

Effects of organic, biological and chemical fertilizers on vegetative indices and essential oil content of coriander (*Coriandrum sativum* L.)

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Abstract

This experiment was conducted to study the effects of single and combined application of organic, biological and chemical fertilizers on qualitative and quantitative characteristics of vegetative part of coriander, (*Coriandrum sativum* L.). The experiment was carried out as split plot in time based on Complete Randomized Block Design with three replications and 12 treatments at Research Station, Faculty of Agriculture, Ferdowsi University of Mashhad, Iran, during growing season of 2010-2011. Treatments included: (1) mycorrhiza (*Glomus mosseae*), (2) biosulfur (*Thiobacillus* sp.), (3) chemical fertilizer (NPK), (4) cow manure, (5) vermicompost, (6) mycorrhiza + chemical fertilizer, (7) mycorrhiza + cow manure, (8) mycorrhiza + vermicompost, (9) biosulfur + chemical fertilizer, (10) biosulfur + cow manure, (11) biosulfur + vermicompost and (12) control. Vegetative parts of coriander were cut at 5% of flowering stage in two dates (19 May and 5 June). Results showed that the highest plant height (28 cm) and lateral branches (5.2) were obtained in combined application of biosulfur with cow manure treatment. The highest fresh and dry leaf weight, fresh and dry matter yield and stem dry matter weight were obtained in single application of chemical fertilizer. Single application of biosulfur increased leaf/stem ratio. The highest essential oil percentage and essential oil yield were observed in cow manure treatment (0.2% and 1753 g.ha⁻¹, respectively). The maximum leaf/stem ratio were observed in the first cutting, while the highest lateral branches, stem fresh and dry matter yield, essential oil percentage and essential oil yield were obtained in second cut. Overall, results of this study showed that the plant vegetative yield increased by using chemical fertilizer, while essential oil percentage and essential oil yield of coriander were improved by using organic and biological fertilizers.

Keywords: Biosulfur, Cutting, Leaf / stem ratio, Mycorrhiza, Yield

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Evaluation of multi-species weed competition and weeds population dynamic in corn (*Zea mays* L.) field

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Abstract

In order to examine the multi-species weed competition in corn field an experiment as an interval mapping was carried out at the Agricultural Research field of Ferdowsi University of Mashhad during growing season 2009-2010. At 3-4 leafy stages of corn, 20 non-destructive quadrates determine and the density of weeds was counted separately. At the same time, 20 destructive quadrates determine and in addition of counting number of plants, leaf area index and dry weight of each species were recorded separately. By using data from previous section, hyperbolic functions were fitted. In these functions number of species serve as the independent variable, weight or leaf area was considered as the dependent variable. With the help of these functions and leaf dry weight of each species was determined for non-destructive quadrates at this stage. Relative leaf area at early season as independent variables and natural logarithm of individual plant weight at later season as dependent variable in a multiple linear regression was fitted to obtain the interspecies competition coefficients. Based on ln of weight of single plant equation the weed interference effects on the corn yield can be divided into two groups: inhibition (negative sign) and stimulation (positive sign). Among all weeds, night shade (*Solanum nigrum* L.), redroot pigweed (*Amaranthus retroflexus* L.) and lambsquarter (*Chenopodium album* L.) had positive effects on corn yield, respectively. In fact, these weeds had competition and negative impacts on other weeds and reduced their competition power with corn and caused facilitation role on corn yield. At the end of growing season of corn, population of lambsquarter and Common purslane (*Portulaca oleracea* L.) decreased while population of barnyard grass (*Echinochloa crus-galli* L.), redroot pigweed and night shade increased.

Keywords: Competition, Competition Coefficient, Facilitation, Natural logarithm of individual plant weight

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Investigation the effects of soil texture and density on corm characteristics and flower yield of saffron (*Crocus sativus* L.)

