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1. Susan B. Mallek, Timothy S. Prather, James J. Stapleton,

Interaction effects of Allium spp. residues, concentrations and soil temperature on seed germination of four weedy plant species

Applied Soil Ecology, Volume 37, Issue 3, November 2007, Pages 233-239, ISSN 0929-1393, 10.1016/j.apsoil.2007.07.003.
(http://www.sciencedirect.com/science/article/pii/S0929139307000844)

Abstract: Summary

Soil in laboratory microcosm experiments was amended with dried and milled crop residues of onion (Allium cepa L. cv. Mission) or garlic (A. sativa L. cv. California Early). The amendments, along with the additional factors of amendment concentration (0, 1 or 3% (w/w)) and soil temperature (23 or 39 °C), were evaluated with respect to germination of seeds of the weedy annual plants Echinochloa crus-galli (L.) Beauv. (barnyardgrass), Portulaca oleracea L. (common purslane), Sisymbrium irio L. (London rocket) and Solanum nigrum L. (black nightshade). Deleterious effects of seed exposure to 39 °C versus 23 °C were demonstrated in ECHCG, POROL, and SSYIR; and to increasing amendment concentration and the [concentration × temperature] interaction in all four plant species tested (P < 0.05). The effect of garlic versus onion amendment was significant only in SOLNI, where garlic residues demonstrated more herbistatic and/or herbicidal activity. The results of these experiments showed that the garlic and onion plant residues were capable of causing significant reductions in seed germination during their decomposition in soil, but only at elevated (39 °C versus 23 °C) soil temperature. At the agricultural level, activity of these residues could be exploited as a component of integrated weed management using appropriate crop sequencing, and may extend utility of soil heating treatments (e.g. solarization) for weed control to cooler climates or seasons, or for shorter treatment durations.

Keyword :Allium sativa; Biofumigation; Echinochloa crus-galli; Portulaca oleracea; ;Sisymbrium irio; ;Solanum nigrum; Solarization

2. Domenico Caridi, V. Craige Trenerry, Simone Rochfort, Samantha Duong,Dianne Laugher, Rod Jones,

Profiling and quantifying quercetin glucosides in onion (Allium cepa L.) varieties using capillary zone electrophoresis and high performance liquid chromatography,

Food Chemistry, Volume 105, Issue 2, 2007, Pages 691-699,
ISSN 0308-8146, 10.1016/j.foodchem.2006.12.063.
(http://www.sciencedirect.com/science/article/pii/S0308814607000441)

Abstract: **Summary**

There is increasing evidence that flavonols demonstrate beneficial properties for human health. Quercetin is the major flavonol present in onion (Allium cepa cv) and is present predominantly as quercetin 3,4′-diglucoside and quercetin 4′-monoglucoside. These compounds are known to be potent free radical scavengers and antioxidants, and are considered to be protective against cardiovascular disease. Analysis for the presence of these compounds has therefore become more important. Robust capillary zone electrophoresis and high performance liquid

chromatography procedures were developed for profiling and quantifying the levels of quercetin 3,4′-diglucoside and quercetin 4′-monoglucoside in 70% methanol/water extracts of six different onion varieties available in Victoria, Australia. Quercetin 3,4′-diglucoside, which is not commercially available as a reference standard, was isolated from freeze-dried onion powder by preparative high performance liquid chromatography and used to quantify the levels in the onion extracts. Significant differences in the levels and ratios of the two compounds were seen between red, brown and white onion varieties (e.g. ‘Redwing’; quercetin 3,4′-diglucoside 191 mg/100 g DW, quercetin 4′-monoglucoside 85 mg/100 g DW; ‘Cream Gold’, quercetin 3,4′-diglucoside 153 mg/100 g DW, quercetin 4′-monoglucoside 58 mg/100 g DW, ‘Spanish white’; quercetin 3,4′-diglucoside <1 mg/100 g DW, quercetin 4′-monoglucoside <1 mg/100 g DW).

