

Effect of integrated weed management systems on seed bank of weeds grown in sugar beet (*Beta vulgaris* L.)

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Submitted: 16-08-2010

Accepted: 06-02-2011

Abstract

To compare the effects of different weed management methods on seed bank of weeds grown in sugar beet (*Beta vulgaris* L.), a field experiment was conducted at the Agricultural Research Station, Ferdowsi University of Mashhad, Iran, during 2006, 2007 and 2008. The experiment designed as a complete randomized block with three replications. The treatments including: disk+ fhenmedifham, disk+ fhenmedifham+ rotation, disk+ cultivation, disk+ cultivation+ rotation, met amitron+ fhenmedifham, met amitron+ fhenmedifham+ rotation, met amitron+ cultivation, met amitron+ cultivation+ rotation, covercrop+ fhenmedifham, covercrop+ cultivation, weeding, weeding+ fhenmedifham and control. Soil samples were taken (in the base of clustering method) in two depths of 0-10 cm and 10-20 cm, at two stages, early season and late season. Results showed that at the first experiment highest and lowest seed bank size obtained in control plots (383 seeds per kg of soil) and weeding+fhenmedifham (52 seeds per kg soil). At the second year maximum and minimum seed bank size were observed in control and weeding treatment with 1080 and 319 seeds/kg soil, respectively. In two years, seed bank size in 0-10 cm depth was more than 10-20 cm depth. In the first and second years seed bank size at late season compare to early season was 2.2 and 1.7 times, respectively. In two years, significant coefficients were observed in seed bank size at early season and late season ($R^2=0.76$ and $R^2=0.65$). There were significant correlations between seed bank size in the first and second year ($R^2=0.71$) and between seed bank size and frequency of seedling ($R^2=0.77$).

Keywords: Density of seedling, Frequency of seed, Seed and seedling coloration

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Effect of wheat, alfalfa, corn, soybean and cotton residues on soil potassium content and its absorption by wheat (*Triticum aestivum* L.)

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Submitted: 19-08-2010

Accepted: 06-02-2011

Abstract

Crop residues management is one of the most important factors to sustain agro-ecosystems. Application of plant residues as organic fertilizers has functional role on the amount of soil elements, their availability for crops and finally yield obtained. In order to investigate the effect of different crop residues and their management on providing wheat potassium requirement, a four-replicated field experiment was carried out as a completely randomized block design on wheat (*Triticum aestivum* L.). Five plant residues with different C:N ratio (including cotton, soybean, alfalfa, wheat and corn) in companion with pure urea and control treatment (without residue or fertilizer) were incorporated as <5 mm particles size. The rate of residues and required nitrogen to avoid immobilization were calculated by determination of C:N ratio and nitrogen factor to provide 90 kg N.ha⁻¹. Soil extractable potassium was evicted by ammonium acetate extraction procedure after 49, 83, 99, 127, 165 and 175 days from beginning of experiment. The results showed that the effect of different residues on potassium release was significant just in booting growth stage. The highest concentration of K in booting stage belonged to alfalfa, wheat and corn residues (with corresponding values of 1663, 1637.6 and 1592.3 kg.ha⁻¹ soil respectively) while the lowest values belonged to cotton residue, urea and control (1472.6, 1425.4 and 1215 kg.ha⁻¹ soil, respectively). Assessing trend of potassium (K) uptake showed that the most K uptake in plants (36.62 g.kg⁻¹) occurred during the first 83 days (stem elongation) and in residue alfalfa treatment that the most K release (2375.7 kg.ha⁻¹) was also from those residues. Therefore, it seems that crop residues could be considered as potential internal inputs for agro-ecosystems with different capabilities. Generally, our results revealed that alfalfa residue is the best option to provide potassium for wheat plants and corn and wheat (with not-significant difference) were ordered after alfalfa.

