.C.; Weston,-E.J.; Strong,-W.M.; Lehane,-K.J.; Cooper,-J. E.; Wildermuth,-G.B.; King,-A.J.; Holmes,-C.J.

TI: Sustaining productivity of a Vertosol at Warra, Queensland, with fertilisers, no-tillage or legumes. 7. Yield, nitrogen and disease-break benefits from lucerne in a two-year lucerne-wheat rotation.

SO: Australian journal of experimental agriculture. 2004, v. 44, no. 6 p. 607-616.

Record 22 of 143 - AGRICOLA 1998-2004/09

AU: Okazaki,-S.; Sugawara,-M.; Minamisawa,-K.

TI: Bradyrhizobium elkanii rtxC gene is required for expression of symbiotic phenotypes in the final step of rhizobitoxine biosynthesis.

SO: Applied and environmental microbiology. 2004 Jan., v. 70, no. 1 p. 535-541.

AB: We disrupted the rtxC gene on the chromosome of Bradyrhizobium elkanii USDA94 by insertion of a nonpolar aph cartridge. The rtxC mutant, designated delta rtxC, produced serinol and dihydrorhizobitoxine but no rhizobitoxine, both in culture and in planta. The introduction of cosmids harboring the rtxC gene into the delta rtxC mutant complemented rhizobitoxine production, suggesting that rtxC is involved in the final step of rhizobitoxine biosynthesis in B. elkanii USDA94. Glycine max cv. Lee inoculated with delta rtxC or with a null mutant, delta rtx::omega 1, showed no foliar chlorosis, whereas the wild-type strain USDA94 caused severe foliar chlorosis. The two mutants showed significantly less nodulation competitiveness than the wild-type strain on Macroptilium atropurpureum. These results indicate that dihydrorhizobitoxine, the immediate precursor of the oxidative form of rhizobitoxine, has no distinct effect on nodulation phenotype in these legumes. Thus, desaturation of dihydrorhizobitoxine by rtxC-encoded protein is essential for the bacterium to show rhizobitoxine phenotypes in planta. In addition, complementation analysis of rtxC by cosmids differing in rtxC transcription levels suggested that rhizobitoxine production correlates with the amount of rtxC transcript.

Record 23 of 143 - AGRICOLA 1998-2004/09

AU: Vrentzos,-G.E.; Papadakis,-J.A.; Malliaraki,-N.; Zacharis,-E.A.; Mazokapakis,-E.; Margioris,-A.; Ganotakis,-E.S.; Kafatos,-A.

TI: Diet, serum homocysteine levels and ischaemic heart disease in a Mediterranean population.

SO: British journal of nutrition. 2004 June, v. 91, no. 6 p.

1013-1019.
AB: Homocysteine (Hcy) is recognised as a risk factor for IHD. Serum Hcy is negatively correlated with serum folate levels, the main sources of which are fruits, vegetables and legumes. The present case-control study was designed to examine the relationship between serum Hcy levels and IHD and to assess the role of dietary factors in the southern Mediterranean population of Crete, Greece. Serum Hcy, folate, vitamin B12, creatinine and glucose levels and a full lipid profile were measured in 152 patients with established IHD, median age 64 (range 33-77) years, and 152 healthy control subjects, age- and sex-matched. Dietary data were assessed using a 3 d food intake record. Compared with controls, patients with IHD had significantly higher daily intakes of vitamin B12 and MUFA and significantly lower intakes of carbohydrate, fibre, folate, cholesterol, n-3 fatty acids and total trans unsaturated fatty acids. Moreover, patients had significantly higher serum Hcy, vitamin B12 and creatinine levels, but significantly lower folate. Serum folate concentrations in both groups had a significant positive correlation with dietary fibre consumption and a significant inverse correlation with vitamin B12 intake. IHD patients should be encouraged to increase their daily dietary intake of fibre, folate and n-3 fatty acids, which are significant components of the traditional Cretan Mediterranean diet. Where dietary folate intake is inadequate, folate supplements are recommended to reduce elevated Hcy levels.

Record 24 of 143 - AGRICOLA 1998-2004/09
AU: Njunie,-M.N.; Wagger,-M.G.; Luna-Orea,-P.
TI: Residue decomposition and nutrient release dynamics from two tropical forage legumes in a Kenyan environment.
SO: Agronomy journal. 2004 July-Aug, v. 96, no. 4 p. 1073-1081.

Record 25 of 143 - AGRICOLA 1998-2004/09
AU: Duiker,-S.W.; Hartwig,-N.L.
TI: Living mulches of legumes in imidazolinone-resistant corn.
SO: Agronomy journal. 2004 July-Aug, v. 96, no. 4 p. 1021-1028.

Record 26 of 143 - AGRICOLA 1998-2004/09
AU: Allahdadi,-I.; Beauchamp,-C.J.; Chalifour,-F.P.
TI: Symbiotic dinitrogen fixation in forage legumes amended with high rates of de-link paper sludge.
SO: Agronomy journal. 2004 July-Aug, v. 96, no. 4 p. 956-965.

Record 27 of 143 - AGRICOLA 1998-2004/09
AU: Martinez-Rodriguez,-S.; Las-Heras-Vezquez,-F.J.; Mingorance-Cazorla,-L.; Clemente-Jimenez,-J.M.; Rodriguez-Vico,-F.
TI: Molecular cloning, purification, and biochemical characterization of hydantoin racemase from the legume symbiont Sinorhizobium meliloti CECT 4114.
SO: Applied and environmental microbiology. 2004 Jan., v. 70, no. 1 p. 625-630.
AB: Hydantoin racemase from Sinorhizobium meliloti was functionally expressed in Escherichia coli. The native form of the enzyme was a homotetramer with a molecular mass of 100 kDa. The optimum temperature and pH for the enzyme were 40ÀC and 8.5, respectively. The enzyme showed a slight preference for

hydantoins with short rather than long aliphatic side chains or those with aromatic rings. Substrates, which showed no detectable activity toward the enzyme, were found to exhibit competitive inhibition.

Record 28 of 143 - AGRICOLA 1998-2004/09

AU: Johnson,-H.E.; Broadhurst,-D.; Kell,-D.B.; Theodorou,-M.K.; Merry,-R.J.; Griffith,-G.W.

TI: High-throughput metabolic fingerprinting of legume silage fermentations via Fourier transform infrared spectroscopy and chemometrics.

SO: Applied and environmental microbiology. 2004 Mar., v. 70, no. 3 p. 1583-1592.

AB: Silage quality is typically assessed by the measurement of several individual parameters, including pH, lactic acid, acetic acid, bacterial numbers, and protein content. The objective of this study was to use a holistic metabolic fingerprinting approach, combining a high-throughput microtiter plate-based fermentation system with Fourier transform infrared (FT-IR) spectroscopy, to obtain a snapshot of the sample metabolome (typically low-molecular-weight compounds) at a given time. The aim was to study the dynamics of red clover or grass silage fermentations in response to various inoculants incorporating lactic acid bacteria (LAB). The hyperspectral multivariate datasets generated by FT-IR spectroscopy are difficult to interpret visually, so chemometrics methods were used to deconvolute the data. Two-phase principal component-discriminant function analysis allowed discrimination between herbage types and different LAB inoculants and modeling of fermentation dynamics over time. Further analysis of FT-IR spectra by the use of genetic algorithms to identify the underlying biochemical differences between treatments revealed that the amide I and amide II regions (wavenumbers of 1,550 to 1,750 cm-1) of the spectra were most frequently selected (reflecting changes in proteins and free amino acids) in comparisons between control and inoculant-treated fermentations. This corresponds to the known importance of rapid fermentation for the efficient conservation of forage proteins.

Record 29 of 143 - AGRICOLA 1998-2004/09

AU: Astatke,-A.; Mamo,-T.; Peden,-D.; Diedhiou,-M.

TI: Participatory on-farm conservation tillage trial in the Ethiopian highland Vertisols: the impact of potassium application on crop yields.

SO: Experimental agriculture. 2004 July, v. 40, no. 3 p. 369-379.

AB: The two years on-farm tillage research during the 1999 and 2000 cropping seasons in Ethiopian highland Vertisol area demonstrated the importance of adapting cultural practices into participatory trials. The minimum tillage package could be an effective intervention for soil conservation due to the early-vegetative cover of the soil. Based on farmers' application of ash on Vertisols at Chefe Donsa, the incorporation of 50 kg ha-1 of potassium sulphate (K2SO4) in the on-farm trial significantly increased grain and straw yields of wheat. The nitrogen levels in the grain and straw of wheat on plots given K2SO4 were higher than those without. The nitrogen level for both wheat grain and straw was even higher when grown on plots previously growing

legumes that received K2SO4. This showed that the availability of extra potassium in these soils improved the extraction of nitrogen by the wheat crop, thus improving the grain yield. The findings indicate the need to reassess the traditionally-practised system of not applying potassium fertilizer to Ethiopian soils.

Record 30 of 143 - AGRICOLA 1998-2004/09

AU: Ellis-Jones,-J.; Schulz,-S.; Douthwaite,-B.; Hussaini,-M.A.; Oyewole,-B.D.; Olanrewaju,-A.S.; White,-R.

TI: An assessment of integrated Striga hermonthica control and early adoption by farmers in northern Nigeria.

SO: Experimental agriculture. 2004 July, v. 40, no. 3 p. 353-368.

AB: Two sets of on-farm trials, each covering two years, were conducted in the northern Guinea savannah of Nigeria over the period 1999-2001, the objective being to compare integrated Striga hermonthica control measures (soybean or cowpea trap crops followed by maize resistant to Striga) with farmers' traditional cereal-based cropping systems. In both sets of trials, this proved to be highly effective in increasing productivity over the two year period, especially where soybean was used as a trap crop. Resistant maize after a trap crop increased the net benefit over the two cropping seasons in both trials by over 100% over farmer practice. However, in the second set of trials there was no significant increase in productivity between a trap crop followed by Striga resistant maize, and a trap crop followed by local maize especially where legume intercropping and fertilizer had been applied in the farmer practice. There was also no increase in productivity between two years' traditional cereal cropping and one year's local maize followed by Striga resistant maize. This indicates the importance of a legume trap crop in the first year in order to ensure high productivity in the second year, regardless of variety. Up to 20% of farmers obtained higher productivity from their own practices, notably intercropping of cereals with legumes and use of inorganic fertilizers. Leguminous trap crops and Striga resistant maize, together with two key management practices (increased soybean planting density and hand-roguing) were seen to be spreading both within and beyond the research villages, indicating that farmers see the economic benefits of controlling Striga. Survey findings show that explaining the reasons why control practices work can greatly increase the adoption of these practices. Wider adoption of Striga control will therefore require an extension approach that provides this training as well as encouraging farmers to experiment and adapt Striga control options for their local farming systems.

Record 31 of 143 - AGRICOLA 1998-2004/09

AU: Chintu,-R.; Mafongoya,-P.L.; Chirwa,-T.S.; Mwale,-M.; Matibini,-J.

TI: Subsoil nitrogen dynamics as affected by planted coppicing tree legume fallows in eastern Zambia.

SO: Experimental agriculture. 2004 July, v. 40, no. 3 p. 327-340.

AB: Nitrogen (N) is a major nutrient that limits crop production in southern Africa. We hypothesized that coppicing tree legumes, which are integrated in cropping systems, would intercept leaching nutrients and could also increase topsoil N in nutrient-depleted soils. This hypothesis was verified in three

ongoing experiments at Msekera (experiments 1 and 2) and Kagoro (experiment 3) in Zambia. Planted tree fallows of Gliricidia sepium, Leucaena leucocephala, Acacia angustisma, and Sesbania sesban were compared with natural fallows and with continuous maize cropping with or without fertilizer (no-tree) controls. Top and subsoil samples were taken in the tree treatments and in the no-tree controls to establish short and long-term tree effects on soil N dynamics. 15N was introduced at various soil depths down to 2 m to determine the vertical root-reach of coppicing trees. Samples taken on two different dates showed that planted trees are capable of capturing subsoil N. The amounts retrieved by trees in experiment 2 did not vary with depth or dates except for A. angustisma which retrieved more N from the top 0.20 m than from the subsoil. L. leucocephala and G. sepium had similar characteristics in terms of coppice biomass production and N content, and both species rooted to at least 2 m. G. sepium in a mixture with S. sesban, retrieved more applied N than when planted alone, implying that mixed fallows may be effective in resource capture. There was more inorganic-N in the topsoil of coppiced fallows was significantly higher than in unfertilized maize plots. Subsoil N accumulation was evident under fertilized maize plots. There was less subsoil nitrate-N beneath planted trees than beneath mono-cropped maize plots indicating that trees probably retrieved subsoil N. Maize yields subsequent to coppicing tree fallows were at least 170% higher than unfertilized controls indicating improved soil fertility status in the tree systems.

Record 32 of 143 - AGRICOLA 1998-2004/09

AU: Wunscher,-T.; Schultze-Kraft,-R.; Peters,-M.; Rivas,-L.

TI: Early adoption of the tropical forage legume Arachis pintoi in Huetar Norte, Costa Rica.

SO: Experimental agriculture. 2004 Apr., v. 40, no. 2 p. 257-268.

AB: The legume Arachis pintoi has a number of characteristics which enable it to make a valuable contribution to the development of sustainable and productive pastures in the tropics. It was introduced to Costa Rica for this reason, in 1987. The objective of this study was to analyse the adoption of A. pintoi as a forage legume in Huetar Norte, a region in the north of Costa Rica. The adoption process was analysed to identify the contributory factors and to make recommendations for measures which could be taken to promote the process. To collect the data, 115 randomly selected livestock holders and an additional 34 farmers known to have planted A. pintoi were interviewed. Farmers see improved pastures to be the most important technology to enhance forage and cattle production. It was confirmed that A. pintoi is a potential improved pasture alternative. Although A. pintoi was well known, the adoption rate was low. Lack of availability of seed, technical assistance and information about the use and management of A. pintoi hinder adoption. Difficulties in establishment and maintenance were also recorded.

Record 33 of 143 - AGRICOLA 1998-2004/09

AU: Emechebe,-A.M.; Ellis-Jones,-J.; Schulz,-S.; Chikoye,-D.; Douthwaite,-B.; Kureh,-I.; Tarawali,-G.; Hussaini,-M.A.; Kormawa,-P.; Sanni,-A.

TI: Farmers' perception of the Striga problem and its control in

northern Nigeria.
SO: Experimental agriculture. 2004 Apr., v. 40, no. 2 p. 215-232.
AB: The parasitic angiosperms, Striga hermonthica and S. gesnerioides, obligate root parasites endemic in sub-Saharan Africa, constitute severe constraints to cereal and legume production in West and Central Africa. Over the years, a range of effective component technologies has been identified for Striga control in Africa. The potential of these technologies has been demonstrated under researcher-managed conditions. To promote farmer testing of the technologies, community workshops were conducted in 42 rural communities in Kaduna State, northern Nigeria. These revealed that agriculture was the main source of livelihood for most households. The three most important crops, maize, sorghum and pearl millet are attacked by S. hermonthica, regarded as the major constraint to crop production, often causing 70-100% crop loss. Farmers recognised two types of Striga damage (underground and aboveground), with greater damage being caused by underground Striga. Farmers attributed increasing incidence and severity of Striga damage to lack of capital, poor soil fertility, infestation of previously uninfested land by Striga seeds, and continuous cropping of host crops. The most widely used among the 15 existing Striga control techniques identified by the farmers were hoe weeding and hand pulling, application of inorganic fertilizer and manure, crop rotations, fallowing, and early planting. In assessing possible control measures farmers considered increased crop yield, reduced Striga reproduction and Striga emergence, greater crop vigour, and increased soil fertility as positive attributes. Negative attributes comprised increased labour requirement, higher costs, increased risk of crop damage or yield reduction, and lower quantity and quality of produce. Overall, a legume-cereal rotation was the most highly rated control option for S. hermonthica management evaluated by the farmers. The implications of these results are examined with respect to farmers' adoption and adaptation of Striga control options beyond the experimental plots.

Record 34 of 143 - AGRICOLA 1998-2004/09
AU: Rischkowsky,-B.; Thomson,-E.F.; Shnayien,-R.; King,-J.M.
TI: Mixed farming systems in transition: the case of five villages along a rainfall gradient in north-west Syria.
SO: Experimental agriculture. 2004 Jan., v. 40, no. 1 p. 109-126.
AB: The changes taking place in the mixed farming systems of northwest Syria were examined by re-visiting, in 1996 and 2000, five villages along a rainfall gradient. The villages had been surveyed first in 1977-79. In those villages with moderate rainfall, intensification of crop production, namely a trend towards cereal monoculture and the planting of tree crops, did not lead to specialization in cropping at the expense of sheep ownership. In contrast, households in the areas too dry for most rainfed crops except barley (Hordeum vulgare) were more likely to sell their sheep because they depended heavily on off-farm income. Increases in crop yields were found but these only benefited the families in villages in the higher rainfall zones. Conversely, with the exception of ewe fertility, there was little evidence of improvements in sheep productivity. The mixed farming systems in the five villages sampled are still passing through a

period of transition, and the cropping component will undoubtedly continue to change. This is less likely to happen to the small ruminant component in the near future unless the sector is given higher priority in national policy. As a strategy to increase feed production and balance the crop rotations, the prospects for closer crop/livestock integration at the farm level are limited by the many difficulties associated with the introduction of leguminous pasture and forage crops.

Record 35 of 143 - AGRICOLA 1998-2004/09

AU: Nyende,-P.; Delve,-R.J.

TI: Farmer participatory evaluation of legume cover crop and biomass transfer technologies for soil fertility improvement using farmer criteria, preference ranking and logit regression analysis.

SO: Experimental agriculture. 2004 Jan., v. 40, no. 1 p. 77-88.

AB: Canavalia ensiformis, Crotalaria grahamiana, Dolichos lablab, Mucuna pruriens, Tephrosia vogellii and Tithonia diversifolia were evaluated as potential species for soil fertility replenishment in on-farm adaptive trials, farm visits and field days in Tororo District, eastern Uganda. Farmers used multiple criteria for assessing and selecting those species that fitted within their production systems and production objectives. Farmers also adapted the technologies to allow for local opportunities and constraints. A preference ranking and logit regression analysis of probabilities of acceptance of the species conducted in 19 farmer groups showed that Mucuna had high, Tithonia and Crotalaria intermediate, and Canavalia, Lablab and Tephrosia low probabilities of being accepted or adopted. The evaluations showed that whilst technologies need to be adapted, a single-use technology had little chance of large-scale adoption. This paper highlights adaptations/innovations by farmers, and opportunities for participatory action research targeting farmers' production objectives.

Record 36 of 143 - AGRICOLA 1998-2004/09

AU: Fagan,-W.F.; Bishop,-J.G.; Schade,-J.D.

TI: Spatially structured herbivory and primary succession at Mount St Helens: field surveys and experimental growth studies suggest a role for nutrients.

SO: Ecological entomology. 2004 Aug., v. 29, no. 4 p. 398-409.

AB: 1. The 1980 eruption of Mount St Helens (Washington, U.S.A.) created a 60-km2 region of primary successional habitat. Since colonising in 1981, the spatial spread of the legume Lupinus lepidus at Mount St Helens, Washington, U.S.A., has afforded intriguing opportunities to study the effect of trophic dynamics on primary succession. Insect herbivory on this lupine has exhibited striking spatial structure for over a decade, with inverse density-dependent damage patterns occurring over both small (10-100 m) and large (1-10 km) spatial scales. Hypothesising that lupine nutritional chemistry might underlie the spatial patterns in herbivory, the distribution of elemental macronutrients (nitrogen, phosphorus) across the landscape was characterised. 4. Samples of soil and lupine tissue (roots and leaves) were collected from sites along both local and regional gradients in lupine density. On both large and small spatial scales, lupine leaves from low-density conditions were significantly more nutrient rich. In addition, in a laboratory

growth study native lepidopteran herbivores that specialise on lupines (Gelechiidae: Filatima sp.) performed better when fed leaves from low-density, high-nutrient lupines than on diets of low-nutrient lupine leaves from high-density areas a few metres away. These data suggest that spatial heterogeneity in lupine nutrient chemistry may underlie the remarkable herbivory gradients witnessed at Mount St Helens.

Record 37 of 143 - AGRICOLA 1998-2004/09

AU: Ballard,-R.A.; Charman,-N.; McInnes,-A.; Davidson,-J.A.

TI: Size, symbiotic effectiveness and genetic diversity of field pea rhizobia (Rhizobium leguminosarum bv. viciae) populations in South Australian soils.

SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1347-1355.

AB: Field pea (Pisum sativum L.) is widely grown in South Australia (SA), often without inoculation with commercial rhizobia. To establish if symbiotic factors are limiting the growth of field pea we examined the size, symbiotic effectiveness and diversity of populations of field pea rhizobia (Rhizobium leguminosarum bv. viciae) that have become naturalised in South Australian soils and nodulate many pea crops. Most probable number plant infection tests on 33 soils showed that R. l. bv. viciae populations ranged from undetectable (six soils) to 32 x 10(3) rhizobia g-1 of dry soil. Twenty-four of the 33 soils contained more than 100 rhizobia g-1 soil. Three of the six soils in which no R. l. bv. viciae were detected had not grown a host legume (field pea, faba bean, vetch or lentil). For soils that had grown a host legume, there was no correlation between the size of R. l. bv. viciae populations and either the time since a host legume had been grown or any measured soil factor (pH, inorganic N and organic C). In glasshouse experiments, inoculation of the field pea cultivar Parafield with the commercial Rhizobium strain SU303 resulted in a highly effective symbiosis. The SU303 treatment produced as much shoot dry weight as the mineral N treatment and more than 2.9 times the shoot dry weight of the uninoculated treatment. Twenty-two of the 33 naturalised populations of rhizobia (applied to pea plants as soil suspensions) produced prompt and abundant nodulation. These symbioses were generally effective at N2 fixation, with shoot dry weight ranging from 98% (soil 21) down to 61% (soil 30) of the SU303 treatment, the least effective population of rhizobia still producing nearly double the growth of the uninoculated treatment. Low shoot dry weights resulting from most of the remaining soil treatments were associated with delayed or erratic nodulation caused by low numbers of rhizobia. Random amplified polymorphic DNA (RAPD) polymerase chain reaction (PCR) fingerprinting of 70 rhizobial isolates recovered from five of the 33 soils (14 isolates from each soil) showed that naturalised populations were composed of multiple (5-9) strain types. There was little evidence of strain dominance, with a single strain type occupying more than 30% of trap host nodules in only two of the five populations. Cluster analysis of RAPD PCR banding patterns showed that strain types in naturalised populations were not closely related to the current commercial inoculant strain for field pea (SU303, > = 75% dissimilarity), six previous field pea inoculant strains (> = 55% dissimilarity) or a former commercial inoculant strain for

faba bean (WSM1274, > = 66% dissimilarity). Two of the most closely related strain types (< =15% dissimilarity) were found at widely separate locations in SA and may have potential as commercial inoculant strains. Given the size and diversity of the naturalised pea rhizobia populations in SA soils and their relative effectiveness, it is unlikely that inoculation with a commercial strain of rhizobia will improve N2 fixation in field pea crops, unless the number of rhizobia in the soil is very low or absent (e.g. where a legume host has not been previously grown and for three soils from western Eyre Peninsula). The general effectiveness of the pea rhizobia populations also indicates that reduced N2 fixation is unlikely to be the major cause of the declining field pea yields observed in recent times.

Record 38 of 143 - AGRICOLA 1998-2004/09

AU: Slattery,-J.F.; Pearce,-D.J.; Slattery,-W.J.

TI: Effects of resident rhizobial communities and soil type on the effective nodulation of pulse legumes.

SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1339-1346.

AB: Communities of resident rhizobia capable of effective nodulation of pulse crops were found to vary considerably over a range of soil environments. These populations from soils at 50 sites in Southern Australia were evaluated for nitrogen fixing effectiveness in association with Pisum sativum, Vicia faba, Lens culinaris, Vicia sativa, Cicer arietinum and Lupinus angustifolius. The values for nitrogen fixing effectiveness could be related to soil pH as determined by soil type and location. It was found that 33% of paddocks had sufficient resident populations of Rhizobium leguminosarum bv viciae for effective nodulation of faba bean, 54% for lentils, 55% for field pea and 66% for the effective nodulation of the vetch host plant. Mesorhizobium cicer populations were very low with only 7% of paddocks surveyed having sufficient resident populations for effective nodulation. Low resident rhizobial populations (<10 rhizobia g-1 soil) of R. leguminosarum bv viciae and M. cicer were found in acid soil conditions. In contrast, Bradyrhizobium populations increased as soil pH decreased. Inoculation increased faba bean yields from 0.34 to 4.4 t ha-1 and from 0.47 to 2.37 t ha-1 for chickpeas on acid soils. On alkaline soils, where resident populations were large there was no consistent response to inoculation. Observations at experimental field sites confirmed the findings from the survey data, stressing the importance of rhizobial inoculation, especially on the acid soils in south-eastern Australia.

Record 39 of 143 - AGRICOLA 1998-2004/09

AU: Charman,-N.; Ballard,-R.A.

TI: Burr medic (Medicago polymorpha L.) selections for improved N2 fixation with naturalised soil rhizobia.

SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1331-1337.

AB: Burr medic (Medicago polymorpha L.) is an annual pasture legume that is widely distributed in southern Australian farming systems. Burr medic is nodulated by rhizobia (Sinorhizobium meliloti and Sinorhizobium medicae) that reside in many Australian soils, but the symbioses that develop are often

sub-optimal in their rate of N2 fixation. We attempted to identify burr medic lines, which are able to form effective symbioses with the naturalised Sinorhizobium in Australian field soils, as potential parents for a breeding program. There were three glasshouse experiments. Initially, 222 lines (including the M. polymorpha cvv. Santiago, Serena and Circle Valley) were inoculated with extracts of two soils that had been collected near Waikerie (soil S109) and Lochiel (soil S142) in South Australia. These soils were used because they contained numerically large communities of naturalised Sinorhizobium spp. that produced sub-optimal rates of N2 fixation with cv. Santiago. None of the 222 lines of burr medic were able to form an effective symbiosis with the rhizobia from soil S109. However, when nodulated by the rhizobia from soil S142, some lines (e.g. SA8194) formed a very effective symbiosis, producing up to double the shoot dry matter (DM) of Santiago and eight times the DM of uninoculated plants. Seven promising lines were selected for further testing (with extracts of nine soils). Subsequently, two lines (SA20056 and SA8194) were selected and their symbiotic performance compared with that of Santiago, using extracts from 28 soils. While soil treatment had a major effect on mean shoot DM (soil N103=120 mg, soil N105=17 mg), the three medic lines performed similarly. Santiago, SA20056 and SA8914 all formed ineffective symbioses with the rhizobia in at least half of the 28 soils, even though >95% of the plants were nodulated. These experiments confirm that ineffective symbioses are common between burr medics and the rhizobia that have become naturalised in many Australian soils. Although some lines of burr medic were identified that were able to form more effective symbioses with the rhizobia in individual soils, none were able to form effective symbioses with a wide range of soil rhizobia. If a plant breeding approach is to be used to improve symbiotic performance of burr medic we propose that its hybridisation with other medic species, that have less specific rhizobial needs, will be required.

Record 40 of 143 - AGRICOLA 1998-2004/09

AU: Yates,-R.J.; Howieson,-J.G.; Nandasena,-K.G.; O'Hara,-G.W.

TI: Root-nodule bacteria from indigenous legumes in the north-west of Western Australia and their interaction with exotic legumes.

SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1319-1329.

AB: Bacteria were isolated from root-nodules collected from indigenous legumes at 38 separate locations in the Gascoyne and Pilbara regions of Western Australia. Authentication of cultures resulted in 31 being ascribed status as root-nodule bacteria based upon their nodulation of at least one of eight indigenous legume species. The authenticated isolates originated from eight legume genera from 19 sites. Isolates were characterised on the basis of their growth and physiology; 20 isolates were fast-growing and 11 were slow-growing (visible growth within 3 and 7 d, respectively). Fast-growers were isolated from Acacia, Isotropis, Lotus and Swainsona, whilst slow-growers were from Muelleranthus, Rhynchosia and Tephrosia. Indigofera produced one fast-growing isolate and seven slow-growing isolates. Three indigenous legumes (Swainsona formosa, Swainsona maccullochiana and Swainsona pterostylis) nodulated with fast-growing isolates

and four species (Acacia saligna, Indigofera brevidens, Kennedia coccinea and Kennedia prorepens) nodulated with both fast- and slow-growing isolates. Swainsona kingii did not form nodules with any isolates. Fast-growing isolates were predominantly acid-sensitive, alkaline- and salt-tolerant. All slow-growing isolates grew well at pH 9.0 whilst more than half grew at pH 5.0, but all were salt-sensitive. All isolates were able to grow at 37 ÀC. The fast-growing isolates utilised disaccharides, whereas the slow-growing isolates did not. Symbiotic interactions of the isolates were assessed on three annual, one biennial and nine perennial exotic legume species that have agricultural use, or potential use, in southern Australia. Argyrolobium uniflorum, Chamaecytisus proliferus, Macroptilium atropurpureum, Ononis natrix, Phaseolus vulgaris and Sutherlandia microphylla nodulated with one or more of the authenticated isolates. Hedysarum coronarium, Medicago sativa, Ornithopus sativus, Ornithopus compressus, Trifolium burchellianum, Trifolium polymorphum and Trifolium uniflorum did not form nodules. Investigation of the 31 authenticated isolates by polymerase chain reaction with three primers resulted in the RPO1 primer distinguishing 20 separate banding patterns, while ERIC and PucFor primers distinguished 26 separate banding patterns. Sequencing the 16S rRNA gene for four fast- and two slow-growing isolates produced the following phylogenetic associations; WSM1701 and WSM1715 (isolated from Lotus cruentus and S. pterostylis, respectively) displayed 99% homology with Sinorhizobium meliloti, WSM1707 and WSM1721 (isolated from Sinorhizobium leeana and Indigofera sp., respectively) displayed 99% homology with Sinorhizobium terangae, WSM1704 (isolated from Tephrosia gardneri) shared 99% sequence homology with Bradyrhizobium elkanii, and WSM1743 (isolated from Indigofera sp.) displayed 99% homology with Bradyrhizobium japonicum.

Record 41 of 143 - AGRICOLA 1998-2004/09

AU: Nandasena,-K.G.; O'Hara,-G.W.; Tiwari,-R.P.; Yates,-R.J.; Kishinevsky,-B.D.; Howieson,-J.G.

TI: Symbiotic relationships and root nodule ultrastructure of the pasture legume Biserrula pelecinus L.--a new legume in agriculture.

SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1309-1317.

AB: Biserrula pelecinus is a pasture legume species new to Australian agriculture. The potential N benefit from B. pelecinus pastures in agricultural systems may not be realised if its symbiotic interactions with Mesorhizobium spp. are not well understood. This study evaluated the symbiotic interactions of four strains of Biserrula root-nodule bacteria (WSM1271, WSM1283, WSM1284, WSM1497) with four genotypes of B. pelecinus (cv. Casbah, 93GRC4, 93ITA33, IFBI1) and with a range of related legumes, including species known to be nodulated by strains of Mesorhizobium loti and other Mesorhizobium spp. Structures of root nodules were studied using light and electron microscopy enabling the ultrastructure of effective and ineffective nodules to be compared. B. pelecinus always formed typical indeterminate, finger-like nodules. The number of bacteroids inside symbiosomes varied between host7strain combinations, however, nodules formed by ineffective associations had well developed peribacteroid

membranes and abundant bacteroids. Considerable variation was found in N2-fixing effectiveness of strains isolated from B. pelecinus on the four B. pelecinus genotypes. Strains WSM1271, WSM1284 and WSM1497 nodulated Astragalus membranaceus, only strains WSM1284 and WSM1497 nodulated Astragalus adsurgens. Strain WSM1284 also nodulated Dorycnium rectum, Dorycnium hirsutum, Glycyrrhiza uralensis, Leucaena leucocephala, Lotus edulis, Lotus glaber, Lotus maroccanus, Lotus ornithopodioides, Lotus pedunculatus, Lotus peregrinus, Lotus subbiflorus and Ornithopus sativus. The four strains from B. pelecinus did not nodulate Amorpha fruticosa, Astragalus sinicus, Cicer arietinum, Hedysarum spinosissimum, Lotus parviflorus, Macroptilium atropurpureum or Trifolium lupinaster. M. loti strain SU343 nodulated all four genotypes of B. pelecinus. However, M. loti strain CC829 only nodulated B. pelecinus genotypes 93ITA33 and IFBI1 and the nodules were ineffective. The root nodule isolates from H. spinosissimum (E13 and H4) nodulated B. pelecinus cv. Casbah whereas the commercial inoculant strain for Cicer (CC1192) could not nodulate any genotype of B. pelecinus. These results indicate that strains WSM1271, WSM1283 and WSM1497 isolated originally from B. pelecinus have a specific host range while strain WSM1284 is promiscuous in its capacity to nodulate with a broad range of related species. As B. pelecinus can be nodulated by Mesorhizobium spp. from other agricultural legumes, particularly Lotus, there is an opportunity to utilise this trait in cultivar development.

Record 42 of 143 - AGRICOLA 1998-2004/09

AU: McInnes,-A.; Thies,-J.E.; Abbott,-L.K.; Howieson,-J.G.

TI: Structure and diversity among rhizobial strains, populations and communities--a review.

SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1295-1308.

AB: Published studies of rhizobial populations, communities and other strain collections were analysed to identify trends in strain richness, strain dominance and genetic diversity within and between locations. For individual populations and communities, strain richness indices were calculated by dividing the number of strain types identified by the number of isolates recovered. Where possible, strain dominance (the proportion of rhizobial isolates represented by each strain type) was also calculated. Analysis of the genetic diversity of populations, communities and rhizobial strain collections originating from diverse legume hosts and locations, was confined to studies using multilocus enzyme electrophoresis (MLEE) so that diversity could be compared on the basis of published H values. Strain richness indices were highly variable (0.02-0.94) and were influenced by both the discriminatory power of the strain typing method and the type and number of legume species used to recover rhizobia from soil. The strain richness of populations recovered either directly from soil, or from the nodules of trap hosts inoculated with the same soil, was similar. Because the arithmetic relationship between the number of strain types and number of isolates varies between different populations and communities, strain richness curves are proposed as the most appropriate method for reporting rhizobial structural diversity. Comparison of over 50 rhizobial populations and communities from published studies showed that strain

dominance patterns in nodules were often similar. Typically, a single strain type occupies more than 30% of nodules with the majority of strain types being recovered at low frequency (~75% of published populations and communities). Rhizobial populations and communities characterised by MLEE varied in their genetic diversity, with H values ranging from 0.06 to 0.78. In several studies, most of the genetic diversity within a site could be recovered from the nodules of a single plant. When hierarchical analyses were performed on populations within and between sites, the genetic diversity within sites was similar to the genetic diversity between sites. Similarly, the genetic diversity of strain collections originating from multiple hosts and locations was no more diverse than some individual populations and communities. Strain richness and genetic diversity measures were not always correlated for rhizobial populations. Populations with low strain richness were sometimes genetically diverse, and the relationship between the diversity measures varied for different legume species at the same location. We suggest that both strain richness and genetic diversity measures are required to fully describe rhizobial population and community diversity.

Record 43 of 143 - AGRICOLA 1998-2004/09
AU: Hartley,-E.; Gemell,-L.G.; Herridge,-D.F.
TI: Lime pelleting inoculated serradella (Ornithopus spp.) increases nodulation and yield.
SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1289-1294.
AB: Lime pelleting of the inoculated seed is recommended for most pasture legume species to improve survival of the rhizobia on the seed and to counter deleterious effects of soil or fertiliser acidity on rhizobial numbers. Except for New South Wales, lime pelleting is specifically not recommended for serradella (Ornithopus spp.). Our objectives were to evaluate effects of lime pelleting on bradyrhizobial numbers on seed, and nodulation and growth of the serradella plants. Three experiments are reported at two acid-soil sites in northern New South Wales involving four cultivars of yellow serradella (Ornithopus compressus) and Bradyrhizobium sp. (Lupinus) strains WSM471 (current inoculant strain) and WU425 and WSM480. Lime pelleting increased bradyrhizobial numbers on seed, 24 h after inoculation, by an average of 90%. Similarly, lime pelleting increased nodulation and shoot dry matter of the inoculated plants by an average of 57 and 28%, respectively. The three strains were similar in effects on plant growth. Relative values for shoot dry weight, averaged over sites, were 100 for WSM471 and 98 for both WU425 and WSM480. Our results confirmed previous research that lime pelleting inoculated serradella seed was not deleterious to survival of the bradyrhizobial inoculum, and showed that it could result in enhanced symbiotic activity of the inoculum in some instances. We recommend lime pelleting of serradella and that WSM471 remain the inoculant strain.

Record 44 of 143 - AGRICOLA 1998-2004/09
AU: Deaker,-R.; Roughley,-R.J.; Kennedy,-I.R.
TI: Legume seed inoculation technology--a review.
SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1275-1288.

AB: Inoculation of legume seed is an efficient and convenient way of introducing effective rhizobia to soil and subsequently the rhizosphere of legumes. However, its full potential is yet to be realised. Following widespread crop failures, the manufacture of high quality inoculants revolutionised legume technology in Australia in the 1960s. Many improvements to inoculants and the advent of an inoculant control service ensured that quality was optimised and maintained. Minimum standards for the number of rhizobia per seed were set after consideration of several factors including seed size and loss of viability during inoculation. Despite manufacturers' recommendations for storage and application of inoculants, there is a distinct lack of control over the inoculation process; hence the full potential of high quality products may not always be achieved. The efficacy of inoculation varies depending on several factors, all of which affect the number of viable rhizobia available for infection of legume roots. Increased numbers of viable rhizobia per seed by application of inoculant above the commercially recommended rate, results in a continued linear increase in nodulation and yield. Several studies have reported yield increases of up to 25%. However, applying higher quantities of inoculant is uneconomical and technically difficult. Alternatively, higher numbers of viable rhizobia per seed may be achieved by improving survival during seed inoculation. Despite recognition of the factors affecting survival of rhizobia on seed and a substantial demand for commercially pre-inoculated legume seed, poor survival is still a major concern. Desiccation, temperature and seed coat toxicity all influence survival of rhizobia on seed. Their adverse effects may be ameliorated by selecting tolerant rhizobial strains and legume seed cultivars with low toxicity or artificially, by the use of additives in the seed coating. The accumulation of the desiccant protectant trehalose in strains of rhizobia, may result in better survival under desiccation stress. Similarly, the accumulation of exopolysaccharide (EPS) may act as a barrier reducing excessive water loss. Polymeric adhesives such as gum arabic, methyl cellulose and polyvinyl pyrollidone (PVP) have improved survival. However, studies of additives used in inoculation have been ad hoc and little of their mode of action is understood. A better understanding of the mechanisms involved in the protection of rhizobia from adverse conditions will assist in defining the optimum conditions for seed inoculation and storage to ensure a higher quality product for farmers at the time of sowing.

Record 45 of 143 - AGRICOLA 1998-2004/09

AU: Howieson,-J.; Ballard,-R.

TI: Optimising the legume symbiosis in stressful and competitive environments within southern Australia--some contemporary thoughts.

SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1261-1273.

AB: In the managed agricultural ecosystems of southern Australia, if an edaphic environment is not stressful to root-nodule bacteria (hereafter rhizobia), it is likely to become a competitive environment for nodulation (although not always detrimentally so) soon after the introduction of an inoculated legume. We suggest that stressful environments limit rhizobial communities to less

than 100 cells g-1 soil at some time during the season. This overview puts forward the hypothesis that in perturbed ecosystems (i.e. those that are intensively managed) such as in the 25 million ha of the southern Australian grain and grazing belts, the rhizobial community is still substantially immature in an evolutionary sense. The rhizobial community is representative of only a few species, primarily those of Mediterranean origin that were accidentally introduced, or have been fostered by legume development programs, or remnants of the populations associated with native legumes. We consider there is little inter-specific competition for substrates because of this relative immaturity, but suggest that intra-specific competition for nodulation is commonplace wherever abiotic stress is absent. We nominate two primary abiotic stresses that are permanently present that have limited rhizobial colonization or legume nodulation for some species in southern Australia and four secondary (temporary) abiotic stresses. We believe that selection of adapted symbioses, or where warranted adapted elite rhizobial strains or legume host genotypes, can overcome these stress factors. We emphasise that where several abiotic stress factors are present they may act synergistically, but that this net effect is still likely to be symbiosis-specific. We acknowledge that genetic transformation in situ is providing new strain variability with which we must contend. We also put forward the suggestion that opportunities exist for the managed introduction of selected genotypes of agricultural legumes that effectively interact with rhizobial communities to achieve optimal N-fixation. In doing so, we give more precise definition to the widely used terms 'exclusive', ' selective' and 'promiscuous' nodulation.