Keywords: Profiling; Quantification; Quercetin glucosides; Onion; Capillary electrophoresis; High performance liquid chromatography

3. Satyendra Kumar, M. Imtiyaz, Ashwani Kumar, Rajbir Singh,
Response of onion (Allium cepa L.)to different levels of irrigation water, **Agricultural Water Management**, Volume 89, Issues 1-2, 16 April 2007, Pages 161-166,
ISSN 0378-3774, 10.1016/j.agwat.2007.01.003.
(http://www.sciencedirect.com/science/article/pii/S037837740700025X)

Abstract: **Summary**

The study analyses the response of onion to different irrigation levels with microsprinkler irrigation system. The four treatments comprised different ratio of irrigation water (IW) to cumulative pan evaporation (CPE) namely 0.60 (T1), 0.80 (T2), 1.0 (T3) and 1.20 (T4). Irrigation had significant effect on growth parameters of onion and subsequently influenced the crop yield. The best yields were recorded from T3 and T4, associated with the higher percentage of bulbs having diameter greater than 45 mm. Protein content in bulbs was highest when associated to T1, but the loss in marketable produce during the storage was also highest in T1. Irrigation water use efficiency and water use efficiency both were highest in T2 and then declined with the increase in irrigation. Hence, in water constraint situation, T2 would be the most appropriate irrigation level for onion production with microsprinkler irrigation system. Production functions of yield versus irrigation water applied and yield versus crop evapotranspiration were found to be polynomial. The developed functions can be used as a guide to yield potential allocation decision related to limited irrigation water.

Keywords: Irrigation; Water use efficiency; Bulb yield; Yield characteristics; Onion

4. M.P. Ortega-Larrocea, C. Siebe, A. Estrada, R. Webster, Mycorrhizal inoculum potential of arbuscular mycorrhizal fungi in soils irrigated with wastewater for various lengths of time, as affected by heavy metals and available P,

Applied Soil Ecology, Volume 37, Issues 1-2, October 2007, Pages 129-138, ISSN 0929-1393, 10.1016/j.apsoil.2007.06.002.
(http://www.sciencedirect.com/science/article/pii/S0929139307000753)

Abstract: Summary

Sewage water is widely used for irrigation in dry countries, but the practice can lead to the accumulation of heavy metals in the soil and consequent poisoning of the soil's microorganisms. The area irrigated with sewage water in the Mezquital Valley in central Mexico has steadily expanded during the last 100 years, and it provides the opportunity to assess the effects of the practice on the mycorrhiza in particular.
We sampled the topsoil of the two main kinds of soil, Vertisol and Leptosol, in fields irrigated for 5, 35, 65 and 95 years in the Valley. We measured the concentrations of zinc, lead, copper and cadmium, all of which appeared to have increased linearly with time. We also determined the abundances of arbuscular mycorrhizal morphotypes in the soil both at the time of sampling and after incubation in association with Allium cepa L. in the greenhouse.
Spores decreased in abundance with increasing duration of irrigation in the Vertisol, whereas in the Leptosol the numbers after only 5 years of irrigation were small, increased after 35 years of irrigation and decreased again thereafter. In the greenhouse the production of spores and sporocarps was maximal in soil irrigated for between 35 and 65 years, as were the intraradical hyphae, spores and vesicles. Glomus species dominate the morphotypes, and the spores of Glomus mosseae were the most abundant in both soils and after all times.
The total root colonization potential seemed unaffected by duration of irrigation, and was substantially greater in the Leptosol than in the Vertisol. However, species of the Glomus genus tend to dominate over other genera as irrigation proceeds, since Glomus species spread not only by spores, but also by roots. We conclude that irrigation with sewage water in the Mezquital Valley is decreasing the mycorrhizas' diversity in the long term.
Keywords: Arbuscular mycorrhiza; Sewage effluent; Leptosol; Vertisol; Soil inoculum