Keywords: Ammonium acetate, Growth stage, Inside- field input, Straw

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The effect of light quality and quantity on morphological and physiological traits of maize (*Zea maize* L.) cultivars in greenhouse conditions

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Submitted: 21-08-2010

Accepted: 06-02-2011

Abstract

In order to study the effect of light quality and quantity on morphological and physiological characteristics of two late and early maize (*Zea maize* L.) S.C., an experiment was conducted in greenhouse conditions, Ferdowsi University of Mashhad, Iran, during 2008. The experiment was carried out factorial based on randomized complete block design with six treatments and three replications. Different light conditions (including natural light, additional two hours lighting after sunset, and reduction of the quality and quantity of light conditions during plants growth, were investigated. The results indicated that leaf area in both maize hybrids increased by light measured until 28 days, and then decreased compared to the natural lighting conditions. In comparison with natural light conditions the dry mater of leaf and stem was increased by adding light until flowering stage. Leaf area and dry weight was reduced in both hybrids with decreasing lighting conditions. Leaf length to width ratio increased by adding the lighting measure till the seventh leaf appearance and later on reduced. This ratio increased with reduction of light duration. Chlorophyll content increased by adding light duration till the sixth leaf appearance. The chlorophyll content of two hybrids in screen conditions decreased compared to other conditions. In general, leaf area, stem and leaf dry weights, height and lodging index of short season hybrid was lower than long season hybrids. The present study showed that extending light duration resulted in increasing of the dry weight and development stage of maize.

Keywords: Chlorophyll content, Dry weight, Height, Leaf area, Lodging index

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Study of wheat yield production over Esfahan province during periods of dry and wet years using MODIS satellite data

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Submitted: 26-08-2010

Accepted: 06-02-2011

Abstract

Technique of remote sensing and its satellite products has many implementations in agricultural science and national resources. In this study, wheat yield in Esfahan province, Iran, were derived from MODIS satellite data over periods of 2000-2001 (dry year) and 2004-2005 (wet year). For this purposes, 68 MODIS products of surface reflectance (MOD09GA) and land surface temperature LST (MOD11A2) over Esfahan in 8-day time step were collected. By using satellite data of LST and vegetation index NDVI, the amount of water stress during each time steps were estimated from a linear relation. Spatial distributions of active photosynthesis absorb radiation (APAR) were also estimated using NDVI index and meteorological data. Finally, cumulative dry matter as indicator of wheat yield was calculated using APAR, light use efficiency and water stress in each time. Actual biomass by using harvest index, converted to grain yield. The results indicated that the amount of dry matter in wet year (2004-2005) was 1.4 times of predicted production in the dry year (2000-2001). Isfahan city had the highest amount of increase and cities of Bigdel, Felavarjan, Ardestan showed the highest decrease in wheat yield production. Good trend of predicted yield with the observation data indicated a promise for application of this procedure for annual yield prediction before harvesting time in large regional scale.

Keywords: Absorbed photosynthetic active radiation, Biomass, Remote sensing

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Evaluation of base, optimum and ceiling temperature for (*Kochia scoparia* L. Schard) with application of Five-Parameters-Beta Model

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Submitted: 03-09-2010

Accepted: 06-02-2011

Abstract

Kochia (*Kochia scoparia* L. Schard) is an annual, halophyte and drought resistant plant, that it can be irrigated with saline water and a valuable source for forage under drought and saline ecosystems. In order to evaluate germination characteristics of *kochia*, an experiment was conducted at Physiology laboratory of Ferdowsi University of Mashhad, Iran, during 2009. This experiment was conducted in a completely randomized design with four replications. Germination was evaluated at 5, 10, 15, 20, 25, 30, 35 and 40°C under dark germinator with 50-60 percentage relative humidity. The results showed that the highest germination percentage was obtained at 20-30°C and the lowest obtained at 40°C. The longest and the shortest period to 20 and 50 germination percentage were recorded to 5-10°C and 20-30°C, respectively. The longest and the shortest period to 80 percentage germination were belonging to 15 and 30°C, respectively. Based on Five Parameters Beta model, base, optimum and ceiling temperatures for *kochia* estimated 3.4, 25 and 43.3°C, respectively. However, seed of this plant is able to germinate in wide temperature range.