Record 46 of 143 - AGRICOLA 1998-2004/09

AU: Ridley,-A.M.; Mele,-P.M.; Beverly,-C.R.

TI: Legume-based farming in southern Australia: developing sustainable systems to meet environmental challenges.

SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1213-1221.

AB: Development of legume-based farming systems has resulted in Australian agriculture being globally competitive. There is now political pressure for agriculture to become accountable for 'off-site' environmental consequences. Farming systems relying on annual species are unsustainable because of a mismatch between the supply and demand of water and N, resulting in N leakage to streams or groundwater. Rainfall in excess of plant requirements coupled with N build-up, permeable soils, limited opportunities for reduction and proximity to surface or groundwater present risks for leakage of NO3-N. We present examples of N leakage from legume systems in southern Australia, where rainfall exceeds 450 mm yr-1, and the evidence suggesting that leakage contributes to stream and groundwater pollution. N build-up in autumn through mineralisation of organic-N from legume-based systems often exceeds 100 kg N ha-1 and N leakage losses can be 15-35 kg N ha-1 yr-1. Stream and groundwater N pollution issues are emerging. Surface water quality problems are already apparent in Victoria although the contribution from legumes, N fertilisers and point sources remains unresolved. Examples of groundwater problems where legumes are a contributing factor have been recorded in New South Wales (NSW), South Australia (SA), Western Australia (WA)

and Victoria. In Victoria, areas at risk of N groundwater contamination are found along the Great Dividing Range and in southern Victoria. Groundwater pollution causes concern because once problems are found they take decades to reverse. Stores of N in the unsaturated zone combined with limited N monitoring in groundwater suggests that early detection is unlikely. Solutions for reducing off-site consequences are outlined and include management to prevent water and N leakage happening, capture of N before it reaches waterways or groundwater and low input systems including land retirement. For scientists interested in N fixation and biological mediation, future research areas include increasing the proportion of perennials in farming systems, better control of N supply and demand through improved technology and us of N fertiliser, use of nitrification inhibitors and studies of the potential for N immobilisation and reduction through denitrification, both within and below the root zone. Integrated management strategies that address environmental implications from point/micro-scale to paddock and catchment scales are needed as are considerations of other environmental consequences. Research priorities will change from maximising N fixation for profitability towards balancing profitability and environmental goals for more sustainable systems.

Record 47 of 143 - AGRICOLA 1998-2004/09

AU: Chen,-W.; McCaughey,-W.P.; Grant,-C.A.

TI: Pasture type and fertilization effects on N2 fixation, N budgets and external energy inputs in western Canada.

SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1205-1212.

AB: A grazing experiment was conducted in Brandon, Manitoba, Canada. The objectives were to examine the effects of including alfalfa and fertilizer management on N2 fixation by alfalfa and plant N dynamics, and to compare N budgets in the four contrasting pasture systems and external energy inputs between fertilizer-N-based and legume-based pasture systems. Estimates of annual amounts of N2 fixed, based on shoot herbage production in grazed mixed alfalfa/grass pastures, ranged from 40 to 118 kg N ha-1 y-1. The amounts would be in the range of 52Æ153 kg N ha-1 y-1, if the amounts of fixed N stored in the roots, were included. Compared to grass-only pastures, total amounts of N2 fixed in the mixed pastures should be sufficient to improve total external N inputs, replace N fertilizer and sustain plant protein for grazing. The reliance of alfalfa (Medicago sativa L.) on N2 fixation for growth was high (70-95%), and %N derived from the atmosphere by alfalfa (%Ndfa) was not affected by P fertilizer management. Thus, the amounts of N2 fixed were predominantly regulated by alfalfa dry matter productivity. The data also indicated that alfalfa fixed 27 kg N t-1 dry matter produced. In mixed alfalfa/grass pastures, high soil mineral N uptake by companion grasses, was essential to effectively utilize N that was fixed by alfalfa and returned to soils through the decomposition of alfalfa litter and roots. Compared to grass-only pastures with or without N fertilizer, alfalfa-based pastures could supply sufficient plant protein for grazing animals through N2 fixation, and at same time, sustain animal productivity with only 28% of the external energy input of the grass-only pasture with N fertilizer.

Record 48 of 143 - AGRICOLA 1998-2004/09

AU: Brockwell,-J.

TI: Abundant, cheap nitrogen for Australian farmers: a history of Australian nodulation and nitrogen fixation conferences.

SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1195-1204.

AB: The first in a series of what are now known as Australian Nitrogen Fixation Conferences took place in Sydney in 1955. It was convened to discuss the shortcomings of the infant Australian legume inoculant industry and widespread failures of legume nodulation in the field. There have been 12 such conferences since. This review traces their development from the beginnings, when the emphasis was very much on practical matters, to the present day. During that time, the content of conference presentations represented a microcosm of the development, over nearly half a century, of nitrogen fixation research in Australia, how it was divided between fundamental and applied work, and the marriage of the two. The review concludes with prognostication about the future of the conference series.

Record 49 of 143 - AGRICOLA 1998-2004/09

AU: Baldock,-J.A.; Ballard,-R.A.

TI: Fixed nitrogen in sustainable farming systems: a symposium examining factors influencing the extent of biological nitrogen fixation and its role in southern Australian agricultural systems. Setting the scene.

SO: Soil biology and biochemistry. 2004 Aug., v. 36, no. 8 p. 1191-1193.

Record 50 of 143 - AGRICOLA 1998-2004/09

AU: Lynch,-D.H.; Voroney,-R.P.; Warman,-P.R.

TI: Nitrogen availability from composts for humid region perennial grass and legume-grass forage production.

SO: Journal of environmental quality. 2004 July-Aug, v. 33, no. 4 p. 1509-1520.

AB: Perennial forages may be ideally suited for fertilization with slow N release amendments such as composts, but difficulties in predicting N supply from composts have limited their routine use in forage production. A field study was conducted to compare the yield and protein content of a binary legumeÆgrass forage mixture and a grass monocrop cut twice annually, when fertilized with diverse composts. In all three years from 1998-2000, timothy (Phleum pratense L.)-red clover (Trifolium pratense L.) and timothy swards were fertilized with ammonium nitrate (AN) at up to 150 and 300 kg N ha-1 yr-1, respectively. Organic amendments, applied at up to 600 kg N ha-1 yr-1 in the first two years only, included composts derived from crop residue (CSC), dairy manure (DMC), or sewage sludge (SSLC), plus liquid dairy manure (DM). Treatments DM at 150 kg N ha-1 yr-1 and CSC at 600 kg N ha-1 yr-1 produced cumulative timothy yields matching those obtained for inorganic fertilizer. Apparent nitrogen recovery (ANR) ranged from 0.65% (SSLC) to 15.1% (DMC) for composts, compared with 29.4% (DM) and 36.5% (AN). The legume component (approximately 30%) of the binary mixture acted as an effective "N buffer" maintaining forage yield and protein content consistently higher, and within a narrower range, across all treatments. Integrating

compost utilization into livestock systems that use legume-grass mixtures may reduce the risk of large excesses or deficits of N, moderate against potential losses in crop yield and quality, and by accommodating lower application rates of composts, reduce soil P and K accumulation.

Record 51 of 143 - AGRICOLA 1998-2004/09
AU: Levenfors,-J.P.; Fatehi,-J.
TI: Molecular characterization of Aphanomyces species associated with legumes.
SO: Mycological research. 2004 June, v. 108, pt. 6 p. 682-689.

Record 52 of 143 - AGRICOLA 1998-2004/09
AU: Peterson,-R.K.D.; Shannon,-C.L.; Lenssen,-A.W.
TI: Photosynthetic responses of legume species to leaf-mass consumption injury.
SO: Environmental entomology. 2004 Apr., v. 33, no. 2 p. 450-456.
AB: Several studies have addressed plant primary physiological responses (gas exchange responses) to insect herbivory. However, relatively few plant species have been examined. It is unknown whether responses to leaf-mass removal by insects vary among plant families and species. Within the legumes, only alfalfa, Medicago sativa L., and soybean, Glycine max (L.) Merrill, have been examined. The goal of this study was to test the hypothesis that gas exchange responses to leaf-mass consumption in a broad range of cultivated legumes do not differ from those of soybean and alfalfa. The species and cultivars used were M. sativa Cimarron, Medicago scutellata (L.) Sava, Medicago truncatula Gaertner Paraggio, Melilotus officinalis (L.) Pallas, Trifolium hybridum L., and Trifolium pratense L. Twelve greenhouse experiments were conducted and each legume species was used in a separate experiment. Depending on the experiment, there were either two or three treatments (control, simulated insect injury, and actual insect injury). For simulated and actual insect defoliation, injury was limited to a single leaf per plant. Simulated insect injury treatments were imposed by removing leaf tissue on each leaflet with scissors. For the actual insect defoliation treatment, fall armyworm larvae, Spodoptera frugiperda (J.E. Smith), were used. Defoliation of single leaves on the six species resulted in similar responses. Plant gas exchange variables (photosynthesis, stomatal conductance, intercellular CO2, and transpiration) were not significantly affected by either simulated or actual insect defoliation. Our results support the hypothesis that there is a generalized primary physiological response to leaf-mass consumption injury among the cultivated legumes. More generally, the results from this experiment support that there is a generalized plant gas exchange response to leaf-mass consumption injury.

Record 53 of 143 - AGRICOLA 1998-2004/09
AU: Marshall,-A.H.; Williams,-T.A.; Abberton,-M.T.; Michaelson-Yeates,-T.P.T.; Olyott,-P.; Powell,-H.G.
TI: Forage quality of white clover (Trifolium repens L.) x Caucasian clover (T. ambiguum M. Bieb.) hybrids and their grass companion when grown over three harvest years.
SO: Grass and forage science the journal of the British Grassland Society. 2004 Mar., v. 59, no. 1 p. 91-99.

AB: Interspecific hybrids between white clover (Trifolium repens L.) and Caucasian clover (Trifolium ambiguum M. Bieb.) have been developed to introgress the rhizomatous growth habit into white clover, to increase persistence and drought tolerance. The forage quality of T. repens, T. ambiguum and the backcross 1 (BC1) and backcross 2 (BC2) hybrids and companion grass, when grown in mixtures with an intermediate perennial ryegrass (Lolium perenne L.) under a cutting-only management, was measured. In vitro dry-matter digestibility (DMD), water-soluble carbohydrate (WSC) and crude protein (CP) concentrations of the legume and grass fractions were measured throughout the growing season over three harvest years. Trifolium repens had a lower WSC but a higher CP concentration than the perennial ryegrass companion in all harvest years and at all cuts. The legume fractions from the BC1 and BC2 hybrid plots had a higher WSC and a lower CP concentration but an in vitro DMD value comparable with white clover throughout the growing season and in each harvest year. The grass fractions from the mixtures with the backcross hybrids had a higher WSC and a lower CP concentration than the grass fraction from the T. repens plots, in all harvest years and throughout the growing season. No difference in in vitro DMD between parental species and backcross hybrids was observed. The implications of these results for the development of these hybrids and animal performance are discussed.

Record 54 of 143 - AGRICOLA 1998-2004/09

AU: Dodd,-M.B.; Barker,-D.J.; Wedderburn,-M.E.

TI: Plant diversity effects on herbage production and compositional changes in New Zealand hill country pastures.

SO: Grass and forage science the journal of the British Grassland Society. 2004 Mar., v. 59, no. 1 p. 29-40.

AB: A small-plot field experiment on grazed hill country pastures in the North Island of New Zealand was conducted to examine the productivity and compositional characteristics of swards in response to variation in pasture species diversity. The balanced incomplete factorial design incorporated variation in location, slope, soil fertility and combinations of eight plant functional groups (C4 grasses, annual grasses, annual legumes, perennial C3 grasses, perennial legumes, perennial forbs, ryegrass and browntop). Net herbage accumulation and botanical composition were measured at 18 months (spring) and 24 months (autumn) after oversowing following application of a systemic herbicide. Analysis of variance indicated a significant positive relationship between the number of functional groups sown and herbage accumulation of the sown species in spring, but not with total herbage accumulation. Regression analysis showed that herbage accumulation was also affected by the identity of the functional groups. However, the statistical models indicated that pasture productivity was most strongly influenced by site factors. There was a significant negative relationship between both the number and herbage accumulation of unsown species and the number of functional groups sown, indicating a positive relationship between diversity and resistance to invasion by unsown species. A comparison of the vegetation between the plots before and after oversowing showed that those more diverse prior to sowing returned to their initial composition more rapidly, evidence that diverse vegetation was more resilient in the face

of disturbance.

Record 55 of 143 - AGRICOLA 1998-2004/09

AU: Amato,-G.; Stringi,-L.; Giambalvo,-D.

TI: Productivity and canopy modification of Medicago arborea as affected by defoliation management and genotype in a Mediterranean environment.

SO: Grass and forage science the journal of the British Grassland Society. 2004 Mar., v. 59, no. 1 p. 20-28.

AB: Medicago arborea is one of the most potentially valuable fodder shrubs in a Mediterranean environment because of its high preference by small ruminants and its nutritive value. Edible biomass production is affected by agronomic and environmental factors. A study, carried out in an inland area of Sicily in the growing seasons of 1994/95, 1995/96 and 1996/97, evaluated the forage production and canopy modification in a M. arborea plantation after (i) commencing defoliation 1 or 2 years after transplanting and (ii) defoliating only in autumn (A), only in early summer (S) or in both seasons (A and S). Six clones derived from five different Mediterranean populations were used. Plant age at the first defoliation did not significantly influence forage production. The genotypes differed in growth rate and forage production. The season and frequency of defoliation markedly influenced forage production and canopy size. The highest annual production was obtained by defoliating once a year in early summer (on average, 1.65, 2.85 and 4.50 tonnes ha-1 respectively in the three growing seasons). With the A and S, and A defoliation treatments, production decreased over 3 years by, on average, 0.19 and 0.57 respectively, but the differences became more marked over a 3-year period. Defoliating only in early summer, however, resulted in an excessive shrub height (> 120 cm, 3 years after transplanting), thereby increasing problems of accessibility to small grazing ruminants, and possibly necessitating cutting. On the contrary, the A and S defoliation made it possible to limit the height to <90 cm.

Record 56 of 143 - AGRICOLA 1998-2004/09

AU: Jiratanan,-T.; Liu,-R.H.

TI: Antioxidant activity of processed table beets (Beta vulgaris var, conditiva) and green beans (Phaseolus vulgaris L.).

SO: Journal of agricultural and food chemistry. 2004 May 5, v. 52, no. 9 p. 2659-2670.

AB: It has been shown that thermal processing of tomatoes and sweet corn results in increased antioxidant activities despite the loss of vitamin C. Until now, it is unclear whether this positive effect of thermal processing occurs with all crop produce. Therefore, analysis of a root vegetable (beets) and of a legume (green beans) was undertaken to address this question. Antioxidant activity of beets processed under typical commercial processing conditions remained constant despite an 8% loss of vitamin C, a 60% loss of color, and 30% loss of dietary folate. There was a slight but significant 5% increase in phenolic content of processed beets. In contrast, vitamin C and dietary folate content of green beans remained constant, whereas a 32% reduction in phenolic compounds occurred after typical commercial processing conditions. The antioxidant activity of green beans was reduced by 20%. These findings along with previous works

suggest that the effects of thermal processing vary with the respective produce crop type. It also reinforces the concept that optimal health benefits may be achieved when a wide variety of plant foods (fruits, vegetables and whole grains) and preparation methods are incorporated into the diet.

Record 57 of 143 - AGRICOLA 1998-2004/09
AU: Bernardo,-A.E.N.; Garcia,-R.N.; Adachi,-M.; Angeles,-J.G.C.; Kaga,-A.; Ishimoto,-M.; Utsumi,-S.; Tecson-Mendoza,-E.M.
TI: 8S globulin of mungbean [Vigna radiata (L.) Wilczek]: cloning and characterization of its cDNA isoforms, expression in Escherichia coli, purification, and crystallization of the major recombinant 8S isoform.
SO: Journal of agricultural and food chemistry. 2004 May 5, v. 52, no. 9 p. 2552-2560.
AB: Three isoforms of the cDNA of the major 8S globulin of mungbean, 8Salpha, 8Salpha', and 8Sbeta, were isolated, cloned, and characterized. The cDNA sequences of 8Salpha, 8Salpha', and 8Sbeta had open reading frames of 1362, 1359 or 1362, and 1359 bp, respectively, which code for 454, 453 or 454, and 453 amino acids corresponding to molecular weights of 51 973, 51 627 or 51 758, and 51 779, respectively. Homology in terms of cDNA and amino acid sequences was 91-92% between 8Salpha and 8Salpha', 87% between 8Salpha and 8Sbeta, and 86-88% between 8Salpha' and 8Sbeta. The signal peptide was found to be 1-25, 1-24 or 25, and 1-23 for 8Salpha, 8Salpha', and 8Sbeta, respectively, using the signalP website (Nielsen, H.; Engelbrecht, J.; Brunak, S.; von Heijne, G. Protein Eng. 1997, 10, 1-6). The propeptide was determined to be IVHREN. A single site for glycosylation (N-X-S/T) was observed about 90 amino acids from the C terminus. Homology between mungbean 8S isoforms and other 7-8S proteins ranged from 45 to 68% within members of the legume family and 29 to 34% for crops of different species. The major isoform 8Salpha was expressed in Escherichia coli and purified by successive ammonium sulfate fractionation, hydrophobic interaction, and Mono Q column chromatography. The recombinant 8Salpha, but not the native form, was successfully crystallized producing rhombohedral crystals.

Record 58 of 143 - AGRICOLA 1998-2004/09
AU: Schroeyers,-K.; Chaparro,-C.; Goormachtig,-S.; Holsters,-M.
TI: Nodulation-enhanced sequences from the water stress-tolerant tropical legume Sesbania rostrata.
SO: Plant science. 2004 Aug., v. 167, issue 2 p. 207-216.

Record 59 of 143 - AGRICOLA 1998-2004/09
AU: Popelka,-J.C.; Terryn,-N.; Higgins,-T.J.V.
TI: Gene technology for grain legumes: can it contribute to the food challenge in developing countries.
SO: Plant science. 2004 Aug., v. 167, issue 2 p. 195-206.

Record 60 of 143 - AGRICOLA 1998-2004/09
AU: Ko,-Y.T.; Lin,-Y.L.
TI: 1,3-beta-glucan quantification by a fluorescence microassay and analysis of its distribution in foods.
SO: Journal of agricultural and food chemistry. 2004 June 2, v. 52, no. 11 p. 3313-3318.
AB: The objective of this study was to establish analytical

approaches to quantify 1,3-beta-glucan (1,3-beta-G) in foods. Six food categories including legumes, cereals, tubers, vegetables, fruits, and mushrooms and 17 total items were tested. An extraction procedure was designed to prepare food cold-water soluble, hot-water soluble, cold-alkaline soluble, and hot-alkaline soluble fractions. A fluorescence microassay based on aniline blue dye, which bound specifically to 1,3-beta-G, was developed to measure its content in the food fractions. Curdlan was used as standard to construct the 1,3-beta-G calibration curve, and a linear correlation within a 14 microgram/mL concentration range was obtained. This microassay displayed selectivities among various 1,3-beta-G species. Biologically active ones such as pachyman and yeast glucan possessed much stronger fluorescent signals than others such as laminarin and barley glucan. Possible fluorescent interference from food proteins was estimated. This assay tolerated up to 50% of bovine serum albumin in 10 microgram/mL curdlan. Analysis of the four food fractions showed that besides the well-known lentinan-containing shiitake, popular foods such as celery, chin-chian leaves, carrot, and radish contained nearly 20% 1,3-beta-G in their total sugar. Soybean dry weight contained 0.8% 1,3-beta-G, which was twice the amount compared to shiitake. Snow mushroom dry weight had the highest 1,3-beta-G content, at 2.5%, and was rich in both water (0.67%) and alkaline soluble (1. 87%) forms. In conclusion, this dye-binding fluorescence microassay in conjunction with the extraction procedure can be applied in the prescreening of potential foods rich in functional 1,3-beta-G.

Record 61 of 143 - AGRICOLA 1998-2004/09

AU: Lopez,-J.; Tejada,-I.; Vasquez,-C.; Dios-Garza,-J.-de; Shimada,-A.

TI: Condensed tannins in humid tropical fodder crops and their in vitro biological activity. 1.