2008

1. S. Sarkar, S.B. Goswami, S. Mallick, M.K. Nanda

Different indices to characterize water use pattern of micro-sprinkler irrigated onion (Allium cepa L.)
Agricultural Water Management, Volume 95, Issue 5, May 2008, Pages 625-632, ISSN 0378-3774, 10.1016/j.agwat.2008.01.002.
(http://www.sciencedirect.com/science/article/pii/S0378377408000188)

Abstract: Summary
The amount of water used by any crop largely depends on the extent to which the soil water depletion from the root zone is being recharged by appropriate depth of irrigation. To test this hypothesis a field study was carried out in November–March of 2002–2003 and 2003–2004 on a sandy loam (Aeric haplaquept) to quantify the effect of depth of irrigation applied through micro-sprinklers on onion (Allium cepa L.) bulb yield (BY) and water use patterns. Seven irrigation treatments consisted of six amounts of sprinkler applied water relative to compensate crop (Kc) and pan (Kp) coefficient-based predicted evapotranspiration loss from crop field (ETp) (i) 160% of ETp (1.6ETp); (ii) 1.4ETp; (iii) 1.2ETp; (iv) 1.0ETp; (v) 0.8ETp; (vi) 0.6ETp; (vii) 40 mm of surface applied water whenever cumulative pan evaporation equals to 33 mm. Water use efficiency (WUE), net evapotranspiration efficiency

(WUEET) and irrigation water use efficiency (WUEI) were computed. Marginal water use efficiency (MWUE) and elasticity of water productivity (EWP) of onion were calculated using the relationship between BY and measured actual evapotranspiration (ETc). Yield increased with increasing sprinkler-applied water from 0.6 to 1.4ETp. Relative to the yield obtained at 0.6ETp, yield at 1.0ETp increased by 23–25% while at 1.4ETp it was only 3–9% greater than that at 1.0ETp. In contrast, yield at 1.6ETp was 9–12% less than that at 1.4ETp. Maximum WUE (7.21 kg m−3) and WUEET (13.87 kg m−3) were obtained under 1.0ETp. However, the highest WUEI (3.83 kg m−3) was obtained with 1.2ETp. The ETc associated with the highest WUE was 20% less than that required to obtain the highest yields. This study confirmed that critical levels of ETc needed to obtain maximum BYs, or WUE, could be obtained more precisely from the knowledge of MWUE and EWP.

Keywords: Onion; Allium cepa L.; Sprinkler irrigation; Water use efficiency; Water use indices

2009

1. R. López-Urrea, F. Martín de Santa Olalla, A. Montoro, P. López-Fuster, Single and dual crop coefficients and water requirements for onion (Allium cepa L.) under semiarid conditions,

Agricultural Water Management, Volume 96, Issue 6, June 2009, Pages 1031-1036,
ISSN 0378-3774, 10.1016/j.agwat.2009.02.004.
(http://www.sciencedirect.com/science/article/pii/S037837740900033X)

Abstract: Summary

The objectives of this study were to determine onion water requirements with a sprinkler irrigation system, the most usual irrigation method in Spain. A weighing lysimeter was used to measure single (Kc) and dual (Kcb + Ke) crop coefficient curves and obtain the relationship between Kc-ground cover (GC) and Kcb-GC. Experimental work was carried out in 2005 at “Las Tiesas” farm, located in Albacete (Central Spain). To determine actual onion evapotranspiration (ETc), we used a weighing lysimeter with continuous electronic data recording. Daily measured ETc values obtained by the lysimeter were compared to calculated ETc values obtained through the standard FAO methodology [Allen, R.G., Pereira, L.S., Raes, D., Smith, M., 1998. Crop evapotranspiration. Guidelines for computing crop water requirements. FAO Irrig. and Drain. Paper 56. Rome, Italy]. Seasonal evapotranspiration measured in the lysimeter (893.34 mm) was higher than the seasonal ETc calculated by FAO-56 method (832.90 mm). The percentage of GC was found through the supervised classification technique of digital photographic images with the maximum probability algorithm [Calera, A., Martínez, C., Melia, J., 2001. A procedure for obtaining green plant cover: relation to NDVI in a case study for barley. Int. J. Remote Sensing, 22, 3357–3362]. The values derived from lysimetric measurements are Kc ini: 0.65, Kc mid: 1.20 and Kc end: 0.75, similar to values given in FAO-56. Lysimetric measurements showed that the evaporative component was high during the growing season, due to the high frequency of irrigation and the fact that the onion crop does not completely cover the ground; maximum GC was 72%. Therefore, the dual crop coefficient was calculated,