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Abstract:

In order to investigate the effects of soil texture and density on corm and flower yield of Saffron (*Crocus sativus* L.) an experiment was conducted as a factorial layout based on complete randomized block design with three replications at the Faculty of Agriculture, Ferdowsi University of Mashhad during two growing seasons of 2009-2010 and 2010-2011. Treatment included 6 soil textures (clay loam, silty loam, loam, sandy loam, loamy sand and silt) with 2 plant densities (100 and 150 corms.m²). Results indicated that the corm number and dry weight were affected by soil texture, significantly ($p \leq 0.01$). The highest number and dry weight of corms were observed in loamy sand texture. Loamy sand, sandy loam and silty texture had the maximum flower number. The highest stigma yield was obtained in silty texture (1.22 g.m²), but with no significant difference with sandy loam. The lowest stigma yield was obtained in clay loam, loam and silty loam textures. A negative significant correlation was observed between clay percentage of soil and corm number and dry weight, flower number and flower and stigma yield. In two growing seasons, plant density didn't have significant effect on flower number, flower and stigma dry weight.

Keyword: Clay percentage, Dry weight, Flower number, Stigma

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Single and integrated effects of biological, organic and chemical fertilizers on quantitative and qualitative traits of milk thistle (*Silybum marianum* L.)

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Abstract

In order to study individual and integrated effects of biological, organic and chemical fertilizers on milk thistle (*Silybum marianum* L.) quantitative and qualitative traits, a field experiment was conducted at Research Station, Faculty of Agriculture, Ferdowsi University of Mashhad, Iran during growing season of 2010-2011. A complete randomized block design with twelve treatments and three replications was used. The treatments were: control, vermicompost (V), poultry manure (H), chemical fertilizer (CH), mycorrhiza (M) (*Glomus mosseae*), biosulfur (B) (*Thiobacillus* sp.), M+V, M+CH, M+H, B+V, B+CH, B+H. The results indicated that the all treatments affected the number of inflorescences per plant, inflorescences diameter and grain yield significantly and other traits weren't affected by treatments. However, mean comparisons proved promising results for reduction in application of chemical fertilizer and its replacement with biological and organic fertilizers. Application of biosulfur increased the number of seeds per capitula in comparison with control up to 73%. The maximum and the minimum amounts of yield were obtained in M and M+CH, respectively. Other factors affected the yield approximately in the same rate. There was a significant enhancement (26%) in seed oil percentage by using M+H compared to poultry manure. The highest silymarin related to the use of Mycorrhiza and the lowest was obtained in M+CH. The maximum silybin was observed in Mycorrhiza treatment. The application of simple and integrated fertilization systems of organic and biological fertilizers can be effective to achieve a balance in applying chemical fertilizers in order to improve soil fertility, increase soil organic matter and also approach sustainable agriculture in farming milk Thistle.

Keywords: Biosulfur, Mycorrhiza, Oil percentage, Poultry manure, Silymarin

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Response of yield and yield components of rice (*Oryza sativa* L. cv. Tarom Hashemi) in rice, duck and *Azolla* (*Azolla* sp.) farming

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Abstract

In order to evaluate the yield and yield components of rice (*Oryza sativa* L. cv. Tarom Hashemi) in integrated rice, duck and *Azolla*, an experiment was conducted at the Research Farm of Sari University of Agricultural Sciences and Natural Resources during 2012. Experiment was arranged in split plot based on a randomized complete block design with three replications. The number of ducks as main plots at four levels (0, 400, 800 and 1200 ducks.ha⁻¹) and Nitrogen source as sub plots at four levels (without *Azolla* and nitrogen, *Azolla*, *Azolla*+nitrogen and nitrogen) were the treatments. Analysis of variance showed highly significant differences for the number of ducks, *Azolla*+nitrogen and their interaction effects of plant height, number of tillers.plant⁻¹, number of panicle.plant⁻¹, number of grains.panicle⁻¹, panicle weight, panicle dry weight and grain yield. The results revealed that the highest values of plant height (133 cm), number of tillers (38 tillers.plant⁻¹), number of panicle (24 numbers.plant⁻¹), number of grains (171 numbers.panicle⁻¹), panicle weight (23 g), panicle dry weight (13 g) and grain yield (4 t.ha⁻¹) were recorded in 1200 duck pieces per hectare while treated with *Azolla* (500 g.m⁻²) and nitrogen (50 kg.ha⁻¹). In conclusion, results of the current experiment showed that increasing of duck number from 400 to 1200 pieces.ha⁻¹ along with *Azolla* and nitrogen could enhance the yield and yield components of rice (Tarom Hashemi cultivar).