SO: Journal of the science of food and agriculture. 2004 Mar., v. 84, issue 4 p. 291-294.

AB: A descriptive study was conducted in order to determine the tannin profiles of tropical fodder crops. The following types of condensed tannins (CT) were determined (expressed as g kg-1 of dry matter): free (FCT), bound to protein (CTP), bound to fibre (CTF) and total (TCT). High FCT levels were found in Desmodium ovalifolium (228.4), Flemigia macrophylla (181.9), Guazuma ulmyfolia (129.7) and Leucaena leucocephala (129.5). The highest concentrations of CTP were detected in Gliricidia sepium (61.0), F macrophylla (23.3), and G ulmyfolia (21.1). CTF levels were the highest in G ulmyfolia (55.1), F macrophylla (46.7) and G sepium (41.5). Analyzed samples cultivated in vertisol and fluvisol soils showed different contents of tannins. It has been reported that plants with more than 60 g kg-1 FCT are less palatable and digestible than forages with lower concentrations of this chemical class, although there is more protein to bypass the rumen and higher nitrogen retention. Graminaceous plants showed higher concentrations of FCT and TCT concentrations were generally lower than legumes and other forage crops.

Record 62 of 143 - AGRICOLA 1998-2004/09

AU: Reyes-Moreno,-C.; Cuevas-Rodriguez,-E.O.; Milan-Carrillo,-J.; Cardenas-Valenzuela,-O.G.; Barron-Hoyos,-J.

TI: Solid state fermentation process for producing chickpea (Cicer arietinum L) tempeh flour. Physicochemical and nutritional characteristics of the product.
SO: Journal of the science of food and agriculture. 2004 Feb., v. 84, issue 3 p. 271-278.
AB: Solid state fermentation (SSF) represents a technological alternative for processing a great variety of legumes and/or cereals to improve their nutritional quality and to obtain edible products with palatable sensorial characteristics. The objectives of this work were (1) to determine the best combination of SSF process variables (fermentation temperature FT/fermentation time Ft) for producing chickpea tempeh flour and (2) to characterise the physicochemical and nutritional properties of the product. Response surface methodology was applied as optimisation technique over three response variables: in vitro protein digestibility (PD), true protein (TP) and water absorption index (WAI). A central composite experimental design with two factors and five levels was used. The process variables FT and Ft had variation levels of 31-36ÀC and 48-72 h respectively. Rhizopus oligosporus (1 x109spores l-1 in distilled water) was used as starter. Prediction models for response variables were developed as a function of process variables. A conventional graphical method was applied to obtain maximum PD, TP and WAI. Contour plots of each of the response variables were superimposed to obtain a contour plot for observation and selection of the best combination of FT (34.9ÀC) and Ft (51.3 h) for producing of chickpea tempeh, which was dried (52ÀC, 24 h) and milled to pass through an 80-US mesh (0.180 mm) screen to obtain optimised chickpea tempeh flour. This flour had higher (p < or = 0.05) TP (25.7 vs 19.7% dry matter (DM)), total colour difference (30.3 vs 16.7), WAI (4.18 vs 2.15 kg gel kg-1 DM), available lysine (42.7 vs 30.4 g kg-1 protein) and PD (83.2 vs 72.2%) and lower lipid content (2.6 vs 6.1% DM), phytic acid (1.1 vs 10.85 g kg-1 DM), tannins (2.65 vs 21.95 g catechin kg-1 DM) and pH (5.9 vs 6.3) than raw chickpea flour.

Record 63 of 143 - AGRICOLA 1998-2004/09
AU: Ryan,-M.H.; Derrick,-J.W.; Dann,-P.R.
TI: Grain mineral concentrations and yield of wheat grown under organic and conventional management.
SO: Journal of the science of food and agriculture. 2004 Feb., v. 84, issue 3 p. 207-216.
AB: On the low-P soils in southeastern Australia, organic crops differ from conventional ones primarily in the use of relatively insoluble, as opposed to soluble, P fertilisers and in the non-use of herbicides. As organic management, particularly elimination of soluble fertilisers, is often claimed to enhance grain mineral concentrations, we examined grain from wheat on paired organic and conventional farms in two sets of experiments: (1) four pairs of commercial crops (1991-1993); and (2) fertiliser experiments on one farm pair where nil fertiliser was compared with 40 kg ha-1 of P as either relatively insoluble reactive phosphate rock or more soluble superphosphate (1991 and 1992). All wheat was grown following a 2-6 year legume-based pasture phase. Both conventional management and the superphosphate treatment greatly increased yields but reduced colonisation by mycorrhizal fungi. While only minor variations

occurred in grain N, K, Mg, Ca, S and Fe concentrations, conventional grain had lower Zn and Cu but higher Mn and P than organic grain. These differences were ascribed to: soluble P fertilisers increasing P uptake but reducing mycorrhizal colonisation and thereby reducing Zn uptake and enhancing Mn uptake; dilution of Cu in heavier crops; and past lime applications on the organic farm decreasing Mn availability. These variations in grain minerals had nutritional implications primarily favouring the organic grain; however, organic management and, specifically, elimination of soluble fertilisers did not induce dramatic increases in grain mineral concentrations. In addition, organic management was coupled with yield reductions of 17-84 per cent due to P limitation and weeds. The impact of large regional variations in the characteristics of organic and conventional systems on the general applicability of the results from this study and other similar studies is discussed.

Record 64 of 143 - AGRICOLA 1998-2004/09

AU: Stephan,-O.; Vieths,-S.

TI: Development of a real-time PCR and a sandwich ELISA for detection of potentially allergenic trace amounts of peanut (Arachis hypogaea) in processed foods.

SO: Journal of agricultural and food chemistry. 2004 June 16, v. 52, no. 12 p. 3754-3760.

AB: Hidden allergens in food products are, especially for peanut-allergic consumers, a serious problem because even low amounts (~200 microgram) of peanut can elicit allergic reactions. Undeclared peanut traces can be found in processed food products, because contaminations with peanut during production processes are frequent. To minimize the risk of such cross-contaminations, it is necessary to develop sensitive analytical methods for the detection of hidden allergens in foods. For this approach we developed two peanut-specific assays based on the detection of peanut protein by specific antibodies (sandwich ELISA) and by the detection of peanut-specific DNA (part of the coding region of Ara h 2) by a real-time PCR. Both tests did not show any cross-reactivity with 22 common food ingredients (cereals, nuts, legumes), and the limit of detection is <10 ppm peanut in processed foods. Thirty-three random samples of food products were tested for the presence of peanut to compare both assay types with each other and to evaluate the percentage of foods on the German market that are contaminated with peanut traces. We found that four products (13.3%) without peanut in the list of ingredients contained peanut protein in a range from 1 to 74 ppm peanut protein and that the results of both tests correlated well. The real-time PCR was able to detect one more positive sample than the sandwich ELISA. In conclusion, both assays are sensitive and specific tools for the detection of hidden allergens in processed foods.

Record 65 of 143 - AGRICOLA 1998-2004/09

AU: Adesogan,-A.T.; Salawu,-M.B.

TI: Effect of applying formic acid, heterolactic bacteria or homolactic and heterolactic bacteria on the fermentation of bi-crops of peas and wheat.

SO: Journal of the science of food and agriculture. 2004 July, v. 84,

issue 9 p. 983-992.
AB: This work aimed to compare the effectiveness of bacterial inoculants or a chemical additive for preserving whole-crop silages made from wheat, two pea varieties (cv Magnus or Setchey) or intercrops of wheat and both pea varieties. The forages were harvested when the wheat and peas were at the late milk and yellow wrinkled stages respectively, and conserved in five replicate mini silos without treatment (control) or after treatment with 2.5 g kg-1 of formic acid (FA) or 1 x 10(6) cfu g-1 fresh forage of either of two bacterial inoculants (WholeCrop Gold (WCG) or WholeCrop Legume (WCL), Biotal Ltd, Cardiff, UK). WCG contained Lactobacillus buchneri, while WCL contained L buchneri, L plantarum and Pediococcus pentosaceus. Chemical composition, fermentation characteristics and in vitro digestibility were measured after 65 days of ensiling. Additive-treated bi-crops had lower ($P < 0.05$) concentrations of soluble N, ammonia N and lactic acid than the controls. Inoculant-treated bi-crops had higher ($P < 0.001$) acetic acid and lower ($P < 0.001$) residual water-soluble carbohydrate (WSC) concentrations than FA-treated bi-crops. WCL-treated bi-crops had similar residual WSC concentrations to and higher ($P < 0.05$) starch concentrations than WCG-treated bi-crops. Unlike Magnus pea bi-crops, Setchey pea bi-crops treated with WCL had lower concentrations of ammonia N ($P < 0.01$) and acetic acid ($P < 0.001$) and higher concentrations of starch ($P < 0.001$) and lactic acid ($P < 0.05$) than those treated with WCG. For both bi-crops, FA-treated bi-crops were more stable ($P < 0.05$) than inoculant-treated or untreated silages, and the stability of inoculant-treated and untreated silages was similar. Formic acid treatment was also the most effective at reducing WSC losses in the bi-crop and pea silages. Inoculant treatment reduced proteolysis in these forages but did not prevent spoilage in the bi-crops. Additive treatment reduced yeast counts but did not improve the fermentation in wheat silages.

Record 66 of 143 - AGRICOLA 1998-2004/09
AU: Kashaija,-I.N.; McIntyre,-B.D.; Ssali,-H.; Kizito,-F.
TI: Spatial distribution of roots, nematode populations and root necrosis in highland banana in Uganda.
SO: Nematology international journal of fundamental and applied nematological research. 2004, v. 6, pt. 1 p. 7-12.

Record 67 of 143 - AGRICOLA 1998-2004/09
AU: Hill,-C.B.; Li,-Y.; Hartman,-G.L.
TI: Resistance of Glycine species and various cultivated legumes to the soybean aphid (Homoptera: Aphididae).
SO: Journal of economic entomology. 2004 June, v. 97, no. 3 p. 1071-1077.
AB: The soybean aphid, Aphis glycines Matsumura, is a new pest of soybean, Glycine max (L.) Merr., in North America. It has become widespread on soybean in North America since it was first identified in the Midwest in 2000. Species of Rhamnus L. (buckthorn) are the primary hosts of A. glycines, and soybean is known as a secondary host. There is limited information about the secondary host range of A. glycines. Aphid colonization on various legume hosts was compared in choice experiments. Aphid colonization occurred on species in the genus Glycine Wild. No

colonization occurred on Lablab purpureus (L.) Sweet, Lens culinaris Medik, Phaseolus vulgaris L., Pisum sativum L., or species of Vicia L. and Vigna Savi. Colonization was limited or aphids were transient on species of Medicago L., Phaseolus L., and Trifolium L. There were significant differences in aphid colonization among Medicago truncatula accessions with numbers ranging from 7 to 97 aphids per plant. Six Glycine soja Sieb. & Zucc. accessions were as resistant as G. max accessions to A. glycines; these may represent novel sources of A. glycines resistance not found in G. max. Antibiosis was found to play a large role in the expression of resistance in three of the G. soja accessions. Results of this study indicated that G. max and G. soja were the best secondary hosts of A. glycines; however, its secondary host range may include other leguminous species. Therefore, A. glycines did not seem to have a highly restricted monophagous secondary host range.

Record 68 of 143 - AGRICOLA 1998-2004/09

AU: Glevarec,-G.; Bouton,-S.; Jaspard,-E.; Riou,-M.T.; Cliquet,-J.B.; Suzuki,-A.; Limami,-A.M.

TI: Respective roles of the glutamine synthetase/glutamate synthase cycle and glutamate dehydrogenase in ammonium and amino acid metabolism during germination and post-germinative growth in the model legume Medicago truncatula.

SO: Planta. 2004 June, v. 219, no. 2 p. 286-297.

AB: Our objective was to determine the respective roles of the couple glutamine synthetase/glutamate synthase (GS/GOGAT) and glutamate dehydrogenase (GDH) in ammonium and amino acid metabolism during germination and post-germinative growth in the model legume Medicago truncatula Gaertn. For this aim, amino acids were analyzed by HPLC and changes in gene expression of several enzymes involved in N and C metabolism were studied by real-time quantitative reverse transcription-polymerase chain reaction. Among the enzymes studied, GDH showed the highest increase in gene expression (80-fold), specifically in the embryo axis and concomitant with the increase in ammonium content during post-germinative growth. In cotyledons, GDH gene expression was very low. Although in vitro GDH aminating activity was several times higher than its deaminating activity, in vivo 15NH4 incorporation into amino acids was completely inhibited by methionine sulfoximine, a GS inhibitor, indicating that GDH is not involved in ammonium assimilation/detoxification. Changes in the expressions of GS and GOGAT isoforms revealed that GS1b (EC 6.3.1.2) in concert with NADH-dependent GOGAT (EC 1.4.1.14) constitute the major route of assimilation of ammonium derived from reserve mobilization and glutamic acid/glutamine synthesis in germinating M. truncatula seeds. However, during post-germinative growth, although germination was held in darkness, expression of GS2 and Fd-GOGAT (EC 1.4.7.1) increased and expression of GS1b decreased in cotyledons but not in the embryo axis. 2-Oxoglutarate, the substrate of the transamination reaction, was provided by the cytosolic isoform of isocitrate dehydrogenase (EC 1.1.1.42). We suggest that GDH during post-germinative growth, specifically in the developing embryo axis, contributes to ammonium delivery to GS for glutamine synthesis in the absence of primary NO3(-) assimilation. Interestingly, this reaction also produces reducing power (NADH)

in organs deprived of photosynthesis.

Record 69 of 143 - AGRICOLA 1998-2004/09
AU: Iannucci,-A.
TI: Effect of generation of inbreeding, cutting treatment and year on agronomic traits iin berseem populations.
SO: Euphytica international journal of plant breeding. 2004, v. 136, no. 2 p. 103-113.

Record 70 of 143 - AGRICOLA 1998-2004/09
AU: Hipkin,-C.R.; Simpson,-D.J.; Wainwright,-S.J.; Salem,-M.A.
TI: Nitrification by plants that also fix nitrogen.
SO: Nature. 2004 July 1, v. 430, no. 6995 p. 98-101.
AB: Nitrification is a key stage in the nitrogen cycle; it enables the transformation of nitrogen into an oxidized, inorganic state. The availability of nitrates produced by this process often limits primary productivity and is an important determinant in plant community ecology and biodiversity. Chemoautotrophic prokaryotes are recognized as the main facilitators of this process, although heterotrophic nitrification by fungi may be significant under certain conditions. However, there has been neither biochemical nor ecological evidence to support nitrification by photoautotrophic plants. Here we show how certain legumes that accumulate the toxin, 3-nitropropionic acid, generate oxidized inorganic nitrogen in their shoots, which is returned to the soil in their litter. In nitrogen-fixing populations this 'new' nitrate and nitrite can be derived from the assimilation of nitrogen gas. Normally, the transformation of elemental nitrogen from the atmosphere into a fixed oxidized form (as nitrate) is represented in the nitrogen cycle as a multiphasic process involving several different organisms. We show how this can occur in a single photoautotrophic organism, representing a previously undescribed feature of this biogeochemical cycle.

Record 71 of 143 - AGRICOLA 1998-2004/09
AU: Kamchan,-A.; Puwastien,-P.; Sirichakwal,-P.P.; Kongkachuichai,-R.
TI: In vitro calcium bioavailability of vegetables, legumes and seeds.
SO: Journal of food composition and analysis an official publication of the United Nations University, International Network of Food Data Systems. 2004 June-Aug, v. 17, no. 3-4 p. 311-320.
AB: Plant foods high in calcium were collected from representative markets in Bangkok. The purpose of this research was to study the bioavailability of calcium in plant sources and the presence of some in situ calcium inhibitory factors. Single composite samples from each market were prepared as commonly consumed and analyzed for in vitro calcium bioavailability (by equilibrium dialysis after simulated gastric digestion method) and for dietary fiber, phytate and oxalate. Compared to milk powder, which contains 25 mg calcium/100 g, five out of 11 vegetables had higher calcium dialysability (25%). High levels of dialysable calcium (20-39%) were found in kale, celery, collard, pak-chee-lao (Anethum graveolens L.), Chinese cabbage and soybean sprouts. These vegetables contained low levels of dietary fiber, phytate and oxalate. Medium levels of dialysable calcium (11-18%) were found in Indian mulberry and sesbania leaves, both of which had medium

levels of oxalate (290-580 mg/100 g). Medium levels of dialyzable calcium were also found in young and mature cooked soybean seeds, both of which had low levels of oxalate and medium levels of phytate (290-400 mg/100 g). Pak-paw (Polygonum odoratum Lour.), amaranth, wild betal and white and black sesame seeds contained low dialysable calcium (2-7%) with high level of oxalate (680-2620 mg/100 g). Sesame seeds also contained high levels of dietary fiber and phytate. The presence of inhibitory factors, especially oxalate, at high or medium levels could limit the calcium bioavailability of plant foods.

Record 72 of 143 - AGRICOLA 1998-2004/09

AU: Ezeagu,-I.E.; Gopal-Krishna,-A.G.; Khatoon,-S.; Gowda,-L.R.

TI: Physico-chemical characterization of seed oil and nutrient assessment of Adenanthera pavonina, L: an underutilized tropical legume.

SO: Ecology of food and nutrition. 2004 July-Aug, v. 43, no. 4 p. 295-305.

AB: Analysis showed the seeds of Adenanthera pavonina contained appreciable amounts of proteins (29.44 g/100 g), crude fat (17. 99g/100 g), and minerals, comparable to commonly consumed staples. Total sugar was low (8.2 g/100 g) while starch (41.95 g/ 100 g) constitutes the major carbohydrates. Low levels of antinutrients were reported and methionine and cystine were the most deficient amino acids. Linoleic and oleic acids make up 70.7 percent of the total fatty acids. Free fatty acid levels were relatively high but peroxide and saponification values of 29.6 mEqkg-1 and 164.1mgKOHg-1 respectively point to a resemblance to oils processed for food. It was concluded that A. pavonina seeds represent a potential source of oil and protein that could alleviate shortages.

Record 73 of 143 - AGRICOLA 1998-2004/09

AU: Chand,-S.; Singh,-A.K.

TI: Plant regeneration from encapsulated nodal segments of Dalbergia sissoo Roxb., a timber-yielding leguminous tree species.

SO: Journal of plant physiology. 2004 Feb., v. 161, no. 2 p. 237-243.

AB: One of the alternative methods adopted in recent years is to use biotechnological approaches for improving the tree species. The synthetic seeds offer several advantages, e.g., easy handling, storability, reduced size of propagules, and transportability. Germplasm can be effectively stored in the form of synthetic seeds. A protocol has been developed for plant regeneration from encapsulated nodal segments of Dalbergia sissoo Roxb. Nodal segments collected from basal sprouts of mature trees were encapsulated in calcium alginate beads. Inability of nodal segments entrapped in calcium alginate beads to form root was a major problem. To avoid this problem, an appropriate root induction treatment was given to nodal segments for 10 days, prior to encapsulation to allow formation of root primordia. For synthetic seeds production and subsequent conversion into plantlet, nodal segments with root primordia were encapsulated using sodium alginate and calcium chloride as gelling matrix. The best gel complexation was achieved using 3 % sodium alginate and 75 mmol/L CaCl2 ¨ 2H2O. Maximum percentage response (85 %) for conversion of encapsulated nodal segments into plantlets was achieved on 1/2-MS medium without plant growth regulators, after

25 days of culture. The frequency of conversion of encapsulated nodal segments into plantlets affected by the concentration of sodium alginate, and the presence or absence of 1/2-MS nutrients in calcium alginate beads. Plantlets with well developed roots and shoots were transferred to pots containing autoclaved mixture of peat moss and soil (1 : 1). Plants were also established in pots. The conversion of encapsulated nodal segments into plantlets also occurred when calcium alginate beads having entrapped nodal segments were directly sown in autoclaved peat moss moistened with 1/2-MS0 medium. Out of 60 encapsulated nodal segments, in each experiments, stored at 4 ÀC for 30 days, 44 plants developed under in vitro conditions, and 27 on peat moss moistened with 1/2-MS0.

Record 74 of 143 - AGRICOLA 1998-2004/09

AU: Lahiri,-K.; Chattopadhyay,-S.; Ghosh,-B.

TI: Correlation of endogenous free polyamine levels with root nodule senescence in different genotypes in Vigna mungo L.

SO: Journal of plant physiology. 2004 May, v. 161, no. 5 p. 563-571.