which allowed differentiation between crop transpiration (basal crop coefficient, Kcb) and evaporation from the soil (evaporation coefficient, Ke). With the aim of facilitating extrapolation of the results to other areas, Kc and Kcb were linearly correlated to fractional GC.

Keywords: Lysimeter; Crop evapotranspiration; Single crop coefficient; Dual crop coefficient; Ground cover; Onion

2. Katherine Downes, Gemma A. Chope, Leon A. Terry,
Effect of curing at different temperatures on biochemical composition of onion (Allium cepa L.) skin from three freshly cured and cold stored UK-grown onion cultivars, Postharvest

Biology and Technology, Volume 54, Issue 2, November 2009, Pages 80-86, ISSN 0925-5214, 10.1016/j.postharvbio.2009.05.005.
(http://www.sciencedirect.com/science/article/pii/S0925521409000970)

Abstract: **Summary**

Onions are cured in order to form a complete, dry, outer skin which reduces water loss and suppresses incidence of disease, and can promote a darker skin finish. Currently in the UK, standard curing practises for onions involves heating at 28 °C for six weeks (65–75% RH), however, reducing curing temperatures may help to reduce energy usage. There is little empirical data on the effects of curing temperature on flavonol concentration in the skin of brown onions and on flavonol and anthocyanin concentration in the skin of red onions. Therefore, the aim of this study was to elucidate the compounds responsible for the change in onion skin colour when cured at different temperatures.

Brown cvs. Sherpa and Wellington, and red onions cv. Red Baron, were cured at 20, 24 or 28 °C for six weeks. Replicated skin samples were analysed immediately after curing and after seven months cold storage at 1 ± 0.5 °C. Measurement of objective colour showed that skin of cvs. Sherpa and Wellington was darker and had a lower hue angle (H°) immediately after being cured at 28 °C compared to 20 °C. In contrast, skin of cv. Red Baron had a higher H° but no change in lightness (L*) when cured at 28 °C compared to 20 °C. Fructose, sucrose and glucose concentrations were analysed as they are thought to play a role in regulating the synthesis of flavonols and anthocyanins, both coloured compounds found in onion skin; however no significant correlations were found between colour data and sugar concentrations. Flavonols were measured in the skin of all cvs. and anthocyanins in the skin of cv. Red Baron. Quercetin glucoside and anthocyanin concentrations in the skin of onions cv. Red Baron immediately after curing were higher in those cured at 20 °C. Total flavonols and total anthocyanins were negatively correlated with H° in the skin of onions cv. Red Baron, but there was no similar correlation between total flavonols and H° for onion cvs. Sherpa and Wellington. This suggests that anthocyanins and flavonols may play a major role in varying skin colour of red onions cv. Red Baron cured at different temperatures; however, the difference between curing temperatures may not have been sufficient to represent a correlation between darkening of cvs. Sherpa and Wellington and flavonol concentration. Further investigation is therefore required to fully elucidate the compounds responsible for colour changes observed in brown onions.