Keywords: Cardinal temperature, Germination percentage, Germination rate

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Comparison of the profitability of conventional and organic crops (case study of cotton in Khorasan Razavi province)

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Submitted: 03-09-2010

Accepted: 06-02-2011

Abstract

Regard to increasing demand for organic agricultural products, awareness of costs and profitability of organic products can help to decision planners of agricultural sector, and particularly farmers. This study has tried to calculate cost and profitability of cotton product in two different conventional and organic ways (procedure) of production using 253 cross-sectional data from Khorasan Razavi cotton farmers during 2008 to 2009. The results showed with an increase in organic fertilizers consumption a year, animal fertilizer elasticity and consequently organic production cotton were increased. Also organic cotton profitability after six years was more than conventional products and organic cotton profitability in the transition period with increasing rate of price ($\gamma = 0.15$) after the transition period 1.66 will be the profitability of conventional cotton. According to the findings, supporting farmers in organic cultivation initial year (transition) either by financial incentives or extension services to encourage them to increase organic production and determination price of cotton organic guarantee purchase by the government as proposed were suggested.

Keywords: Conventional cotton, Organic cotton, Transition period

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Evaluation of biological control of Russian knapweed (*Acroptilon repens* L.) by applying flower-eater mite (*Aceria acroptiloni* Shevchenko & Kacalev) (Acari: Eriophyidae)

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Submitted: 16-09-2010

Accepted: 06-02-2011

Abstract

Russian knapweed (*Acroptilon repens* L.) is a perennial weed of Aceraceae that is becoming a dominant weed in suitable conditions. In order to find an ecological non-chemical approach for controlling Russian knapweed and studying the possibility of using flower-eater mite (*Aceria acroptiloni* Shevchenko & Kacalev) (Acari: Eriophyidae), a series of studies including field survey and field experiments were conducted in North Khorasan province, Agricultural Research Station of Shirvan College during spring 2010. Preliminary studies included collecting, identifying and screening of insects as biocontrol agents for Russian knapweed were carried out. In field survey studies, contaminated natural regions by flower-eater mite were recognized. At the end of growing season, 20 health and infested plants were selected and their height, flower number, shoot fresh weight and shoot dry weight were measured afterwards. In the field experiment, 40 similar plants with about one meter away from each other were selected. In addition, 40 plants (20 infested and 20 healthy plants) were transplanted to the pots, and then planted in a land with a distance of about 100 cm. After establishment, control plants were sprayed with an acaricide 20 shoots each that used as 'control' and 20 shoots that infested with the mite were randomly selected. Russian knapweed shoots infested with the mite *Aceria acroptiloni* in a natural infestation were collected and observed under the binocular for the presence of the mite. The infested shoots were put in small vials filled with water, and transfer one shoot beside each of the 20 shoots that were selected for mite infestation. Mite infestation of the test shoots after two weeks was checked and in case the test shoots did not show signs of mite attack after four weeks, plants were infested again. As soon as the Russian knapweed leaves start wilting (when the green colour disappears), all 40 shoots were cut at the ground level. Each shoot put in a separate envelope, and the envelope labeled. In the laboratory, shoot height, fresh shoot weight, dry shoot weight, number of flower heads, numbers of seeds were recorded. The results showed that the mite did not feed from all plants except on Russian knapweed. Application of mite reduced the number of flowers by 68% in natural conditions. In the field conditions, it could reduce the number of flowers by 59% in the nature plants and 11% in transplanted plants. Since this mite was able to reduce vegetative and reproductive organs of Russian knapweed, it could be considered as a potential promising biological control agent for using in ecological agriculture.

Keywords: Biocontrol, Flower-eater mite, Natural enemy, Weed

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The effect of various micronutrient foliar applications and irrigation regimes on quantitative and qualitative yields of isabgol (*Plantago ovata* Forsk.)