AB: Endogenous free polyamines, nitrogenase (EC 1.1.8.6.1, acetylene reduction), and leghaemoglobin (pyridine-hemochrome assay) levels were compared among five genotypes of developing Vigna root nodules grown under field conditions. Nitrogenase activity and leghaemoglobin level attained a peak at the flowering stage and gradually declined thereafter. Individual and total polyamine also followed the same pattern. Ranking on the basis of legume yield and other morphometric attributes was PDU-2 > UH-28 > UH-82 > T-9 > Sardhomash. Except spermine, the levels of putrescine, spermidine, and total polyamine showed significant differences ($p < 0.05$) amongst the genotypes, particularly from flowering to mid-pod development stage. Genotype, development stage, and their interaction between the two had significant ($p < 0.01$) effects on individual as well as total polyamines. Moreover, significant high linear correlations were found between total free polyamine and putrescine with conventional nodule senescence marker like nitrogenase ($R2 = 0.94$ and $R2 = 0.92$, respectively). Putrescine had an overall positive correlation with high legume yield. The results strongly suggest a relationship between polyamine and nodule senescence. Endogenous free polyamine and putrescine may be considered as genotypic markers for nodule senescence in field grown V. mungo. It is suggested that the flowering stage is more suitable for selection.

Record 75 of 143 - AGRICOLA 1998-2004/09

AU: Hou,-S.W.; Jia,-J.F.

TI: Plant regeneration from protoplasts isolated from embryogenic calli of the forage legume Astragalus melilotoides Pall.

SO: Plant cell reports. 2004 May, v. 22, no. 10 p. 741-746.

AB: An efficient and reproducible protocol is described for the regeneration of Astragalus melilotoides protoplasts isolated from hypocotyl-derived embryogenic calli. Maximum protoplast yield (11.74«0.6x10(5)/g FW) and viability (87.07«2.8%) were achieved using a mixture of 2% (w/v) Cellulase Onozuka R10, 0.5% (w/v) Cellulase Onozuka RS, 0.5% (w/v) Macerozyme R10, 0.5% (w/v) Hemicellulase, and 1% (w/v) Pectinase, all dissolved in a cell protoplast wash (CPW) salt solution with 13% (w/v) sorbitol. First divisions occurred 3-7 days following culture initiation. The highest

division frequency (9.86«0.68%) and plating efficiency (1.68«0.05%) were obtained in solid-liquid medium (KM8P) supplemented with 1.0 mg/l 2,4-dichlorophenoxyacetic acid, 0.5 mg/l 6-benzylaminopurine (BA), 0.2 mg/l kinetin, 0.2 M glucose, 0.3 M mannitol and 500 mg/l casein hydrolysate. Upon transfer to MS medium with 0.5 mg/l alpha-naphthaleneacetic acid and 1-2 mg/l BA, the protoplast-derived calli produced plantlets via somatic embryogenesis (56.3«4.1%) and organogenesis (21.6«0.6%). Somatic embryos or adventitious shoots developed into well-rooted plantlets on MS medium without any plant growth regulators or supplemented with 3.0 mg/l indole-3-butyric acid, respectively. About 81% of the regenerants survived in soil, and all were normal with respect to morphology and growth characters.

Record 76 of 143 - AGRICOLA 1998-2004/09
AU: Rasanen,-L.A.; Saijets,-S.; Jokinen,-K.; Lindstrom,-K.
TI: Evaluation of the roles of two compatible solutes, glycine betaine and trehalose, for the Acacia senegal-Sinorhizobium symbiosis exposed to drought stress.
SO: Plant and soil. 2004 Mar., v. 260, no. 1-2 p. 237-251.

Record 77 of 143 - AGRICOLA 1998-2004/09
AU: Lesturgez,-G.; Poss,-R.; Hartmann,-C.; Bourdon,-E.; Noble,-A.; Ratana-Anupap,-S.
TI: Roots of Stylosanthes hamata create macropores in the compact layer of a sandy soil.
SO: Plant and soil. 2004 Mar., v. 260, no. 1-2 p. 101-109.

Record 78 of 143 - AGRICOLA 1998-2004/09
AU: San-Emeterio,-L.; Arroyo,-A.; Canals,-R.M.
TI: Allelopathic potential of Lolium rigidum Gaud. on the early growth of three associated pasture species.
SO: Grass and forage science the journal of the British Grassland Society. 2004 June, v. 59, no. 2 p. 107-112.
AB: In Mediterranean areas, the establishment of multi-species pastures for extensive livestock use is an alternative to the growing of traditional cereal crops. Lolium rigidum Gaud. is one of the most valuable forage grasses adapted to semiarid environments but its performance in mixtures is not fully understood. Field observations suggest that the species exerts allelopathic effects, although there is no evidence in the literature to support this assumption. The objective of the study was to determine whether L. rigidum affects the germination and seedling growth of common forage species by allelopathic means. Two bioassays were conducted to test for the allelopathic potential of seeds and adult (shoot and root) tissues of L. rigidum on two grasses, Lolium multiflorum Lam. and Dactylis glomerata L., and a legume, Medicago sativa L. The three species showed different degrees of sensitivity to L. rigidum with L. multiflorum being particularly sensitive to allelopathy. Positive and negative effects of L. rigidum on seedling development were noted. Shoot extracts of L. rigidum displayed the most consistent negative effects by inhibiting elongation of the radicle of the three target species. The significance of the results is that in drought-prone environments and where water resources are scarce poor root development decreases the ability of the plants to grow and survive.

Record 79 of 143 - AGRICOLA 1998-2004/09

AU: Santos,-H.P.-dos; Purgatto,-E.; Mercier,-H.; Buckeridge,-M.S.

TI: The control of storage xyloglucan mobilization in cotyledons of Hymenaea courbaril.

SO: Plant physiology. 2004 May, v. 135, no. 1 p. 287-299.

AB: Hymenaea courbaril is a leguminous tree species from the neotropical rain forests. Its cotyledons are largely enriched with a storage cell wall polysaccharide (xyloglucan). Studies of cell wall storage polymers have been focused mostly on the mechanisms of their disassembly, whereas the control of their mobilization and the relationship between their metabolism and seedling development is not well understood. Here, we show that xyloglucan mobilization is strictly controlled by the development of first leaves of the seedling, with the start of its degradation occurring after the beginning of eophyll (first leaves) expansion. During the period of storage mobilization, an increase in the levels of xyloglucan hydrolases, starch, and free sugars were observed in the cotyledons. Xyloglucan mobilization was inhibited by shoot excision, darkness, and by treatment with the auxin-transport inhibitor N-1-naphthylphthalamic acid. Analyses of endogenous indole-3-acetic acid in the cotyledons revealed that its increase in concentration is followed by the rise in xyloglucan hydrolase activities, indicating that auxin is directly related to xyloglucan mobilization. Cotyledons detached during xyloglucan mobilization and treated with 2,4-dichlorophenoxyacetic acid showed a similar mobilization rate as in attached cotyledons. This hormonal control is probably essential for the ecophysiological performance of this species in their natural environment since it is the main factor responsible for promoting synchronism between shoot growth and reserve degradation. This is likely to increase the efficiency of carbon reserves utilization by the growing seedling in the understorey light conditions of the rain forest.

Record 80 of 143 - AGRICOLA 1998-2004/09

AU: Ayers,-G.S.

TI: The other side of beekeeping: the legumes, a diverse, but important group of bee forages.

SO: American bee journal. 2004 June, v. 144, no. 6 p. 463-468.

Record 81 of 143 - AGRICOLA 1998-2004/09

AU: Hoa,-L.T.P.; Nomura,-M.; Kajiwara,-H.; Day,-D.A.; Tajima,-S.

TI: Proteomic analysis on symbiotic differentiation of mitochondria in soybean nodules.

SO: Plant and cell physiology. 2004 Mar., v. 45, no. 3 p. 300-308.

AB: Symbiotic interactions between legume plants and rhizobia induce specific metabolisms and intracellular organelles in nodules. For surveying symbiotic differentiation of a key organelle, mitochondria, protein constituents of soybean nodule and root mitochondria were compared after two-dimensional (2-D) electrophoresis, and the proteins were characterized in combination with matrix-assisted desorption/ionization time-of-flight mass spectrometry, electrospray ionization mass spectrometry and N-terminal amino acid sequencing. Of the proteins that were detected only in nodule mitochondria, phosphoserine aminotransferase, flavanone 3-hydroxylase,

coproporphyrinogen III oxidase, one ribonucleoprotein and three unknown proteins were identified. Seven up-regulated, eight down-regulated and two strongly suppressed protein spots in nodule mitochondria were also assigned protein identities. The physiological roles of these differential expressions were discussed in relation to nodule-specific metabolisms in soybean nodules.

Record 82 of 143 - AGRICOLA 1998-2004/09

AU: Nukui,-N.; Ezura,-H.; Minamisawa,-K.

TI: Transgenic Lotus japonicus with an ethylene receptor gene Cm-ERS1/H70A enhances formation of infection threads and nodule primordia.

SO: Plant and cell physiology. 2004 Apr., v. 45, no. 4 p. 427-435.

AB: Ethylene inhibits the establishment of symbiosis between rhizobia and legumes. To examine how and when endogenous ethylene inhibits rhizobial infection and nodulation, we produced transgenic Lotus japonicus carrying the mutated melon ethylene receptor gene Cm-ERS1/H70A that confers ethylene insensitivity and fixes the transgene in the T3 generation. The resultant transgenic plants showed reduced ethylene sensitivity because of 1-aminocyclopropane-1-carboxylate resistance and increased flowering duration, probably due to a dominant negative mechanism. When inoculated with Mesorhizobium loti, transgenic plants showed markedly higher numbers of infection threads and nodule primordia on their roots than did either wild-type or azygous plants during the early stage of cultivation period as well as during later stages, when the number of mature nodules had reached a steady state. In addition, transcripts of NIN, a gene governing infection thread formation, increased in the inoculated transgenic plants as compared with the wild-type plants. The infection responses of transgenic plants were similar to those of wild-type plants treated with ethylene inhibitors. These results imply that the endogenous ethylene in L. japonicus roots inhibits rhizobial infection at the primary nodulation, probably via NIN gene, and suggest that ethylene perception assists negative feedback regulation of secondary nodule initiation.

Record 83 of 143 - AGRICOLA 1998-2004/09

AU: Duque,-A.S.R.L.A.; Araujo,-S.-de-S.; Santos,-D.M.M.F.-dos; Fevereiro,-M.P.S.

TI: Optimisation of a selection scheme using kanamycin to improve transformation of Medicago truncatula cv. Jemalong.

SO: Plant cell, tissue and organ culture. 2004 Sept., v. 78, no. 3 p. 277-280.

AB: We developed an efficient method for in vitro selection of Medicago truncatula cv. Jemalong lines transformed with the nptII gene and subsequent confirmation of phenotype inheritance in these lines. For in vitro selection, the concentration of kanamycin inhibitory to embryogenic callus development and somatic embryo differentiation was identified by placing wounded leaves of non-transformed M. truncatula cv. Jemalong on Embryo Inducing Medium supplemented with 0, 85.8, 128.7, 171.6, 214.6, 257.5 and 343.3 micromolar of kanamycin. Differentiation of somatic embryos was inhibited with 171.6 micromolar of kanamycin but callus development was not altered. To confirm transgene

inheritance, the kanamycin concentration to distinguish between resistant and non-resistant seedlings was identified by germinating non-transformed seeds of M. truncatula cv. Jemalong on 0.8% (w/v) water-agar plates containing 0, 171.6, 343.3, 514.9 and 686.6 micromolar of kanamycin. These concentrations did not impair seed germination since all the seedlings exhibited green cotyledons. The effect of kanamycin was only observed at 514.9 and 686.6 micromolar and on the first pair of leaves, which became white. Due to the high level of resistance to kanamycin of the seedlings the highest concentration is thought to be use to assure the selection efficiency. This optimised antibiotic selection scheme eliminates the regeneration of non-transformed escapes and discriminates between resistant and non-resistant seedlings, confirming the inheritance of the phenotype in transformed M. truncatula cv. Jemalong lines.

Record 84 of 143 - AGRICOLA 1998-2004/09

AU: Accensi,-F.; Abarca,-M.L.; Cabanes,-F.J.

TI: Occurrence of Aspergillus species in mixed feeds and component raw materials and their ability to produce ochratoxin A.

SO: Food microbiology. 2004 Oct., v. 21, no. 5 p. 623-627.

AB: The mycobiota of 147 samples of mixed feeds and 153 samples of raw materials (cereals and legumes) was studied in order to ascertain the occurrence of Aspergillus spp. and their ability to produce ochratoxin A (OTA). Total fungal counts ranged from <102 to 5.3x106 cfu/g. Aspergillus spp. (including teleomorphs) were isolated from 77.7% of the samples and ranged from non-detectable to 5.3x106 cfu/g with a mean value of 2.2x104 cfu/g. On average, Aspergillus spp. comprised 15.6% of the total fungal population. Aspergillus spp. were present in 94.4% of legume samples and 89.8% of mixed feeds, whereas in cereal samples Aspergillus spp. had a much lower occurrence (57.3%). Fourteen Aspergillus spp. (including teleomorphs) were identified. The predominant species were A. flavus, Eurotium chevalieri, E. amstelodami, and E. rubrum. Among the OTA-producing aspergilli only A. niger var. niger and A. ochraceus were isolated in this survey. Aspergillus niger var. niger was detected in 23% of the samples, whereas A. ochraceus was present in 7.3%. Three out of 52 of the A. niger var. niger isolates (5.8%) and one out of 20 A. ochraceus strains (5%), were able to produce OTA.

Record 85 of 143 - AGRICOLA 1998-2004/09

AU: Yu,-P.; McKinnon,-J.J.; Christensen,-D.A.

TI: The ratios of degradation characteristics of forages in the rumen of dairy cows: effect of variety and stage of maturity.

SO: Journal of the science of food and agriculture. 2004 Jan. 30, v. 84, issue 2 p. 179-189.

AB: In situ digestive characteristics of neutral detergent fibre (NDF) , non-fibre carbohydrates (NFC) and crude protein (CP) in alfalfa and timothy were determined in the rumen of dairy cows. Two varieties of alfalfa (Pioneer and Beaver) and timothy (Climax and Joliotte) were grown in western Canada and cut at three maturity stages (alfalfa: 1 = early bud, 2 = late bud, 3 = early bloom; timothy: 1 = joint, 2 = pre - bloom head, 3 = full head). Measured ruminal degradation characteristics were soluble fraction (NFC, CP), undegradable fraction (NDF, CP), lag time (NDF) and rate of degradation of the insoluble but degradable

fraction (NDF, NFC, CP). All measured characteristics showed large differences between the two forage species (alfalfa vs timothy) and to a lesser extent between the maturity stages and varieties. Mean total rumen available NDF (248.6 vs 282.5 g kg-1 dry matter (DM)), NFC (200.5 vs 106.1 g kg-1 DM) and CP (139.7 vs 44.5 g kg-1 DM) differed ($p < 0.01$) between alfalfa and timothy. Based on the measured characteristics, degradation ratios were calculated between total rumen available N and carbohydrates (FN/FCHO), soluble N and carbohydrates (SN/SCHO) and rumen available insoluble N and carbohydrates (EN/ECHO). The ratios showed large differences between the two forages species and to a lesser extent between the varieties and stages of maturity. Alfalfa species had significantly higher ($p < 0.01$) ratios of FN/FCHO (49.8 vs 18.3 g kg-1), SN/SCHO (115.0 vs 36.1 g kg-1) and EN/ECHO (28.3 vs 12.0 g kg-1) than timothy. These results indicate that alfalfa varieties exhibited a superior rumen fermentation ratio (optimum FN/FCHO = 25-33 g N kg-1 carbohydrates). The results also suggest a potential N loss in alfalfa and N shortage in timothy. Comparing the two varieties of alfalfa, no differences ($p > 0.05$) were found in the ratios of FN/FCHO and EN/ECHO, but a significant difference ($p < 0.05$) was found in SN/SCHO (132.3 vs 97.6 g kg-1). However, comparing the two varieties of timothy, there were significant differences ($p < 0.01$) in FN/FCHO (23.8 vs 12.8 g kg-1) and EN/ECHO (15.3 vs 8.7 g kg-1) ratios but not in SN/SCHO ratio ($p > 0.05$), indicating large differences between legume and grass. As plant maturity advanced from stage 1 to stage 3, there were no significant changes in all ratios in alfalfa and timothy except the EN/ECHO ratio in timothy (14.3, 13.4 and 8.3 g kg-1 at stages 1, 2 and 3 respectively). It was concluded that the degradation characteristic ratios were dependent on species, variety and/or stage of maturity. Such ratios could be used to optimise a dairy diet composition with regard to rumen fermentation.

Record 86 of 143 - AGRICOLA 1998-2004/09
AU: Suszkiw,-J.
TI: Dairy researchers may mix it up in the pasture.
SO: Agricultural research. 2004 Mar., v. 52, no. 3 p. 10-12.

Record 87 of 143 - AGRICOLA 1998-2004/09
AU: Sannazzaro,-A.I.; Ruiz,-O.A.; Alberto,-E.; Menendez,-A.B.
TI: Presence of different arbuscular mycorrhizal infection patterns in roots of Lotus glaber plants growing in the Salado River basin.
SO: Mycorrhiza. 2004 Apr., v. 14, no. 2 p. 139-142.

Record 88 of 143 - AGRICOLA 1998-2004/09
AU: Jofre,-E.; Lagares,-A.; Mori,-G.
TI: Disruption of dTDP-rhamnose biosynthesis modifies lipopolysaccharide core, exopolysaccharide production, and root colonization in Azospirillum brasilense.
SO: FEMS microbiology letters Federation of European Microbiological Societies. 2004 Feb. 16, v. 231, no. 2 p. 267-275.
AB: The interaction between Azospirillum brasilense and plants is not fully understood, although several bacterial surface components like exopolysaccharides (EPS), flagella, and capsular polysaccharides are required for attachment and colonization.

While in other plantÆbacteria associations (Rhizobium-legume, Pseudomonas-potato), lipopolysaccharides (LPS) play a key role in the establishment of an effective association, their role in the root colonization by Azospirillum had not been determined. In this study, we isolated a Tn5 mutant of A. brasilense Cd (EJ1) with an apparently modified LPS core structure, non-mucoid colony morphology, increased EPS production, and affected in maize root colonization. A 3790-bp region revealed the presence of three complete open reading frames designated rmlC, rmlB and rmlD. The beginning of a fourth open reading frame was found and designated rmlA. These genes are organized in a cluster which shows homology to the cluster involved in the synthesis of dTDP-rhamnose in other bacteria. Additionally, the analysis of the monosaccharide composition of LPSs showed a diminution of rhamnose compared to the wild-type strain.

Record 89 of 143 - AGRICOLA 1998-2004/09
AU: Pierre,-J.N.; Badrie,-N.
TI: Changes in consumer acceptance and physicochemical quality of low fat pigeon pea (Cajanus cajan) patties with the addition of xanthan gum.
SO: Foodservice research international. 2004 Apr., v. 14, no. 3 p. 153-162.
AB: The objectives of the research were to investigate the effects of adding xanthan gum on the physicochemical and sensory quality of low fat pigeon pea (Cajanus cajan) patties. A pretested questionnaire conducted on patty-eating consumers determined consumers' preferences and guided the formulation of pigeon pea patties. The soaked legumes were steam pressurized at 121C for 10 min. Spices/herbs were added to the mixture which was baked at 150C for 20 min. Only 50% of the respondents were influenced by nutritional content of patties. Pigeon pea patties had 13.8-14.6 g protein/100 g and 3.5-3.9 g fat/100 g. Addition of xanthan gum resulted ($P < 0.05$) in more red and softer textured products. The suitable addition of either 1.5% or 2.5% xanthan gum did not vary sensory quality ($P < 0.05$) as both products were liked slightly to neither like nor disliked in overall acceptability. When asked about purchase intent for these patties, 48.5% of consumers indicated they would probably buy them, while 16.3% would definitely buy.

Record 90 of 143 - AGRICOLA 1998-2004/09
AU: Dolezel,-J.; Kubalakova,-M.; Bartos,-J.; Macas,-J.
TI: Flow cytogenetics and plant genome mapping.
SO: Chromosome research. 2004, v. 12, no. 1 p. 77-91.

Record 91 of 143 - AGRICOLA 1998-2004/09
AU: Carre,-B.
TI: Causes for variation in digestibility of starch among feedstuffs.
SO: World's poultry science journal. 2004 Mar., v. 60, no. 1 p. 76-89.