Keywords: Integrated farming, Nitrogen, Organic farming, Paddy, Panicle

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Evaluation of intercropping of garlic (*Allium sativum* L.) with some medicinal plants in Ahvaz climatic conditions

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Abstract

To evaluate the potential of garlic in intercropping with medicinal plants, this study was conducted as a randomized complete block design with three replications at the Ramin Agriculture and Natural Resources University during growing season of 2011-2012. Treatments were including garlic intercropping with psyllium (*Plantago ovata* Forsk.), black seeds (*Nigella sativa* L.), ajowan (*Carum copticum* L.), fennel (*Foeniculum vulgare* Mill.), marigold (*Callendula officinalis* L.) and dill (*Anethum graveolens* L.) that planted with the 50:50 proportion and sole cropping of mentioned plants. Result showed that the highest relative advantage of garlic intercropping with medicinal plants in terms of relative value total (RVT) was shown in garlic intercropping with marigold. The most of the amount of increasing actual yield was related to intercropping of garlic with psyllium with 1.78 and was significant with intercropping of garlic and marigold with 1.64. The highest and the lowest garlic yield were observed in the sole cropping of garlic (7330 kg.ha^{-1}) and intercropping of garlic with ajowan (2300 kg.ha^{-1}), respectively and also yield of intercropping of garlic with psyllium (with 5560 kg.ha^{-1}) was in second significant level. When the number of irrigation (water required plant) increased, garlic yield was decreased. However, a direct relationship was found between total relative value and number of irrigation. Finally, intercropping of garlic with psyllium and marigold because of the highest amount of actual yield total (AYT) is proposed in Ahvaz condition.

Keywords: Interstitial culture, Land Equivalent Ratio (LER), Marigold, Relative Value Total (RVT), Psyllium

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Effect of application time of integrated chemical fertilizer with cattle manure on growth, yield and yield components of black seed (*Nigella sativa* L.)

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Abstract

One of the important aspects of the medicinal plants production is using less chemical inputs. It could be effective for increasing of production and environmental purposes. In order to investigate the effects of application time of integrated chemical fertilizer with cattle manure on growth, yield and yield components of black seed (*Nigella sativa* L.), an experiment was conducted based on a randomized complete block design with nine treatments and three replications in Research Farm of Shahrekord University during growing season 2011-2012. The treatments consisted of control (no amended nitrogen), cattle manure, urea, three levels of split integrated fertilizers such as $\frac{2}{3}$ cattle manure + $\frac{1}{3}$ urea, $\frac{1}{2}$ cattle manure + $\frac{1}{2}$ urea, $\frac{1}{3}$ cattle manure + $\frac{2}{3}$ urea, and three levels of full integrated fertilizers including $\frac{2}{3}$ cattle manure + $\frac{1}{3}$ urea, $\frac{1}{2}$ cattle manure + $\frac{1}{2}$ urea, $\frac{1}{3}$ cattle manure + $\frac{2}{3}$ urea. The results indicated that integrated application of cattle manure with chemical fertilizer caused significant increase in number of main branch per plant (%11.5), number of capsules per plant (%9.5), 1000-seed weight (%7.4), capsule weight (%5.9), and biological yield (% 36.7) of black seed. Full dose application of urea fertilizer with cattle manure (50:50) due to improve of capsules per plant and 1000-seed weight increased significantly grain yield (2397 kg.ha⁻¹). In general, use of integrated cattle manure with chemical fertilizer, full dose application of urea specially, with increasing of fertilizer efficiency led to improve of quantitative characteristic in black seed. This method caused to cost eliminates of top dressing fertilizer and it can be effective for environment and medicinal plant health.

Keywords: Animal manure, Separate application, Split application, Urea fertilizer

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Evaluation of yield and some physiological, morphological and phenological characteristics in sunflower (*Helianthus annuus* L.) influenced by biological and chemical fertilizer of nitrogen and phosphorus