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Submitted: 25-09-2010

Accepted: 06-02-2011

Abstract

The responses of isabgol (*Plantago ovata* Forsk.) to micronutrient foliar application under low irrigation condition were investigated. The experiment was carried out in Agricultural Research Farm of Zabol University, Iran, during growing season of 2007-2008. The experiment was conducted in spilt plot using randomized complete block design with four replications. Three irrigation regimes defined as normal irrigation, one time lack of irrigation before flowering and one time lack of irrigation after flowering were used as the main plots. Five levels of micronutrient foliar application including: control unit, four ppt of Fe, three ppt of Zn, four ppt of Mn, and a mixture of these elements were considered as subplots. The results indicated that the seed and biological yield, seed number per spike, spike number per plant and thousand seed weight were significantly affected by irrigation regimes. The maximum seed yield obtained in control plots with normal irrigation. The seed yield diminish in treatments of one time lack of irrigation before flowering and one time lack of irrigation after flowering was 14.9 and 20.1 percentage, respectively. The seed and biological yield, mucilage yield, seed number per spike and thousand seed weight were significantly affected by micronutrient foliar application. The maximum seed yield was observed in Zn treatment with 22.12% yield more than control. The maximum mucilage yield and percent were found in the treatment of one time lack of irrigation before flowering and the maximum turgid index in treatment of one time lack of irrigation after flowering. The micronutrient foliar application showed positive effect on seed, biological, and mucilage yields. The maximum seed yield was obtained in normal irrigation with micronutrient foliar application.

Keywords: Irrigation regime, Mucilage, Seed yield, Spike number, Turgid index

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Influence of cover crops and mulch management on yield and yield components and in safflower (*Carthamus tinctorius* L.)

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Submitted: 25-09-2010

Accepted: 06-02-2011

Abstract

In order to evaluate the effect of cover crops and mulch management on yield and yield components of safflower (*Carthamus tinctorius* L.), a study was conducted as split-plot based on a complete randomized block design with four replications during 2008-2009. The mulch managements as main factor were consisted of three levels including incorporation of cover crops with soil, harvesting + removing, and harvesting + surface mulch, and three cover crops were considered as subplots (triticale, common vetch, and intercropping triticale + common vetch). Also, a non cover crop was considered as control beside the experiment. The result showed that there was a significant difference between different mulch managements for heads per plant and seed yield. The highest head no. per plant was observed in surface mulch and harvesting treatments. Also, the highest safflower seed yield was observed in mixture of triticale + common vetch and triticale + surface mulch treatments. The plants in intercropped triticale + common vetch and triticale + surface mulch treatments produced 22.49 and 10.48 percent more seed yield than control, respectively.

Keywords: Mulch, Organic matter, Sustainable agriculture

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Effect of mycorrhizal fungi and phosphorus fertilizer on concentration of leaf nutrients and photosynthetic pigments of common bean (*Phaseolus vulgaris* L.) under salinity stress condition

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Submitted: 13-10-2010

Accepted: 06-02-2011

Abstract

In order to investigate the effect of Mycorrhizal fungi and phosphorus fertilizer on concentration of leaf nutrients and photosynthetic pigments of bean (*Phaseolus vulgaris* L.) in condition of irrigation with saline water, an experiment was conducted based on completely randomized design with three replications in greenhouse of Bahonar University of Kerman, Iran during 2010. The studied factors were water salinity (500 (control), 2000, 4000 and 6000 $\mu\text{s.cm}^{-1}$), phosphorus fertilizer (0, 100 and 200 mg.kg^{-1} soil) in form of Triple super phosphate and mycorrhizal fungi with three levels (*Glomus mosseae* and *Glomus intraradices* and no fungi (control)). The results showed that the concentrations of chlorophyll a, chlorophyll b, total chlorophyll, carotenoids, K, Ca and P were decreased with increasing of salinity levels. But salinity increased the concentration of Na and Na/K ratio. Mycorrhizal fungi had no significant effect on concentration of Ca and chlorophyll a. The interaction of salinity and phosphorus fertilizer on concentration of chlorophyll b, Na and P was significant. Results demonstrated that *Glomus intraradices* had better effect on improvement of photosynthetic pigments concentration and concentration of nutrition elements. In low levels of salinity stress, use of Mycorrhizal fungi with phosphorus fertilizer, can reduce the negative effects of salt by increasing of concentration of photosynthetic pigments and nutrition elements.