Record 92 of 143 - AGRICOLA 1998-2004/09
AU: Galasso,-I.; Lioi,-L.; Lanave,-C.; Bollini,-R.; Sparvoli,-F.
TI: Identification and isolation of lectin nucleotide sequences and species relationships in the genus Lens (Miller).
SO: Theoretical and applied genetics. 2004 Apr., v. 108, no. 6 p.

1098-1102.
AB: Genes for lectin, a component of legume storage proteins, were identified and characterised in two lentil cultivars (Lens culinaris ssp. culinaris) and six wild relatives. In each taxon no differences were found among the two or three lectin clones sequenced, while differences were observed among lectin genes isolated from the different taxa. All of the clones analysed contained an insert of 828 bp and showed a high similarity with the nucleotide sequence of Pisum sativum seed lectin, PSL1. The deduced amino acid lectin sequences in all taxa were 275 amino acids long, and their multiple alignment showed that most of the variation among them occurred in regions which are not important for metal- and sugar-binding. The data from Southern blot analysis indicated the presence of only one lectin gene in all Lens taxa except L. tomentosus. Phylogenetic analyses carried out on the lectin sequences showed the existence of two main clusters and clearly indicated that L. nigricans falls outside the two groups.

Record 93 of 143 - AGRICOLA 1998-2004/09
AU: Cozzolino,-D.; Moron,-A.
TI: Exploring the use of near infrared reflectance spectroscopy (NIRS) to predict trace minerals in legumes.
SO: Animal feed science and technology. 2004 Jan. 12, v. 111, no. 1-4 p. 161-173.

Record 94 of 143 - AGRICOLA 1998-2004/09
AU: Kuusela,-E.; Khalili,-H.; Nykanen-Kurki,-P.
TI: Fertilisation, seed mixtures and supplementary feeding for annual legume-grass-cereal pastures in organic milk production systems.
SO: Livestock production science. 2004 Feb., v. 85, no. 2-3 p. 113-127.

Record 95 of 143 - AGRICOLA 1998-2004/09
AU: Gakis,-S.; Mantzanas,-K.; Alifragis,-D.; Papanastasis,-V.P.; Papaioannou,-A.; Seilopoulos,-D.; Platis,-P.
TI: Effects of understorey vegetation on tree establishment and growth in a silvopastoral system in northern Greece.
SO: Agroforestry systems. 2004, v. 60, no. 2 p.149-157.

Record 96 of 143 - AGRICOLA 1998-2004/09
AU: Shockley,-F.W.; McGraw,-R.L.; Garrett,-H.E.
TI: Growth and nutrient concentration of two native forage legumes inoculated with Rhizobium and Mycorrhiza in Missouri, USA.
SO: Agroforestry systems. 2004, v. 60, no. 2 p. 137-142.

Record 97 of 143 - AGRICOLA 1998-2004/09
AU: Rochette,-P.; Angers,-D.A.; Belanger,-G.; Chantigny,-M.H.; Prevost,-D.; Levesque,-G.
TI: Emissions of N2O from alfalfa and soybean crops in eastern Canada.
SO: Soil Science Society of America journal. 2004 Mar.-Apr., v. 68, no. 2 p. 493-506.
AB: There is considerable uncertainty relative to the emissions of N2O from legume crops. A study was initiated to quantify N2O fluxes from soils cropped to alfalfa (Medicago sativa L.) and soybean (Glycine max L.), and to improve our understanding of

soil and climatic factors controlling N2O emissions from these crops. Measurements were made on three soils cropped to alfalfa, soybean, or timothy (Phleum pratense L.), a perennial grass used as a control. In situ soil-surface N2O emissions (FN2O) were measured 47 times during the 2001 and 2002 growing seasons. Soil water, NH4-N, NO3-N, and N2O contents, and soil temperature were also determined to explain the variation in gas fluxes. Emissions of N2O were small under the grass where very low soil mineral N content probably limited denitrification and N2O production. Soil mineral N contents under legumes were up to 10 times greater than under timothy. However, soil mineral N contents and FN2O were not closely related, thus suggesting that the soil mineral N pool alone was a poor indicator of the intensity of N2O production processes. Higher FN2O were measured under legume than under timothy in only 6 out of 10 field comparisons (site-years). Moreover, the emissions associated with alfalfa (0.67-1.45 kg N ha-1) and soybean (0.46-3.08 kg N ha-1) production were smaller than those predicted using the emission coefficient proposed for the national inventory of greenhouse gases (alfalfa = 1.60-5.21 kg N ha-1; soybean = 2.76-4.97 kg N ha-1). We conclude that the use of the current emission coefficient may overestimate the N2O emissions associated with soybean and alfalfa production in eastern Canada.

Record 98 of 143 - AGRICOLA 1998-2004/09

AU: Guretzky,-J.A.; Moore,-K.J.; Knapp,-A.D.; Brummer,-E.C.

TI: Emergence and survival of legumes seeded into pastures varying in landscape position.

SO: Crop science. 2004 Jan.-Feb., v. 44, no. 1 p. 227-233.

AB: Landscape position affects legume establishment in pastures. We conducted this study to (i) determine the role of emergence and survival on establishment of legumes on summit and backslope positions and (ii) examine how competition, as influenced by sward-cutting height and N fertilization, affects legume emergence and survival across these positions. We no-till drilled a mixture composed of red clover (Trifolium pratense L.), alfalfa (Medicago sativa L.), and birdsfoot trefoil (Lotus corniculatus L.) into an existing cool-season grass pasture at Rhodes, IA, in 1998 and 1999. Treatments consisted of landscape positions (summit and backslope), N fertilizer rates (0, 22, 44, and 89 kg ha-1), and sward heights (uncut, 5, and 13 cm). Landscape position did not affect legume emergence in swards cut at 5 and 13 cm. At those heights, emergence averaged 1041 and 831 seedlings m-2. In swards cut at 5 cm, 62 plants m-2 survived on summits vs. 183 plants m-2 on backslopes. Legume emergence and survival generally decreased as sward height and N fertilization increased but interactions with landscape position occurred. Addition of 89 kg ha-1 N was required to reduce survival on backslopes to 39 plants m-2, a density similar to that on summits. Our results show that seedling survival limits legume establishment on summit positions in pastures. Legume establishment is successful on backslopes because of less competition from grass. We recommend that legumes be seeded on backslope positions in pastures, N fertilizer not be applied, and grass competition be reduced before seeding legumes in pastures.

Record 99 of 143 - AGRICOLA 1998-2004/09

AU: Araujo,-S.-de-S.; Duque,-A.S.R.L.A.; Santos,-D.M.M.F.-dos; Fevereiro,-M.P.S.
TI: An efficient transformation method to regenerate a high number of transgenic plants using a new embryogenic line of Medicago truncatula cv. Jemalong.
SO: Plant cell, tissue and organ culture. 2004 Aug., v. 78, no. 2 p. 123-131.
AB: A simple and efficient regeneration-transformation method was established to obtain transgenic plants of the model legume Medicago truncatula cv. Jemalong. This method takes advantage of a new highly embryogenic line (M9-10a) isolated in our laboratory. Leaflets of in vitro grown M9-10a plants were co-cultured with Agrobacterium tumefaciens EHA105. Plasmid constructs containing the oat arginine decarboxylase gene, Adc and the GUS reporter gene (p35SAdc-Gus) or ELIP-like drought stress protein 22 (DSP22) encoding gene from Craterostigma plantagineum (p35SDsp22) were used. Both constructs include the nptII gene as selection marker. Embryogenic calli (100-97%) were obtained on embryo induction medium containing 100 mg l-1 kanamycin and 500 mg l-1 carbenicillin. Using a two-fold increase in kanamycin concentration, instead of 50 mg l-1 usually used, we reduced the number of emerging false kanamycin-resistant (KanR) embryos, which is an important improvement to the method, making it less laborious and very efficient. Isolation of late torpedo/ cotyledonary-stage embryos to lower carbenicillin/agar media reduced secondary embryogenesis and prevents hyperhydricity, improving embryo conversion. Primary transformants (T0) were regenerated within 3-4 months and those that were able to root in a 50 mg l-1 kanamycin medium were transferred to the greenhouse to produce seeds. Southern blot hybridisation analysis confirmed the integration of either the Adc or Dsp22 transgenes in the genome of the T0 transformants. Detection of (beta)-glucuronidase (GUS) activity in Adc-Gus T0 plants demonstrated the expression of the inserted transgene. In average, 1-2 independent transgenic lines are obtained per KanR embryogenic callus, independently of the plasmid construct used for transformation. Inheritance of the transgenes is shown to be stable in the T1 generation.

Record 100 of 143 - AGRICOLA 1998-2004/09
AU: Wei,-H.; Atkins,-C.A.; Layzell,-D.B.
TI: Adenylate gradients and Ar:O2 effects on legume nodules. II. Changes in the subcellular adenylate pools.
SO: Plant physiology. 2004 Apr., v. 134, no. 4 p. 1775-1783.
AB: Central infected zone tissue of soybean (Glycine max L. Merr.) nodules was fractionated into separate subcellular compartments using density gradient centrifugation in nonaqueous solvents to better understand how exposure to Ar:O2 (80:20%, v/v) atmosphere affects C and N metabolism, and to explore a potential role for adenylates in regulating O2 diffusion. When nodules were switched from air to Ar:O2, adenylate energy charge (AEC) in the plant cytosol rose from 0.63 « 0.02 to 0.73 « 0.02 within 7 min and to 0.80 « 0.01 by 60 min. In contrast, AEC of the mitochondrial compartment of this central zone tissue remained high (0.80 « 0.02 to 0.81 « 0.02) following Ar treatment while that of the bacteroid compartment was unchanged, at 0.73 « 0.02, after 7 min, but declined to 0.57 « 0.03 after 60 min. These results were

consistent with a simulation model that predicted Ar:O2 exposure would first reduce ATP demand for ammonia assimilation and rapidly increase cytosolic AEC, before the Ar:O2-induced decline mediated by a decrease in nodule O2 permeability reduces bacteroid AEC. The possibility that adenylates play a key, integrating role in regulating nodule permeability to oxygen diffusion is discussed.

Record 101 of 143 - AGRICOLA 1998-2004/09

AU: D'Apuzzo,-E.; Rogato,-A.; Simon-Rosin,-U.; El-Alaoui,-H.; Barbulova,-A.; Betti,-M.; Dimou,-M.; Katinakis,-P.; Marquez,-A.; Marini,-A.M.

TI: Characterization of three functional high-affinity ammonium transporters in Lotus japonicus with differential transcriptional regulation and spatial expression.

SO: Plant physiology. 2004 Apr., v. 134, no. 4 p. 1763-1774.

AB: Ammonium is a primary source of nitrogen for plants. In legume plants ammonium can also be obtained by symbiotic nitrogen fixation, and is also a regulator of early and late symbiotic interaction steps. Ammonium transporters are likely to play important roles in the control of nodule formation as well as in nitrogen assimilation. Two new genes, LjAMT1;2 and LjAMT1;3, were cloned from Lotus japonicus. Both were able to complement the growth defect of a yeast (Saccharomyces cerevisiae) ammonium transport mutant. Measurement of [14C]methylammonium uptake rates and competition experiments revealed that each transporter had a high affinity for . The K(i) for ammonium was 1.7, 3, and 15 micromolar for LjAMT1;1, 1;2, and 1;3, respectively. Real-time PCR revealed higher expression of LjAMT1;1, 1;2, and 1;3 genes in leaves than in roots and nodule, with expression levels decreasing in the order LjAMT1;1 > 1;2 > 1;3 except in flowers, in which LjAMT1;3 was expressed at higher level than in leaves, and LjAMT1;1 showed the lowest level of expression. Expression of LjAMT1;1 and 1;2 in roots was induced by nitrogen deprivation. Expression of LjAMT1;1 was repressed in leaves exposed to elevated CO2 concentrations, which also suppress photorespiration. Tissue and cellular localization of LjAMT1 genes expression, using promoter-beta-glucuronidase and in situ RNA hybridization approaches, revealed distinct cellular spatial localization in different organs, including nodules, suggesting differential roles in the nitrogen metabolism of these organs.

Record 102 of 143 - AGRICOLA 1998-2004/09

AU: Schulze,-J.

TI: How are nitrogen fixation rates regulated in legumes.

SO: Journal of plant nutrition and soil science = Zeitschrift fur Pflanzenernahrung und Bodenkunde. 2004 Apr., v. 167, no. 2 p. 125-127.

Record 103 of 143 - AGRICOLA 1998-2004/09

AU: Mintesinot,-B.; Verplancke,-H.; Ranst,-E.-van; Mitiku,-H.

TI: Examining traditional irrigation methods, irrigation scheduling and alternate furrows irrigation on vertisols in northern Ethiopia.

SO: Agricultural water management. 2004 Jan. 1, v. 64, issue 1 p. 17-27.

Record 104 of 143 - AGRICOLA 1998-2004/09
AU: Capo-chichi,-L.J.A.; Morton,-C.M.; Weaver,-D.B.
TI: An intraspecific genetic map of velvetbean (Mucuna sp.) based on AFLP markers.
SO: Theoretical and applied genetics. 2004 Mar., v. 108, no. 5 p. 814-821.
AB: Velvetbean (Mucuna sp., n=11), a self-pollinated species, is an important legume used in tropical agricultural systems in rotation with other crops for nematode management and/or soil improvement. A genetic map of velvetbean was constructed in order to identify potential molecular markers linked to important morphological and agronomic traits that would be particularly useful for developing and improving the species. Traits such as seed coat color, pod color, and pod pubescence were among the main parameters observed in a process of genetic diversity estimation. Two slightly divergent velvetbean accessions, PI364362 and 'Edgar Farm White', a land race from Alabama, were used to make an intraspecific F1 hybrid. Amplified fragment length polymorphism analysis (AFLP) detected an average of six polymorphic fragments per primer pair between the two parents. As expected for dominant markers, the sum of all AFLP bands from both parents was generally observed to be present in the AFLP profiles of the F1 progeny, indicating full penetrance and the dominant nature of AFLP markers. An F2 population was generated by self-pollinating a single F1 plant. Using 37 AFLP primer pairs, we detected 233 polymorphic markers of which 164 (70.4%) segregated in 3:1 Mendelian ratios, while the remaining 69 (29.6%) both segregated and were scorable. The genetic linkage map constructed from this population comprised 166 markers, including two morphological traits (pod color and pod pubescence). Twenty linkage groups were found with an average distance between markers of 34.4 cM, covering a total of 687.9 cM. The linkage groups contained from 2 to 12 loci each and the distance between two consecutive loci ranged from 0 to 21.8 cM. The newly designated morphological traits pod color (pdc) and pod pubescence (pdp) co-segregated with each other at a distance of 4.2 cM. Two DNA markers designated ACGCAG2 and ACTCTG1 were located in the same group as pdc and pdp. The AFLP linkage map provides opportunities for use in marker-assisted selection and in the detection of loci controlling morphologically important traits.

Record 105 of 143 - AGRICOLA 1998-2004/09
AU: Stracke,-S.; Sato,-S.; Sandal,-N.; Koyama,-M.; Kaneko,-T.; Tabata,-S.; Parniske,-M.
TI: Exploitation of colinear relationships between the genomes of Lotus japonicus, Pisum sativum and Arabidopsis thaliana, for positional cloning of a legume symbiosis gene.
SO: Theoretical and applied genetics. 2004 Feb., v. 108, no. 3 p. 442-449.
AB: The Lotus japonicus LjSYM2 gene, and the Pisum sativum orthologue PsSYM19, are required for the formation of nitrogen-fixing root nodules and arbuscular mycorrhiza. Here we describe the map-based cloning procedure leading to the isolation of both genes. Marker information from a classical AFLP marker-screen in Lotus was integrated with a comparative genomics approach, utilizing Arabidopsis genome sequence information and the pea genetic map.

A network of gene-based markers linked in all three species was identified, suggesting local colinearity in the region around LjSYM2/PsSYM19. The closest AFLP marker was located just over 200 kb from the LjSYM2 gene, the marker SHMT, which was converted from a marker on the pea map, was only 7.9 kb away. The LjSYM2/ PsSYM19 region corresponds to two duplicated segments of the Arabidopsis chromosomes AtII and AtIV. Lotus homologues of Arabidopsis genes within these segments were mapped to three clusters on LjI, LjII and LjVI, suggesting that during evolution the genomic segment surrounding LjSYM2 has been subjected to duplication events. However, one marker, AUX-1, was identified based on colinearity between Lotus and Arabidopsis that mapped in physical proximity of the LjSym2 gene.

Record 106 of 143 - AGRICOLA 1998-2004/09

AU: Eujayl,-I.; Sledge,-M.K.; Wang,-L.; May,-G.D.; Chekhovskiy,-K.; Zwonitzer,-J.C.; Mian,-M.A.R.

TI: Medicago truncatula EST-SSRs reveal cross-species genetic markers for Medicago, spp.

SO: Theoretical and applied genetics. 2004 Feb., v. 108, no. 3 p. 414-422.

AB: Expressed sequence tags (ESTs) are important resources for gene discovery and molecular marker development. From over 147,000 ESTs of Medicago truncatula, we have identified 4,384 ESTs containing perfect simple sequence repeats (EST-SSR) of di-, tri-, tetra- or pentanucleotides. Six hundred sixteen primer pairs (PPs) were designed and screened over a panel of eight genotypes representing six Medicago spp. and subspecies. Nearly, 74% (455) of the PPs produced characteristic SSR bands of expected size length in at least one Medicago species. Four hundred six (89%) of these 455 PPs produced SSR bands in all eight genotypes tested. Only 17 PPs were M. truncatula -specific. High levels of polymorphism (>70%) were detected for these markers in alfalfa, M. truncatula, and other annual medics. About 48% of the reported markers are part of gene transcripts linked to putative functions. Our results indicate that the SSR markers developed from M. truncatula ESTs are valuable genetic markers for the Medicago genus. These markers will be useful in establishing the genomic relationships of M. truncatula to important forage legume crops such as alfalfa and other annual medics.

Record 107 of 143 - AGRICOLA 1998-2004/09

AU: Bartsev,-A.V.; Deakin,-W.J.; Boukli,-N.M.; McAlvin,-C.B.; Stacey,-G.; Malnoe,-P.; Broughton,-W.J.; Staehelin,-C.

TI: NopL, an effector protein of Rhizobium sp. NGR234, thwarts activation of plant defense reactions.

SO: Plant physiology. 2004 Feb., v. 134, no. 2 p. 871-879.

AB: Bacterial effector proteins delivered into eukaryotic cells via bacterial type III secretion systems are important virulence factors in plant-pathogen interactions. Type III secretion systems have been found in Rhizobium species that form symbiotic, nitrogen-fixing associations with legumes. One such bacterium, Rhizobium sp. NGR234, secretes a number of type III effectors, including nodulation outer protein L (NopL, formerly y4xL). Here, we show that expression of nopL in tobacco (Nicotiana tabacum) prevents full induction of pathogenesis-related (PR) defense

proteins. Transgenic tobacco plants that express nopL and were infected with potato virus Y (necrotic strain 605) exhibited only very low levels of chitinase (class I) and beta-1,3-glucanase (classes I and III) proteins. Northern-blot analysis indicated that expression of nopL in plant cells suppresses transcription of PR genes. Treatment with ethylene counteracted the effect of NopL on chitinase (class I). Transgenic Lotus japonicus plants that expressed nopL exhibited delayed development and low chitinase levels. In vitro experiments showed that NopL is a substrate for plant protein kinases. Together, these data suggest that NopL, when delivered into the plant cell, modulates the activity of signal transduction pathways that culminate in activation of PR proteins.

Record 108 of 143 - AGRICOLA 1998-2004/09

AU: Wei,-H.; Atkins,-C.A.; Layzell,-D.B.

TI: Adenylate gradients and Ar:O2 effects on legume nodules. I. Mathematical models.

SO: Plant physiology. 2004 Feb., v. 134, no. 2 p. 801-812.

AB: Mathematical models were developed to test the likelihood that large cytosolic adenylate concentration gradients exist across the bacteria-infected cells of legume nodules. Previous studies hypothesized that this may be the case to account for the unusually low adenylate energy charge (AEC; 0.65) measured in the plant fraction of metabolically active nodules (M.M. Kuzma, H. Winter, P. Storer, I. Oresnik, C.A. Atkins, D.B. Layzell [1999] Plant Physiol 119: 399-407). Simulations coupled leghemoglobin-facilitated O2 diffusion into the infected cell, through bacteroid nitrogenase activity, with the ATP demand for transport and ammonia assimilation in the plant fraction of ureide- and amide-producing nodules. Although large cytosolic adenylate gradients were predicted to exist in both nodule types, amide nodules were predicted to have steeper AEC gradients (0.82-0.52) than ureide nodules (0.82-0.61). The differences were attributed to an additional ATP demand for Asn synthesis in the amide nodule. Simulations for nodules transferred to an Ar:O2 atmosphere predicted a major reduction in the magnitude of adenylate gradients and an increase in the AEC of the plant fraction. Results were consistent with a number of experimental studies and were used to propose an experimental test of the models.