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Abstract

In order to study the effect of biological and chemical fertilizers of nitrogen and phosphorus on yield and some physiological, morphological and phenological traits of sunflower (*Helianthus annuus* L.) this study was carried out in Eivanegharb (Ilam province) in summer of 2011. Treatments were arranged in a split factorial based on RCBD with three replications. The main plot include four levels of phosphorus and nitrogen chemical fertilizer (0, 33, 66 and 100% of nitrogen and phosphorus fertilizer requirements) and subplot includes factorial of Nitroxin and Phosphate Barvare 2 application with two levels (inoculation and non-inoculation) The results showed Nitroxin application increased significantly chlorophyll (8.4 percent). Chemical fertilizers had a significant effect on sunflower morphological characters, so that the use of 100% required chemical fertilizer compared to the control increased sunflower stem height 4.92 percent. Nitroxin and Phosphate Barvare2 interaction had a significant decrease effect on growth degree-day (GDD) needed until budding, so that in Nitroxin absence, Phosphate Barvare 2 application reduced the amount GDD needed until budding sunflower (38 units). Seed compared to the non-inoculation increased GDD needed for sunflower grain filling 2.25 and 2.60 percent, respectively. Finally base on this study can explain that sunflower seed inoculation with Nitroxin and Phosphate barvar2 biofertilizer in addition chemical fertilizer application, grain yield will increase trough improvement of different traits

Keywords: Budding, Nitroxin, Phosphate Barvare2, Seed yield

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The consequences of single and integrated application of Mycorrhiza and *Azospirillum* inoculants on yield and yield components of warm region wheat cultivars (*Triticum* spp.)

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Abstract

In order to study the consequences of single and integrated application of Mycorrhiza and *Azospirillum* inoculants on yield and yield components of wheat cultivars, an experiment was conducted in the research station of Shahid Chamran University of Ahvaz, Iran, during growing season of 2012-13. The experimental design was factorial based on randomized complete block design with three replications. The treatments including of Mycorrhiza fungi in three levels (no use of strain and using strain *Glomus intraradices* and *Glomus mossae*), bacteria *Azospirillum lipoferum* in the two-level (non-inoculated seeds and inoculated seed) and two wheat cultivars in three levels, Chamran (bread wheat), Dena and Behrang (durum wheat) varieties. Survey the traits such as spike density, hectoliter weight, grain yield, productivity index and several other traits indicate a significant and positive effect of used biofertilizers on wheat cultivars. So that cooperation of Mycorrhiza 7 to 33% and associative symbiosis of *Azospirillum* 4 to 32% improved traits. However, concurrent use, led to increase the use of biological fertilizers effects on wheat traits. But the highest seed thousand weights (52 g), grain yield and biological yield (1246.33 and 3000.9 g.m², respectively), the highest number of days to heading (71.33 days) and hectoliter weight (805.37 g.lit⁻¹) were obtained from inoculation of C.V Chamran seeds with *Azospirillum* and *G. mossae*. Thus, it can be stated that *Azospirillum* and Mycorrhiza for organic feeding of wheat bread and pasta are as suitable replacement for chemical fertilizers.

Keywords: Biological fertilizers, Hectoliter weight, Productivity Index, Spike density

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Yield and relative advantage of sunflower (*Helianthus annuus* L.) intercropping under different patterns with soybean (*Glycine max* L. Merrill) and corn (*Zea mays* L.) in Tabriz condition

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Abstract

In order to evaluate the yield and advantage of two- and three-species intercropping of sunflower (*Helianthus annuus* L.) with soybean (*Glycine max* L. Merrill) and corn (*Zea mays* L.), an experiment was conducted at the Research Farm of Faculty of Agriculture, Tabriz University during growing season 2010-2011. The experiment was arranged based on a randomized complete block design with 6 treatments and three replications. Treatments were included, replacement intercropping including two-species intercropping of sunflower with corn in ratio of 3:3, sunflower and soybean in ratio of 3:4, three-species intercropping of sunflower -soybean- corn at ratio of 3:4:3, three-species intercropping of sunflower- soybean-corn-soybean at ratio of 4:3:4:3, respectively; and additive intercropping of sunflower with soybean in ratios of 100: 20 and sunflower pure stand. Results indicated that there were not significant differences for plant height, chlorophyll content, seed weight and biological yield of sunflower between pure stand and intercropping. The sunflower leaf number was affected significantly by planting pattern and intercropping treatments had greater leaf number than its pure stand. The head diameter, number of seeds per head, seed yield and harvest index of sunflower in intercropping of sunflower-maize were lower than them in pure stand and other intercropping treatments. The two-species intercropping of sunflower-soybean had higher grain yield and harvest index than three-species intercropping of sunflower-soybean-corn. The highest and lowest values of land equivalent ratio (LER) were obtained in additive intercropping of sunflower-soybean (1.37) and replacement corn-sunflower (0.87). The three-species intercropping of sunflower-soybean-corn-soybean had greater LER (1.01) than intercropping of sunflower-soybean-corn (0.94). Using three crops in intercropping increased in yield and also would improve sustainability in agro-ecosystem.