Keywords: Biological fertilizer, Chlorophyll, Salinity of irrigation water

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Water use efficiency in medicinal pumpkin (*Cucurbita pepo* L. var. *styriac*)/ chickpea (*Cicer arietinum* L.)- lentil (*Lens esculenta* Moench.) intercropping system associated with several nitrogen levels

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Submitted: 13-10-2010

Accepted: 06-02-2011

Abstract

Although the physiological and morphological differences between intercropped species caused a higher WUE possibly, most researches on multiple cropping systems have focused on yields and the resources use efficiency (water, light and nutrients) has been less investigated. In addition, optimal use of nitrogen is important to attain sustainable agriculture due to its role in WUE improvement. The experiment carried out during 2008 growing season as split plot based on RCBD design. The main plots included different nitrogen levels (0, 75, 100 and 125 kg.ha⁻¹), which applied as urea and sub plots were three cropping systems consist of sole cropping of pumpkin (*Cucurbita pepo* L. var. *styriac*) seed and intercropped with four rows of lentil (*Lens esculenta* Moench.) and or chickpea (*Cicer arieinum* L.). The results showed that WUE and evapo-transpiration efficiency of medicinal pumpkin was affected by N application significantly. However no differences were observed between cropping systems with regard to total water use, WUE and evapo-transpiration efficiency. Intercropping has no significant effect on total water use, therefore, medicinal pumpkin/ chickpea- lentil intercropping systems can be recommended without any concern in terms of increasing of water consumption.

Keywords: Multiple cropping, Resources of production, Sustainable agriculture

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The effect of different species of mycorrhiza on phytohormone changes in soybean (*Glycine max* L.) by nano, biologic and chemical fungicides

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Submitted: 21-11-2010

Accepted: 06-02-2011

Abstract

In order to investigate the response of mycorrhizal fungi to different kinds of fungicides and phytohormone balance in soybean, the present study was carried out during 2008-2009 at Research Site of Azad University of Karaj branch as factorial based on randomized complete block design with two factors and four replications. Treatments were all combination of arbuscular mycorrhizal fungi species in four levels (*Glomus mosseae*, *G. etunicatum*, *G. intraradices*, control) and four fungicides [control, benomyl, Nano-silver and biologic (*Bacillus subtilis*)]. The results indicated that fungicides and mycorrhizal species had significant effect on phytohormones and mycorrhizal colonization. The mutualistic interaction between arbuscular mycorrhiza (AM) fungi and fungicide had significant effect on phytohormone changes. Gibberellin (GA), Auxin (AX) and cytokinin (CK) considerably increased in response to three species infection. *G. intraradices* inoculation brought about the largest increase (35.33%) in mycorrhizal colonization in comparison with control. The level of phytohormones significantly decreased in comparison with control by fungicide treatments. Mycorrhizal colonization decreased 44.12% by using *Bacillus subtilis* as biofungicide. AX, GA and CK concentrations decreased in AM-colonized plant when subjected to different fungicide treatments. Biofungicide had the most consistent effects towards *G. intraradices* and CK is found at about 2% higher in this treatment versus nonfungicide-mycorrhizal treatment. AX, GA and CK tended to decreased 53.58%, 63% and 85.23% by inhibition effects of benomyl on *G. etunicatum* infection in comparison with nonfungicide control. By using nano-silver, *G. mosseae* showed more susceptibility than the other species. In conclusion, stimulating of phytohormones synthesis by mycorrhizal association decreased under fungicides stress.

Keywords: Auxin, Colonization, Cytokinin, Gibberellin, Nano-silver

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