Record 109 of 143 - AGRICOLA 1998-2004/09

AU: Pelissier,-H.C.; Frerich,-A.; Desimone,-M.; Schumacher,-K.; Tegeder,-M.

TI: PvUPS1, an allantoin transporter in nodulated roots of French bean.

SO: Plant physiology. 2004 Feb., v. 134, no. 2 p. 664-675.

AB: Nodulated legumes receive their nitrogen via nitrogen-fixing rhizobia, which exist in a symbiotic relationship with the root system. In tropical legumes like French bean (Phaseolus vulgaris) or soybean (Glycine max), most of the fixed nitrogen is used for synthesis of the ureides allantoin and allantoic acid, the major long-distance transport forms of organic nitrogen in these species. The purpose of this investigation was to identify a ureide transporter that would allow us to further characterize the mechanisms regulating ureide partitioning in legume roots. A

putative allantoin transporter (PvUPS1) was isolated from nodulated roots of French bean and was functionally characterized in an allantoin transport-deficient yeast mutant showing that PvUPS1 transports allantoin but also binds its precursors xanthine and uric acid. In beans, PvUPS1 was expressed throughout the plant body, with strongest expression in nodulated roots, source leaves, pods, and seed coats. In roots, PvUPS1 expression was dependent on the status of nodulation, with highest expression in nodules and roots of nodulated plants compared with non-nodulated roots supplied with ammonium nitrate or allantoin. In situ RNA hybridization localized PvUPS1 to the nodule endodermis and the endodermis and phloem of the nodule vasculature. These results strengthen our prediction that in bean nodules, PvUPS1 is involved in delivery of allantoin to the vascular bundle and loading into the nodule phloem.

Record 110 of 143 - AGRICOLA 1998-2004/09

AU: Esseling,-J.J.; Lhuissier,-F.G.P.; Emons,-A.M.C.

TI: A nonsymbiotic root hair tip growth phenotype in NORK-mutated legumes: implications for nodulation factor-induced signaling and formation of a multifaceted root hair pocket for bacteria.

SO: Plant cell. 2004 Apr., v. 16, no. 4 p. 933-944.

AB: The Medicago truncatula Does not Make Infections (DMI2) mutant is mutated in the nodulation receptor-like kinase, NORK. Here, we report that NORK-mutated legumes of three species show an enhanced touch response to experimental handling, which results in a nonsymbiotic root hair phenotype. When care is taken not to induce this response, DMI2 root hairs respond morphologically like the wild type to nodulation factor (NF). Global NF application results in root hair deformation, and NF spot application induces root hair reorientation or branching, depending on the position of application. In the presence of Sinorhizobium meliloti, DMI2 root hairs make two-dimensional 180(degree) curls but do not entrap bacteria in a three-dimensional pocket because curling stops when the root hair tip touches its own shank. Because DMI2 does not express the promoter of M. truncatula Early Nodulin11 (ENOD11) coupled to (beta)-glucuronidase upon NF application, we propose a split in NF-induced signaling, with one branch to root hair curling and the other to ENOD11 expression.

Record 111 of 143 - AGRICOLA 1998-2004/09

AU: Baurens,-F.C.; Nicolleau,-J.; Legavre,-T.; Verdeil,-J.L.; Monteuuis,-O.

TI: Genomic DNA methylation of juvenile and mature Acacia mangium micropropagated in vitro with reference to leaf morphology as a phase change marker.

SO: Tree physiology. 2004 Apr., v. 24, no. 4 p. 401-407.

AB: Genomic DNA methylation was analyzed in Acacia mangium Willd. microshoots micropropagated in vitro from juvenile and mature explants, and in relation to leaf morphology of the microshoots, which is considered a phase change indicator. Based on high performance liquid chromatography (HPLC) analyses, we found more DNA methylation in microshoots exhibiting juvenile leaf morphology (22.4%) than in microshoots of the mature phyllode morphological type (20.7%), irrespective of the age of the source material. Overall, the degree of DNA methylation in A. mangium

microshoots was consistent with values reported for other angiosperms. Complementary investigations based on methylation sensitive amplification polymorphism (MSAP) techniques established that, of 1204 fragments revealed by the different primer pairs used, 49 (i.e., 4.08%) were derived from C5mCGG methylated sites. Three of these C5mCGG sites were exclusive to the juvenile plant material, and three sites were exclusive to the mature source. No fragments were associated specifically with leaf morphology, rather than with plant age. Thus, although the two age classes could not be distinguished based on a quantitative HPLC measure of DNA methylation, qualitative differences existed, as demonstrated by the six age-specific markers identified by MSAP. The reliability of the MSAP data was confirmed on a larger sample of juvenile plant material, which suggested that the total of six methylation markers detected is probably an underestimation of the age-related differences in DNA methylation that may exist between juvenile and mature plant materials.

Record 112 of 143 - AGRICOLA 1998-2004/09

AU: Prenner,-G.

TI: New aspects in floral development of Papilionoideae: initiated but suppressed bracteoles and variable initiation of sepals.

SO: Annals of botany. 2004 May, v. 93, no. 5 p. 537-545.

AB: Background and Aims: The increase of molecular data and the resulting insights into legume systematics make the search for new morphological characters and a careful re-investigation of already stated characters necessary. Bracteoles are small, reduced leaves borne close to the base of lateral branches. Although they seem unimportant in older buds, they have an ecological function in protecting the sepal primordia. Furthermore, a morphogenetic function in mediating the onset of sepal initiation is suspected in the literature. The occurrence of bracteoles varies within Papilionoideae, and their distribution is used in legume systematics. But this is open to criticism, because there is a tendency to use 'absent' for ' caducous'. Thus attention here was paid to the initiation of bracteoles as well as to the sequence of sepal initiation. Methods The floral development of 30 taxa out of 15 tribes of Papilionoideae was investigated using scanning electron microscopy (SEM). Key Results: In five taxa the bracteoles initiated, but suppressed early. Furthermore, a broad variability of sepal initiation was found. Besides the widely stated unidirectional pattern, modified unidirectionality, tendencies towards whorled, fully whorled, bidirectional and successive initiation of sepals were all found. Conclusion: Initiated but suppressed bracteoles are presented as a new' character in Papilionoideae. Considering the presence of bracteoles as a plesiomorphy, their suppression can be seen as a step towards completely reduced bracteoles. The remarkable variability of the sequence of sepal initiation questions the widely stated unidirectionality of organ initiation in Papilionoideae. The different modes of sepal initiation are deducible from the helical pattern of some caesalpinioids, which is seen as a developmental link of the flowers of Papilionoideae and Caesalpinioideae. The bidirectional sepal initiation is possibly a consequence of the morphogenetic function of bracteoles,

although bidirectionality is not found in all taxa with reduced bracteoles.

Record 113 of 143 - AGRICOLA 1998-2004/09
AU: Shi,-J.; Arunasalam,-K.; Yeng,-D.; Kakuda,-Y.; Mittal,-G.; Jiang,-Y.
TI: Saponins from edible legumes: chemistry, processing, and health benefits.
SO: Journal of medicinal food. 2004 Spring, v. 7, no. 1 p. 67-78.

Record 114 of 143 - AGRICOLA 1998-2004/09
AU: Marx,-J.
TI: The roots of plant-microbe collaborations.
SO: Science. 2004 Apr. 9, v. 304, no. 5668 p. 234-236.

Record 115 of 143 - AGRICOLA 1998-2004/09
AU: Agbede,-J.O.; Aletor,-V.A.
TI: Chemical characterization and protein quality evaluation of leaf protein concentrates from Glyricidia sepium and Leucaena leucocephala.
SO: International journal of food science and technology. 2004 Mar., v. 39, no. 3 p. 253-261.
AB: Leaves and leaf protein concentrates (LPCs) from leaves of Glyricidia sepium and Leucaena leucocephala were analysed for chemical constituents. The protein quality of the LPC, with or without dl-methionine supplementation, was estimated by using sixty weanling albino rats. Glyricidia leaves contained higher crude protein and lower crude fibre than L. leucocephala leaves, while the ash values were identical. In the LPCs, crude protein showed a good balance of amino acids and nutritionally important minerals. The gross energy (GE) was only enhanced in the LPC of Glyricidia and, although tannin content was reduced in the LPCs, the phytate concentration increased. The rat bioassay did not suggest that, even when supplemented with dl-methionine, Glyricidia or Leucaena LPC would support rat growth when used as the sole sources of dietary protein. Based on the analytical and bioassay data, the nutritional potentials and limitations of these under-utilized protein resources are discussed.

Record 116 of 143 - AGRICOLA 1998-2004/09
AU: Kmiecik,-W.; Korus,-A.; Lisiewska,-Z.
TI: Evaluation of physico-chemical and sensory quality of frozen green grass pea (Lathyrus sativus L.).
SO: International journal of food science and technology. 2004 Feb., v. 39, no. 2 p. 149-155.
AB: The quality of grass peas (cv. Krab) intended for freezing was estimated at four degrees of seed maturity. The retention of basic physico-chemical in dices such as dry matter, sugars, dietary fibre, total acids, total nitrogen, protein nitrogen and ash, as well as the sensory quality of frozen seeds prepared for consumption were used as the criteria in determining the overall quality value. Relative to fresh grass peas, the losses in cooked frozen seeds reached 47-64% for the content of reducing sugars, 36-53% of total sugars, 7-14% of starch, 2-4% of dietary fibre, 13-16% of total acids, 8-9% of total nitrogen and 4-6% of protein nitrogen. In cooked frozen seeds, differences between the first and the fourth maturity degree reached 47% in the case of dry

matter content, 71% for starch, 166% for dietary fibre, 12% for acids, 51% for total nitrogen and 94% for protein nitrogen. The sensory quality of the cooked frozen grass peas was estimated to be from 4.17 to 4.77 on a 5-score scale, and decreased with increasing seed maturity.

Record 117 of 143 - AGRICOLA 1998-2004/09

AU: Chimphango,-S.B.M.; Musil,-C.F.; Dakora,-F.D.

TI: Responses to ultraviolet-B radiation by purely symbiotic and NO3-fed nodulated tree and shrub legumes indigenous to southern Africa.

SO: Tree physiology. 2004 Feb., v. 24, no. 2 p. 181-192.

AB: Purely symbiotic and NO3-fed nodulated seedlings of Virgilia oroboides (Bergius) T.M. Salter, Cyclopia maculata (L.) Vent and Podalyria calyptrata Willd. were exposed to biologically effective ultraviolet-B radiation (UV-B) to assess the effects of above- and below-ambient UV-B on growth, symbiotic function and metabolite concentrations. Seedlings were grown outdoors either on tables under ambient or 34 or 66% above-ambient UV-B conditions (UV-B(100) control, UV-B(134) and UV-B(166), respectively), or in chambers providing below-ambient (22% of ambient) UV-B (UV-B(22)) along with a UV-A control and a photosynthetically active radiation (PAR) control. Exposure of seedlings to UV-B(166) radiation reduced (P less than or equal to 0.05) leaf and stem dry mass by 34 and 39%, respectively, in C. maculata, and reduced leaf nitrogen concentration (%N) by 12% in V. oroboides. Nodule %N in C. maculata and stem %N in P. calyptrata also decreased (P less than or equal to 0.05) in response to UV-B(22) radiation compared with the UV-A control, but not compared with the PAR control. Concentrations of flavonoids, soluble sugars and starch were unaltered by the UV-B treatments. Application of 1 mM NO3 to UV-B(166)-treated seedlings increased whole-plant dry mass of V. oroboides and P. calyptrata by 47 and 52%, respectively. Dry mass of organs, nodule %N and total N concentration of these species also increased with NO3 application. However, NO3 supply decreased (P less than or equal to 0.05) nodule dry mass, stem %N and leaf %N as well as root and leaf anthocyanin concentrations in C. maculata. In terms of UV-B x N interactions, dry mass of stems, roots, nodules and total biomass of NO3-fed C. maculata seedlings were reduced, and nodule %N, total N and leaf anthocyanins were depressed by the UV-B(134) and UV-B(166) treatments relative to UV-B(100)-treated seedlings. Although we found that above-ambient UV-B had no effects on growth and symbiotic function of V. oroboides and P. calyptrata seedlings, feeding NO3 to these species increased (P less than or equal to 0.05) seedling growth. In contrast, purely symbiotic C. maculata seedlings were sensitive to the UV-B(166) radiation treatment, and adding NO3 further increased their sensitivity to both the UV-B(134) and UV-B(166) treatments.

Record 118 of 143 - AGRICOLA 1998-2004/09

AU: Fraser,-J.; McCartney,-D.; Najda,-H.; Mir,-Z.

TI: Yield potential and forage quality of annual forage legumes in southern Alberta and northeast Saskatchewan.

SO: Canadian journal of plant science = Revue Canadienne de phytotechnie. 2004 Jan., v. 84, no. 1 p. 143-155.

Record 119 of 143 - AGRICOLA 1998-2004/09

AU: Zentner,-R.P.; Campbell,-C.A.; Biederbeck,-V.O.; Selles,-F.; Lemke,-R.; Jefferson,-P.G.; Gan,-Y.

TI: Long-term assessment of management of an annual legume green manure crop for fallow replacement in the Brown soil zone.

SO: Canadian journal of plant science = Revue Canadienne de phytotechnie. 2004 Jan., v. 84, no. 1 p. 11-22.

Record 120 of 143 - AGRICOLA 1998-2004/09

AU: Bhardwaj,-H.L.; Hamama,-A.A.; Van-Santen,-E.

TI: White lupin performance and nutritional value as affected by planting date and row spacing.

SO: Agronomy journal. 2004 Mar.-Apr., v. 96, no. 2 p. 580-583.

AB: White lupin (Lupinus albus L.) is a potential alternative winter grain legume crop for the mid-Atlantic region of the United States. However, information about suitable production technology and nutritional quality of lupin grown in this region is unavailable. We studied the performance of a determinate cultivar (Lucyanne) and an indeterminate cultivar (Lunoble) during 1998-1999 and 1999-2000 growing seasons to identify optimum planting time and row spacing and to examine the nutritional quality of lupin. Three row spacings (0.3, 0.6, and 0.9 m) were evaluated in each of the three planting dates: early October, late October, and mid-November. The indeterminate cultivar was taller and had a 26% higher seed yield (4.8 Mg ha-1) than the determinate cultivar (3.8 Mg ha-1). A delay in planting time from early October to late October or mid-November decreased both seed yield (5.6, 4.1, and 3.2 Mg ha-1, respectively) and plant height (0.77, 0.64, and 0.53 m, respectively). The highest seed yield (5. 9 Mg ha-1) was recorded for the row spacing of 0.3 m. Row spacing did not affect seed size or plant height. Cultivar, planting date, and row-spacing effects on protein and sugar concentrations were not significant. Delayed planting reduced, whereas narrow row spacing increased, oil concentration. The mean protein, sugar, and oil contents in Virginia-grown lupin seed were 347, 73, and 75 g kg-1, respectively. These preliminary experiments indicated that indeterminate cultivar had a yield advantage over the determinate cultivar, the optimal planting time was early October, and the optimal row spacing was 0.3 m.

Record 121 of 143 - AGRICOLA 1998-2004/09

AU: Guretzky,-J.A.; Moore,-K.J.; Burras,-C.L.; Brummer,-E.C.

TI: Distribution of legumes along gradients of slope and soil electrical conductivity in pastures.

SO: Agronomy journal. 2004 Mar.-Apr., v. 96, no. 2 p. 547-555.

AB: Legumes establish and persist on backslope landscape positions but fail on summits and toeslopes in southeastern Iowa pastures, suggesting that these pastures be managed site specifically. Visual delineation of landscape positions, however, can be difficult, and characterization of spatial variability through soil sampling is expensive. Creation of digital elevation models (DEM) and apparent soil electrical conductivity (EC(a)) mapping are inexpensive alternatives to describing field conditions. Our objective was to examine the relationship of DEM-derived slope, soil EC(a), and legume distribution in pastures. We examined these relationships across four 1.4-ha pastures. Each pasture was

divided into 0.46-ha plots that were assigned one of three stocking treatments: continuous, rotational, and nongrazed. We found that legumes, as a percentage of pasture cover, were greatest at 15 to 20% slopes and intermediate values of soil EC(a) . The absolute EC(a) value at which legumes were maximized varied by plot within each stocking system and year EC(a) was measured. When EC(a) was standardized by pasture and year, however, a nonlinear response curve explained 23 to 42% of the variation of legume cover across the plots. Grazing reduced competition from smooth brome (Bromus inermis Leyss.) and reed canarygrass (Phalaris arundinacea L). These grasses dominated at 0 to 8% slopes and where EC(a) was either low or high in value. We concluded that slope and soil EC(a) data are useful in identifying sites where legumes are successful in pastures and showed potential for use in site-specific management of pastures.

Record 122 of 143 - AGRICOLA 1998-2004/09

AU: Sweeney,-D.W.; Moyer,-J.L.

TI: In-season nitrogen uptake by grain sorghum following legume green manures in conservation tillage systems.

SO: Agronomy journal. 2004 Mar.-Apr., v. 96, no. 2 p. 510-515.

AB: With renewed interest in legumes as green manures, it is important to understand their effect on in-season N uptake of following nonlegume row crops. This study assessed the effect of legumes as green manures on in-season N uptake by subsequent grain sorghum [Sorghum bicolor (L.) Moench] grown in conservation tillage systems in the eastern Great Plains. Treatments were (i) red clover (Trifolium pratense L.) and hairy vetch (Vicia villosa Roth) before grain sorghum vs. continuous grain sorghum, (ii) reduced or no-tillage, and (iii) fertilizer N rates. The experiment was conducted on two adjacent sites (Parson silt loam: fine, mixed thermic Mollic Albaqualf) similar in organic matter but Site 1 higher in pH, P, and K than Site 2. In-season N uptake was often statistically greater in reduced-tillage than no-tillage systems. At both sites, red clover as a previous crop resulted in about 25% greater N uptake by sorghum vs. sorghum grown continuously with no previous legume crop. Nitrogen uptake by sorghum at the boot and soft dough growth stages responded linearly to increasing N rate, but the slope was <0.2, indicating low fertilizer N efficiency on this soil. Calculated N fertilizer equivalencies were >135 kg ha-1 during the first year for both legumes at each site, but values for red clover remained greater than those for hairy vetch in subsequent years, especially at the higher fertility site. Grain yield tended to be maximized when N uptake at the soft dough stage exceeded 100 kg ha-1 at Site 2 but continued to increase as N uptake increased at the higher-fertility Site 1. Utilizing legumes as green manures can increase in-season N uptake by following grain sorghum crops compared with continuous sorghum in these prairie soils.

Record 123 of 143 - AGRICOLA 1998-2004/09

AU: Lauriault,-L.M.; Kirksey,-R.E.

TI: Yield and nutritive value of irrigated winter cereal forage grass-legume intercrops in the Southern High Plains, USA.

SO: Agronomy journal. 2004 Mar.-Apr., v. 96, no. 2 p. 352-358.

AB: With dwindling water supplies, alfalfa (Medicago sativa L.) and corn (Zea mays L.) producers in the Southern High Plains (USA)

seek alternative forages for the dairy industry. At New Mexico State University's Agricultural Science Center at Tucumcari, cereal forage monocultures and intercrops with legumes were subjected to two irrigation treatments during two growing seasons in a Canez fine sandy loam (fine-loamy, mixed, thermic Ustollic Haplargid). Dry matter (DM) yield of monocultures averaged 3.76, 3.90, 5.55, 5.59, and 3.17 Mg ha-1 for rye (Secale cereale L.), barley (Hordeum vulgare L.), wheat (Triticum aestivum L.), triticale (x Triticosecale rimpaui Wittm.), and oat (Avena sativa L.), respectively. Cereal forages irrigated once in a growing season yielded equally to those watered twice with average precipitation (2000-2001, 408 mm), but not in a dry growing season (2001-2002, 245 mm) (6.15, 5.41, 1.90, and 3.21 Mg ha-1 for cereal forages irrigated once or twice in 2000-2001 or 2001-2002, respectively). Also, levels of forage nutritive components were greatest when irrigated once in 2001-2002. Intercropping with winter pea [Pisum sativum subsp. arvense (L.) Poir] or hairy vetch (Vicia villosa Roth.) reduced yield of wheat and triticale compared with monocultures, but these yields were still greater than those of the other cereal forages and winter pea improved quality indicators when intercropped with wheat or triticale. Water can be conserved in the Southern High Plains by irrigating cereals only as needed for germination or to promote fall growth.