Keywords: Chlorophyll index, Harvest index, Land equivalent ratio (LER), Replacement method, Seeds per head

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Effect of vermicompost and biofertilizers on some quantitative characteristics of basil (*Ocimum basilicum* L.)

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Abstract

Basil (*Ocimum basilicum* L.) belongs to the mint family, which is used as fresh vegetables, spices and medicinal plant. Nowadays excessive use of chemical inputs into the farming systems caused severe environmental problems such as soil and water pollution and declining soil fertility level. Using biological inputs rather than chemicals, has an important impact on the preservation of soil fertility and biological activity, improving the quantity of agricultural products and ecosystem health. A field study was carried out in factorial layout based on a randomized complete block design with four replications to evaluate the effect of biofertilizers on growth of basil at Research Station of Karaj Azad University in 2012 growing season. The experimental treatments were all combination of *Glomus intraradices*, *Azotobacter chroococcum* and vermicompost each one at two levels (with and without inoculation). Results showed that the triple use of mycorrhiza, *Azotobacter* and vermicompost increased plant height, number of leaves per plant, number of inflorescences per plant, stem diameter and fresh and dry matter, compared to control treatment. Concomitant use of mycorrhiza, *Azotobacter* and vermicompost was effective on growth parameters of basil.

Keywords: *Azotobacter*, Growth, Medicinal plants, Mycorrhiza

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Effect of irrigation interval on growth characteristics, qualitative and quantitative yield of tomato (*Solanum lycopersicum* L.) under mulch application

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Abstract

In order to study the effect of polyethylene sheet as mulch on water requirement and yield of tomato, an experiment was carried out as factorial layout based on a randomized complete block design with four replications in Fariman fields, during growing season of 2011. The first factor was mulching in two levels (with/without mulch applications) and the second factor was irrigation intervals in four levels (including 5, 7, 9 and 11 days intervals). The criteria such as plant height, the number of flowers and fruits, yield, fruit weight of tomato were measured. The result showed that the effect of mulch and irrigation interval treatments were significant on reproductive characteristics such as flower number, fruit number and fruit weight of tomato, but they had no significant impact on plant height. Plant height, number of flowers and fruit in mulch treatments were higher in comparison with without mulch. The highest yield was obtained from five days interval irrigation which had not significant difference with seven days irrigation intervals. At the first and the second sampling stages flower numbers with mulch application were higher than without mulch. The results showed that the mulching caused early ripening, increasing in reproductive growth and yield of tomato. In addition, using mulch can increase the irrigation intervals by two days which cause optimal use of water and the possibility of increasing cultivating area.

Keywords: Dark polyethylene, Irrigation interval, Reproductive, Yield

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Evaluation of wheat genotypes for yield and grain- filling rate of wheat genotypes under non stress and post anthesis drought stress conditions

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Abstract

In order to evaluate yield and grain filling rate and period of 10 wheat genotypes and comparison of stress indices among them, an experiment was carried out in Ardabil Agricultural Research Station under non stress and terminal water stress (stop irrigation after pollination stage) conditions based on randomized complete block design in three replications during 2009-2010 season. Analysis of variance showed that for grain yield, the genotype and environment effects were significant but their interaction was insignificant. Genotypes 2 (Bow"s"/Crow"s"/Kie"s"/Vee"s"/3/MV17) and 4 (Spb"s"/ K134 (60)Vee"s"/3/ Druchamps /4/Alvd) with 3830 and 3690 kg.ha⁻¹ produced the highest yield in terminal drought stress conditions. The effect of genotype, environment and their interaction were significant for grain filling rate and period. The correlation coefficient between traits indicated that there were negative correlation between grain filling rate and period. In terms of grain filling rate the genotype 7 (F130-L-1-12/MV12 (ATILLA-12) with 1.29 mg.day⁻¹ showed the highest filling rate in stress condition and the genotypes 3 (Owl/Siossons//Zrn), 4 (Spb"s"/K134(60)Vee"s"/3/Druchamps/4/Alvd) and 7 (F130-L-1-12/MV12(ATILLA-12) with 1.41 mg.day⁻¹ and showed the highest filling rate in non-stressed condition. Results showed that for all of genotypes the filling rate in non-stressed condition was greater than stressed conditions. There are significant differences between the genotypes for grain filling rate however, grain yield increased with the rate of grain filling product is no longer available.