Keywords: Anthocyanins; Flavonols; Fructose; Glucose; Objective colour

3. Juan Enciso, Bob Wiedenfeld, John Jifon, Shad Nelson,

Onion yield and quality response to two irrigation scheduling strategies,
Scientia Horticulturae, volume 120, Issue 3, 1 May 2009, Pages 301-305,
ISSN 0304-4238, 10.1016/j.scienta.2008.11.004.
(http://www.sciencedirect.com/science/article/pii/S0304423808004548)

Abstract: Summary

Irrigation technologies that conserve water are necessary to assure the economic and environmental sustainability of commercial agriculture. This study was conducted in the Rio Grande Valley in Texas to evaluate yield and quality of subsurface drip irrigated onions (Allium cepa L.) using different scheduling strategies and water stress levels. One strategy consisted of initiating irrigation when the reading of a granular matrix sensors (Watermark®11Mention of a trademark, proprietary product or vendor does not constitute a guarantee or warranty of the product, nor does it imply approval or disapproval to the exclusion of other products or vendors that may also be suitable.
soil moisture sensor, Irrometer, Co., Riverside, CA) installed at 0.2 m depth reached −20 kPa (optimum), −30 kPa and −50 kPa. The second strategy was to replace 100%, 75%, and 50% of crop evapotranspiration (ETc) weekly. Higher total yields, and jumbo onion size yields were obtained when the soil moisture was kept above −30 kPa. Yields were not affected when water applications were reduced from 100% to 75% ETc and from −20 to −30 kPa. The ETc strategies of 100%, and 75% ETc resulted in similar water usage to the soil moisture monitoring strategies of initiating irrigation at −20 and −30 kPa. Total yields dropped significantly when soil water stress increased below −50 kPa. For the ET based strategy yields also dropped with the 50% ETc treatment. Onion bulb pungency and brix were unaffected by water level.

Keywords: Onion; Irrigation scheduling; Yield; Quality

2010

1. Jongtae Lee,

Effect of application methods of organic fertilizer on growth
soil chemical properties and microbial densities in organic bulb onion production
Scientia Horticulturae, Volume 124, Issue 3, 5 April 2010, Pages 299-305, ISSN 0304-4238, 10.1016/j.scienta.2010.01.004.
(http://www.sciencedirect.com/science/article/pii/S0304423810000075)

Abstract: Summary

This study was carried out to maximize the fertilization efficiency of mixed organic fertilizer (OF) for organically managed onion (Allium cepa L.) production during the one growing season of 2005–2006. The organic fertilizer was made of organic materials like sesame oil cake, rice bran and molasses and minerals like illite and mountainous soil. Four organic topdressing treatments, which all followed the same basal fertilization with solid OF, consisted of solid OF without mulch (OF/OFnM), liquid organic fertilizer without mulch (OF/LOFnM), liquid organic fertilizer under mulch (OF/LOFuM) and liquid organic fertilizer over mulch (OF/LOFoM). Chemical fertilizer (CF) and no fertilizer (NF) were treated as controls. The solid organic fertilization base was 2.0 ton ha−1, and 4.57 ton ha−1 and was used for topdressing. The total amount of liquid organic fertilization was 133.2 ton ha−1, which was divided into 6 applications from February through March. The OF/LOFuM and OF/LOFoM

topdressings did not reduce onion height, leaf number or bulb diameter as compared to chemical fertilizer, whereas no mulch treatments made onion growth significantly poorer. Onion top weight in CF was significantly higher than that in OF groups at the peak growth stage, while there was not much difference in bulb weight between the CF and OF/LOFoM treatment. Finally, the onion marketable yield was 45.9 ton ha−1 in the OF/LOFoM treatment, which exceeded that in the CF treatment by up to 1.9 ton. Furthermore, OF/LOFoM was the most effective among all the treatments in transferring the nutrients from sink to source. CF made the soil pH more acidic than OF did, and the electrical conductivity (EC) remained higher with CF than OF as well. While organic fertilizer helped to keep the NO3-N content stable throughout the growing season, the concentration rapidly oscillated up and down according to CF fertilization. Organic fertilizer increased population number of soil microorganisms like aerobes, actinomycetes in the field.