Record 124 of 143 - AGRICOLA 1998-2004/09

AU: Edwards,-M.E.; Choo,-T.S.; Dickson,-C.A.; Scott,-C.; Gidley,-M.J.; Reid,-J.S.G.

TI: The seeds of Lotus japonicus lines transformed with sense, antisense, and sense/antisense galactomannan galactosyltransferase constructs have structurally altered galactomannans in their endosperm cell walls.

SO: Plant physiology. 2004 Mar., v. 134, no. 3 p. 1153-1162.

AB: Galactomannan biosynthesis in legume seed endosperms involves two Golgi membrane-bound glycosyltransferases, mannan synthase and galactomannan galactosyltransferase (GMGT). GMGT specificity is an important factor regulating the distribution and amount of (1 to 6)-(alpha)-galactose (Gal) substitution of the (1 to 4)-(beta)-linked mannan backbone. The model legume Lotus japonicus is shown now to have endospermic seeds with endosperm cell walls that contain a high-Gal galactomannan (mannose [Man]/Gal = 1.2-1.3). Galactomannan biosynthesis in developing L. japonicus endosperms has been mapped, and a cDNA encoding a functional GMGT has been obtained from L. japonicus endosperms during galactomannan deposition. L. japonicus has been transformed with sense, antisense, and sense/antisense ("hairpin loop") constructs of the GMGT cDNA. Some of the sense, antisense, and sense/antisense transgenic lines exhibited galactomannans with altered (higher) Man/Gal values in their (T1 generation) seeds, at frequencies that were consistent with posttranscriptional silencing of GMGT. For T1 generation individuals, transgene inheritance was correlated with galactomannan composition and amount in the endosperm. All the azygous individuals had unchanged galactomannans, whereas those that had inherited a GMGT transgene exhibited a range of Man/Gal values, up to about 6 in some lines. For Man/Gal values up to 4, the results were consistent with lowered Gal substitution of a constant amount of mannan backbone.

Further lowering of Gal substitution was accompanied by a slight decrease in the amount of mannan backbone. Microsomal membranes prepared from the developing T2 generation endosperms of transgenic lines showed reduced GMGT activity relative to mannan synthase. The results demonstrate structural modification of a plant cell wall polysaccharide by designed regulation of a Golgi-bound glycosyltransferase.

Record 125 of 143 - AGRICOLA 1998-2004/09

AU: Sadras,-V.O.; Roget,-D.K.

TI: Production and environmental aspects of cropping intensification in a semiarid environment of southeastern Australia.

SO: Agronomy journal. 2004 Jan.-Feb., v. 96, no. 1 p. 236-246.

AB: Low and highly variable rainfall are major sources of risk for farms in semiarid environments, including the Mallee region of Australia where risk management is largely based on a conservative, low-input approach. This approach has substantial opportunity costs (missing the benefits of wetter seasons) and low yield per unit rainfall. We combined field and modeling experiments to evaluate an intensive, flexible cropping approach based on (i) an opportunistic combination of crops, including wheat (Triticum aestivum L), canola (Brassica napus L.), and grain legumes, and (ii) a close matching of N input to soil and seasonal conditions. In a 4-yr field trial established on a coarse-textured soil, an intensive cropping approach doubled gross margin and halved its coefficient of variation in relation to current practice. Modeling experiments revealed the underlying mechanisms of this response and estimated the effect of cropping intensification on N leaching and deep drainage. Simulated yield improvement under intensive cropping was related to increased water use efficiency [biomass per unit evapotranspiration (ET)] at the expense of N use efficiency (biomass per unit of N uptake); this is consistent with the theoretical expectation that plant growth is maximized when all resources are equally limiting. Simulations indicated no substantial increase in N leaching and moderate decrease in drainage beyond the root zone with the more intensive approach. The approach to intensification in this research provides a platform to improve production and profit and to reduce its seasonal variation with neutral or positive effects on environmentally relevant processes.

Record 126 of 143 - AGRICOLA 1998-2004/09

AU: Yang,-J.; Han,-K.H.

TI: Functional characterization of allantoinase genes from Arabidopsis and a nonureide-type legume black locust.

SO: Plant physiology. 2004 Mar., v. 134, no. 3 p. 1039-1049.

AB: The availability of nitrogen is a limiting factor for plant growth in most soils. Allantoin and its degradation derivatives are a group of soil heterocyclic nitrogen compounds that play an essential role in the assimilation, metabolism, transport, and storage of nitrogen in plants. Allantoinase is a key enzyme for biogenesis and degradation of these ureide compounds. Here, we describe the isolation of two functional allantoinase genes, AtALN (Arabidopsis allantoinase) and RpALN (Robinia pseudoacacia allantoinase), from Arabidopsis and black locust (Robinia pseudoacacia). The proteins encoded by those genes were predicted to have a signal peptide for the secretory pathway, which is

consistent with earlier biochemical work that localized allantoinase activity to microbodies and endoplasmic reticulum (Hanks et al., 1981). Their functions were confirmed by genetic complementation of a yeast mutant (dal1) deficient in allantoin hydrolysis. The absence of nitrogen in the medium increased the expression of the genes. In Arabidopsis, the addition of allantoin to the medium as a sole source of nitrogen resulted in the up-regulation of the AtALN gene. The black locust gene (RpALN) was differentially regulated in cotyledons, axis, and hypocotyls during seed germination and seedling growth, but was not expressed in root tissues. In the trunk wood of a mature black locust tree, the RpALN gene was highly expressed in the bark/ cambial region, but had no detectable expression in the sapwood or sapwood-heartwood transition zone. In addition, the gene expression in the bark/cambial region was up-regulated in spring and fall when compared with summer, suggesting its involvement in nitrogen mobilization.

Record 127 of 143 - AGRICOLA 1998-2004/09

AU: Xie,-D.Y.; Jackson,-L.A.; Cooper,-J.D.; Ferreira,-D.; Paiva,-N.L.

TI: Molecular and biochemical analysis of two cDNA clones encoding dihydroflavonol-4-reductase from Medicago truncatula.

SO: Plant physiology. 2004 Mar., v. 134, no. 3 p. 979-994.

AB: Dihydroflavonol-4-reductase (DFR; EC1.1.1.219) catalyzes a key step late in the biosynthesis of anthocyanins, condensed tannins (proanthocyanidins), and other flavonoids important to plant survival and human nutrition. Two DFR cDNA clones (MtDFR1 and MtDFR2) were isolated from the model legume Medicago truncatula cv Jemalong. Both clones were functionally expressed in Escherichia coli, confirming that both encode active DFR proteins that readily reduce taxifolin (dihydroquercetin) to leucocyanidin. M. truncatula leaf anthocyanins were shown to be cyanidin-glucoside derivatives, and the seed coat proanthocyanidins are known catechin and epicatechin derivatives, all biosynthesized from leucocyanidin. Despite high amino acid similarity (79% identical), the recombinant DFR proteins exhibited differing pH and temperature profiles and differing relative substrate preferences. Although no pelargonidin derivatives were identified in M. truncatula, MtDFR1 readily reduced dihydrokaempferol, consistent with the presence of an asparagine residue at a location known to determine substrate specificity in other DFRs, whereas MtDFR2 contained an aspartate residue at the same site and was only marginally active on dihydrokaempferol. Both recombinant DFR proteins very efficiently reduced 5-deoxydihydroflavonol substrates fustin and dihydrorobinetin, substances not previously reported as constituents of M. truncatula. Transcript accumulation for both genes was highest in young seeds and flowers, consistent with accumulation of condensed tannins and leucoanthocyanidins in these tissues. MtDFR1 transcript levels in developing leaves closely paralleled leaf anthocyanin accumulation. Overexpression of MtDFR1 in transgenic tobacco (Nicotiana tabacum) resulted in visible increases in anthocyanin accumulation in flowers, whereas MtDFR2 did not. The data reveal unexpected properties and differences in two DFR proteins from a single species.

Record 128 of 143 - AGRICOLA 1998-2004/09

AU: Taylor,-G.B.
TI: Effect of temperature and state of hydration on rate imbibition in soft seeds of yellow serradella.
SO: Australian journal of agricultural research. 2004, v. 55, no. 1 p. 39-45.

Record 129 of 143 - AGRICOLA 1998-2004/09
AU: Bellinder,-R.R.; Dillard,-H.R.; Shah,-D.A.
TI: Weed seedbank community responses to crop rotation schemes.
SO: Crop protection. 2004 Feb., v. 23, no. 2 p. 95-101.
AB: Improved weed management strategies may be possible through rotational schemes which alter the weed seedbank community. This study investigated the effects of 2-year crop rotations with alfalfa (Medicago sativa L.), clover (Trifolium pratense L.), rye (Secale cereale L.), or sweet corn (Zea mays L. var. rugosa Bonaf.) on weed seedbank density and diversity at three sites in New York. Weed seedbank density and diversity increased under all rotational schemes over the 2 years, but increases were generally lowest after sweet corn, in which tillage and herbicides were used. By the end of the second year, seed densities of individual weed species had changed to different extents in response to rotational crop. Most of the instances in which seed densities increased significantly were associated with rye. Although pre- and post-emergence herbicides plus tillage were used with sweet corn, weed seedbank densities were similar compared with the alfalfa and clover rotations, in which no herbicides nor tillage were used. Our results indicate that legumes could be a component in the sustainable management of weeds through manipulation of the seedbank. A rye cover crop did not appear to deter seed return nor recruitment to the seedbank as much as the legumes did.

Record 130 of 143 - AGRICOLA 1998-2004/09
AU: Annicchiarico,-P.; Piano,-E.
TI: Indirect selection for root development of white clover and implications for drought tolerance.
SO: Journal of agronomy and crop science = Zeitschrift fur Acker- und Pflanzenbau. 2004 Feb., v. 190, no. 1 p. 28-34.

Record 131 of 143 - AGRICOLA 1998-2004/09
AU: Pangga,-I.B.; Chakraborty,-S.; Yates,-D.
TI: Canopy size and induced resistance in Stylosanthes scabra determine anthracnose severity at high CO2.
SO: Phytopathology. 2004 Mar., v. 94, no. 3 p. 221-227.
AB: This study examines the relative importance of canopy size and induced resistance to Colletotrichum gloeosporioides at 350- and 700-ppm atmospheric CO(2) concentrations on susceptible Stylosanthes scabra 'Fitzroy' from two studies in a controlled environment facility (CEF) and in the field. Plants were grown at the two CO(2) concentrations in a repeated experiment in the CEF and inoculated at 6, 9, or 12 weeks of age. Although the physiological maturity of plants was at a similar stage for all three ages, the number of lesions per plant increased with increasing plant age at both CO(2) concentrations. At 350 ppm, the increase was associated with canopy size and increasing infection efficiency of the pathogen, but at 700 ppm, it was associated only with canopy size, because infection efficiency did not change with increasing age. A level of resistance was

induced in plants at 700 ppm CO(2). In a second study, plants were raised for 12 to 14 weeks at the two CO(2) concentrations in the CEF and exposed to C. gloeosporioides inoculum in replicated field plots under ambient CO(2) over three successive years. Fitzroy developed a dense and enlarged canopy, with 28 to 46% more nodes, leaf area, and aboveground biomass at high CO(2) than at low CO(2). Up to twice as many lesions per plant were produced in the high CO(2) plants, because the enlarged canopy trapped many more pathogen spores. The transient induced resistance in high CO(2) plants failed to operate when exposed to pathogen inoculum under ambient CO(2) in the field. These results highlight the need to consider both canopy size and host resistance in assessing the influence of elevated CO(2) on plant disease.

Record 132 of 143 - AGRICOLA 1998-2004/09
AU: Latham,-L.J.; Jones,-R.A.C.; Coutts,-B.A.
TI: Yield losses caused by virus infection in four combinations of non-persistently aphid-transmitted virus and cool-season crop legume.
SO: Australian journal of experimental agriculture. 2004, v. 44, no. 1 p. 57-63.

Record 133 of 143 - AGRICOLA 1998-2004/09
AU: Sivakumaran,-S.; Meagher,-L.P.; Foo,-L.Y.; Lane,-G.A.; Fraser,-K.; Rumball,-W.
TI: Floral procyanidins of the forage legume red clover (Trifolium pratense L.).
SO: Journal of agricultural and food chemistry. 2004 Mar. 24, v. 52, no. 6 p. 1581-1585.
AB: The chemical characteristics of the purified procyanidin polymers of the flowers of the forage legume red clover (Trifolium pratense L.) were studied by 13C NMR, acid-catalyzed degradation with benzyl mercaptan, and electrospray ionization mass spectrometry (ESI-MS). The 13C NMR showed that the fraction consisted of predominantly procyanidin polymers. The thiolysis reaction products indicated a mean degree of polymerization (mDP) of 9.3 with epicatechin (81%) as the abundant flavan-3-ol extension unit and the terminating units dominated by catechin (95%). ESI-MS showed a range of oligomeric procyanidin ions (DP of 2-11). The white clover floral prodelphinidins consist of terminal units with nearly equal proportions of epigallocatechin (52%) and gallocatechin (48%) and extender units showing epigallocatechin (56%) and gallocatechin (39%). The dramatic difference in the stereochemistry of the terminal and extender units observed for the red clover floral procyanidins contrasts with the mixture of cis and trans stereochemistry observed for white clover floral prodelphinidins.

Record 134 of 143 - AGRICOLA 1998-2004/09
AU: Yigzaw,-Y.; Gorton,-L.; Solomon,-T.; Akalu,-G.
TI: Fermentation of seeds of teff (Eragrostis teft), grass-pea (Lathyrus sativus), and their mixtures: aspects of nutrition and food safety.
SO: Journal of agricultural and food chemistry. 2004 Mar. 10, v. 52, no. 5 p. 1163-1169.
AB: Fermentation of pure teff (Eragrostis teff), pure grass-pea (

Lathyrus sativus), and their mixtures, 9:1 and 8:2 (teff/grass-pea) has been done at two temperatures (room temperature and 35ÀC) in duplicate using the strains of Lactobacillus plantarum, for bacterial fermentation, and Aspergillus oryzae and Rhizopus oligosporus in succession for solid-state fungal fermentation as inocula. In addition, the natural or spontaneous and back-slopping methods of bacterial fermentation have been done on the above four substrate groups. The pH and essential amino acid profiles of the different fermentation processes were compared. The back-slopping in teff at a temperature of 35ÀC gave the sharpest pH drop. All fermentations done at 35ÀC showed a steeper slope in their pH versus time plot compared to their room temperature counterpart. Fungal fermentation gave an improved amino acid profile for the essential ones in all of the substrate groups, except in pure grass-pea. Fermented teff/grass-pea (8:2) in this fungal fermentation has been found to be quite comparable in essential amino acid profile to an ideal reference protein recommended for children of 2-5 years of age. None of the bacterial fermentations produced a net change in their essential amino acid profile in any of the substrate groups investigated. Solid state fungal fermentation on pure grass-pea using the fungal strains R. oligosporous and A. oryzae in succession has shown that the neurotoxin Wgb-N-oxalyl-a,b-diaminopropionic acid(Wgb-ODAP) in grass-pea has been removed by 80% on average for the high-toxin variety and by up to 97% for the low-toxin variety as determined by an improved chromatographic method with bioelectrochemical detection coupled on-line with refractive index detection.

Record 135 of 143 - AGRICOLA 1998-2004/09

AU: Ane,-J.M.; Kiss,-G.B.; Riely,-B.K.; Penmetsa,-R.V.; Oldroyd,-G.E. D.; Ayax,-C.; Levy,-J.; Debelle,-F.; Baek,-J.M.; Kalo,-P.

TI: Medicago truncatula DMI1 required for bacterial and fungal symbioses in legumes.

SO: Science. 2004 Feb. 27, v. 303, no. 5662 p. 1364-1367.

AB: Legumes form symbiotic associations with both mycorrhizal fungi and nitrogen-fixing soil bacteria called rhizobia. Several of the plant genes required for transduction of rhizobial signals, the Nod factors, are also necessary for mycorrhizal symbiosis. Here, we describe the cloning and characterization of one such gene from the legume Medicago truncatula. The DMI1 (does not make infections) gene encodes a novel protein with low global similarity to a ligand-gated cation channel domain of archaea. The protein is highly conserved in angiosperms and ancestral to land plants. We suggest that DMI1 represents an ancient plant-specific innovation, potentially enabling mycorrhizal associations.

Record 136 of 143 - AGRICOLA 1998-2004/09

AU: Levy,-J.; Bres,-C.; Geurts,-R.; Chalhoub,-B.; Kulikova,-O.; Duc,-G.; Journet,-E.P.; Ane,-J.M.; Lauber,-E.; Bisseling,-T.

TI: A putative Ca2+ and calmodulin-dependent protein kinase required for bacterial and fungal symbioses.

SO: Science. 2004 Feb. 27, v. 303, no. 5662 p. 1361-1364.

AB: Legumes can enter into symbiotic relationships with both nitrogen-fixing bacteria (rhizobia) and mycorrhizal fungi. Nodulation by rhizobia results from a signal transduction pathway

induced in legume roots by rhizobial Nod factors. DMI3, a Medicago truncatula gene that acts immediately downstream of calcium spiking in this signaling pathway and is required for both nodulation and mycorrhizal infection, has high sequence similarity to genes encoding calcium and calmodulin-dependent protein kinases (CCaMKs). This indicates that calcium spiking is likely an essential component of the signaling cascade leading to nodule development and mycorrhizal infection, and sheds light on the biological role of plant CCaMKs.

Record 137 of 143 - AGRICOLA 1998-2004/09
AU: Puhler,-A.; Arlat,-M.; Becker,-A.; Gottfert,-M.; Morrissey,-J.P.; O'Gara,-F.
TI: What can bacterial genome research teach us about bacteria-plant interactions.
SO: Current opinion in plant biology. 2004 Apr., v. 7, no. 2 p. 137-147.

Record 138 of 143 - AGRICOLA 1998-2004/09
AU: Kuster,-H.; Hohnjec,-N.; Krajinski,-F.; El-Yahyaoui,-F.; Manthey,-K.; Gouzy,-J.; Dondrup,-M.; Meyer,-F.; Kalinowski,-J.; Brechenmacher,-L.
TI: Construction and validation of cDNA-based Mt6k-RIT macro- and microarrays to explore root endosymbioses in the model legume Medicago truncatula.
SO: Journal of biotechnology. 2004 Mar. 4, v. 108, no. 2 p. 95-113.

Record 139 of 143 - AGRICOLA 1998-2004/09
AU: Aregheore,-E.M.; Perera,-D.
TI: Effect of supplementation of a basal diet of maize stover with Erythrina variegata, Gliricidia sepium or Leucaena leucocephala on feed intake and digestibility by goats.
SO: Tropical animal health and production. 2004 Feb., v. 36, no. 2 p. 175-189.

Record 140 of 143 - AGRICOLA 1998-2004/09
AU: Gowda,-N.K.S.; Ramana,-J.V.; Prasad,-C.S.; Singh,-K.
TI: Micronutrient content of certain tropical conventional and unconventional feed resources of Southern India.
SO: Tropical animal health and production. 2004 Jan., v. 36, no. 1 p. 77-94.

Record 141 of 143 - AGRICOLA 1998-2004/09
TI: Sod-based rotations : a proven old practice to improve soil productivity.
SO: Auburn, AL : Soil Quality Institute, [2004]

Record 142 of 143 - AGRICOLA 1998-2004/09
AU: Esseling,-John.
TI: From signal to form : nod factor as a morphogenetic signal molecule to induce symbiotic responses in legume root hairs.
SO: [Wageningen : s.n., 2004?] 152 p. : ill. (some col.)

Record 143 of 143 - AGRICOLA 1998-2004/09
AU: Muzquiz,-M.
TI: Recent advances of research in antinutritional factors in legume seeds and oilseeds : proceedings of the Fourth International

Workshop on Antinutritional Factors in Legume Seeds and Oilseeds, Toledo, Spain, 8-10 March 2004.

SO: Wageningen : Wageningen Academic Publishers, 2004. 370 p. : ill.