Keywords: Correlation coefficient, Genotype, Tolerance

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Evaluation of competitive and economic indices in canola (*Brassica napus* L.) and green pea (*Pisum sativum* L.) intercropping as affected by different rates of nitrogen fertilizer

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Abstract

This experiment was conducted in order to evaluate the competitive and economic indices of canola (*Brassica napus* L.) and green pea (*Pisum sativum* L.) intercropping in different rates of nitrogen fertilizer in a factorial arrangement based on randomized complete block design with three replications at Shahrekord University research farm during growing season of 2011-2012. Intercropping and sole cropping treatments (green pea-canola 1:2, 1:1 and 2:1) were evaluated as the first factor and nitrogen rates (100%; 75% and 50% need) as the second factor. The calculated competitive indices were included land equivalent ratio (LER), relative crowding coefficient (K), the system production index (SPI), actual yield loss (AYL), competitive ratio (CR); and the economic indices included monetary advantage index (MAI) and the intercropping advantage (IA). The results showed that all the competitive and economic indices had the highest amount in 50 % of nitrogen requirement. The amounts of AYL, SPI and economic indices (MAI and IA) were positive for all intercropping ratios. Also, LER and Kt for all intercropping ratio were greater than one that indicated the advantage of intercropping over sole cropping of the plants. The positive values of aggressiveness index and competitive ratio greater than one for canola indicated that canola was superior competitor in compared to green pea. In conclusion, the evaluation of competitive and economic indices appropriately describes intercropping advantage of canola with green pea in reduced nitrogen fertilizer conditions.

Keywords: Aggressiveness, land equivalent ratio, monetary advantage, relative crowding coefficient, system production index

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Evaluation of integrated application of biofertilizers on quantitative and qualitative yield of ajowan (*Carum copticum* L.) in strip intercropping with fenugreek (*Trigonella foenum-graecum* L.)

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Abstract

In order to evaluate the integrated application of bio-fertilizers and chemical fertilizers on quantitative and qualitative yield of ajowan in strip intercropping with fenugreek, a field experiment was conducted as factorial based on randomized complete block design with three replications at the farm located in West Azerbaijan province- city Nagadeh, Iran during growing season of 2011-2012. The fertilizer treatments included 100% chemical fertilizers (NPK), biofertilizers +50% chemical fertilizers and control (no fertilizer) and strip intercropping patterns consisted of 4 rows of ajowan+ 2 rows of fenugreek, 8 rows of ajowan+ 4 rows of fenugreek and 12 rows of ajowan+ 6 rows of fenugreek and sole cropping of each crop. Different traits such as plant height, number of umbels per plant, number of seed per umbel, 1000-seed weight, seed yield, biological yield, essential oil percentage and essential oil yield were recorded. Results showed that intercropping patterns had significant effect on all studied traits except ajowan plant height. The highest and the lowest seed yield were obtained in 4 rows of ajowan + 2 rows of fenugreek and 12 rows of ajowan+ 6 rows of fenugreek, respectively. Effect of fertilizer on yield and some yield components of ajowan were also significant. The maximum and seed minimum and essential oil yield of ajowan were obtained in treatments of bio-fertilizers +50% chemical fertilizers and control, respectively. The highest Land equivalent ratio (LER) values were obtained in intercropping pattern of 4 rows of ajowan+ 2 rows of fenugreek with chemical fertilizers (1.97), bio-fertilizers +50% chemical fertilizers (1.95) and control (1.9), respectively. Also, in intercropping pattern of 8 rows of ajowan+ 4 rows of fenugreek with bio-fertilizers +50% chemical fertilizers (1.9) showed a higher LER. According to the aims of sustainable agriculture with the aim of elimination or significant reduction of chemical inputs, without biofertilizers and integrated fertilization treatment for intercropping pattern of 4 rows of ajowan+ 2 rows of fenugreek and integrated fertilization for intercropping pattern of 8 rows of ajowan+ 4 rows of fenugreek suitable and Justified.