Keywords: Liquid organic fertilizer; Organic farming; Plastic mulch; Short-day onions; Allium cepa

2. Katherine Downes, Gemma A. Chope, Leon A. Terry,
Postharvest application of ethylene and 1-methylcyclopropene either before or after curing affects onion (Allium cepa L.) bulb quality during long term cold storage
Postharvest Biology and Technology, Volume 55, Issue 1, January 2010, Pages 36-44,
ISSN 0925-5214, 10.1016/j.postharvbio.2009.08.003.
(http://www.sciencedirect.com/science/article/pii/S0925521409001641)

Abstract: Summary

The storability of onion bulbs is dependent on the incidence and rate of sprout growth. Exogenous ethylene applied continuously has been demonstrated to act as a sprout suppressant in onion. However, the ethylene binding inhibitor, 1-methylcyclopropene (1-MCP), can also suppress sprouting in onion. Given this seemingly contradictory result, the precise role that ethylene plays during onion storage and the effect of curing on its efficacy is not understood.
Sherpa' and 'Wellington' onion bulbs were treated before or after curing (28 °C for 6 weeks) with a single dose of 10 µL L−1 ethylene or 1 µL L−1 1-MCP for 24 h at 20 °C, or no treatment (control). Replicated out-turns were sampled during 38 weeks storage at 0–1 °C. Sprout growth (31 weeks after harvest) was reduced in 'Sherpa' treated before curing with ethylene or before or after curing with 1-MCP. However, sprout growth of 'Wellington' was not affected by any treatment. Following treatment, the cured, thick-skinned 'Wellington' released a lower concentration of treatment gas compared with the newly harvested, thin-skinned 'Sherpa'. Onion bulb respiration rate increased immediately after being treated with ethylene but to a lesser extent or not at all when treated with 1-MCP. Fructose concentrations of onions treated with ethylene or 1-MCP before curing were not significantly different, however, after curing concentrations were about 2-fold higher compared with the control. Mean glucose and sucrose concentrations for both cultivars were higher immediately after being treated before curing with ethylene or 1-MCP than control bulbs. It appears that inhibition of sprout growth can be achieved using just a short 24 h treatment with ethylene or 1-MCP. However, skin thickness or permeability, which is dependent on cultivar and curing, may affect ethylene or 1-MCP influx and therefore efficacy of sprout suppressant action.

Keywords: Antioxidants; Respiration rate; Sprouting; Sugars

2011

1. Jorge E. Rattin, Silvia G. Assuero, Gastón O. Sasso, Jorge A. Tognetti, Accelerated storage losses in onion subjected to water deficit during bulb filling,

Scientia Horticulturae, Volume 130, Issue 1, 26 August 2011, Pages 25-31, ISSN 0304-4238, 10.1016/j.scienta.2011.06.026.
(http://www.sciencedirect.com/science/article/pii/S0304423811003165)

Abstract: **Summary**

Withholding irrigation during last stages of onion crops is a common practice to minimize losses in storage due to rots. However, it is unclear whether extended periods of water deprivation may affect bulb postharvest behaviour. In this study we analyze the effects of water deficit during the crop cycle on bulb weight loss and sprouting during storage. Two experiments were conducted: one in a glasshouse with two onion cultivars subjected to three treatments of water availability (100%, 80% and 60% of field capacity); the other in the field, with one of these cultivars, subjected to two water availability treatments (dryland and irrigated twice during bulb filling). In both experiments five destructive samplings were done along crop development to assess plant height, number of green leaves, bulb and neck diameter, and whole-plant dry weight. Bulbs were harvested when 50% or more of the tops fell over. Harvested bulbs were classified by weight and then kept in a ventilated chamber at a mean temperature of 15 °C and weighted every two weeks, up to six months. Water deficit led to a significant reduction of bulb size, an acceleration of sprouting and an increased rate of weight loss during storage in both cultivars and under both experimental conditions. Hence, restricted irrigation during extended periods may have negative effects on the conservation of stored onion bulbs which suggests the need to finely adjust water management in this crop.
Keywords: Allium cepa; Irrigation; Post-harvest life; Sprouting