Keywords: Essential oil, Land equivalent ratio, Medicinal plant, Sustainable Agriculture

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The effects of different methods of applying green, farmyard manure and biofertilizers on nitrogen dynamics in soil, leaves and grains in corn (*Zea mays* L. cv. sc704)

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Abstract

In order to evaluate the applying green, farmyard manure and biofertilizers either separated or integrated on nitrogen dynamics in soil and corn (*Zea mays* L.) plant, an experiment was conducted at 2009 growing season. Experiment was arranged as split split plot based a randomized complete block design with three replicates. Main plots were three levels of green manure [consisting of control, berseem clover (*Trifolium alexandrinum* L. and barley (*Hordeum vulgare* L.)] and sub plots were different levels of green manure residuals management (including full and half clipping and no-clipping). Different levels of integrated fertilizers (including control; recommended NPK as 250, 150 and 100 kg urea, superphosphate triple and potassium sulphate ha⁻¹, respectively; 50% NPK; 15 Mg farmyard manure (FM) + 50% NPK ha⁻¹; biofertilizer (BF) + 50% NPK; 15 Mg FM + BF ha⁻¹; 15 Mg FM + 50%NPK ha⁻¹ + BF, were the sub sub plots. Results indicated that green manures (both clover and barley) significantly increased soil nitrogen up to 23 percent. However, in clover treated plots leaf nitrogen content (15%), nitrogen uptake in grain (12%) and grain yield (13%) increased compared to those traits in barley treated plots. Also farmyard manure + 50% NPK, biofertilizer + 50% NPK, and integration of farmyard manure + biofertilizer + 50% NPK, showed the best performance (up to 32.9%) in terms of nitrogen dynamics compared to recommended NPK.

Keywords: Biofertilizer treatment, Nitrogen dynamics in soil, Residues management

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Long term evaluation of yield stability trend for cereal crops in Iran

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Abstract

During the last few decades cereals yield have increased drastically at the national level however, information about yield stability and its resistance to annual environmental variability are scarce. In this study long term stability of grain yield of wheat, barley, rice, corn and overall cereals in Iran were evaluated during a 40-years period (1971-2011). Stability analysis was conducted using two different methods. In the first method the residuals of regression between crop yield and time (years) were calculated as stability index. For this different segmented regression models including linear, bi-linear and tri-linear were fitted to yield trend data and the best model for each crop was selected based on statistical measures. Absolute residuals (the difference between actual and predicted yields for each year) as well as relative residuals (absolute residuals as percent of predicted yield) were estimated. In the second method yield stability was estimated from the slope of the regression line between average annual yield of all cereals (environmental index) and the yield of each crop in the same year. Results indicated that in wheat and barley absolute and relative residuals were increased during the study period leading to reduction of stability despite considerable yield increment. However, for rice and corn residuals followed a decreasing trend and therefore yield stability of these crops was increased during the last 40 years. The same result was obtained with the environmental index but in this method reduction of yield stability in barley was lower than wheat. Based on the results, yield and yield stability of cereals crops in Iran increased during the last 40 years. However, the percentage increase in stability is lower than that of yield. Application of nitrogen fertilizers was led to reduction in stability. Yield stability of wheat, barley, rice, corn and overall cereals was improved with increasing their cultivated area.

Keywords: Cultivated area, Environmental index, Nitrogen fertilizers, Regression residuals, Yield trend

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Energy sensitivity analysis and greenhouse gas emissions for tea production in Guilan province, Iran

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Abstract

Sustainable development of the production in every region requires consideration of energy flow in the production system. Moreover, investigating the production system inputs from environmental management point of view is of high importance. In this study energy use and greenhouse gas emissions of tea (*Camellia sinensis* L.) production were investigated. Data were collected through interviews with 75 tea farmers and comparing the results with Farmers Information Book. Results showed that total energy input was 39060.60 MJ.ha⁻¹ and energy efficiency was calculated as 0.22. Chemical fertilizers had the largest share in energy use and greenhouse gas emissions with 58.55% and 74.22% in tea production, respectively. Total greenhouse gas emission in tea production was 1281.82 kgCO₂eq.ha⁻¹. The results of Cobb-Douglas model and sensitivity analysis of energy inputs revealed that the effect of all energy inputs except chemicals were positive on the yield. Energy of labor input had the most sensitivity and also had the most effect on the yield and then the machinery energy input and chemicals had the next highest effect on the yield of tea production in Guilan province.

Keywords: Carbon dioxide emissions, Energy efficiency, Energy input, Environmental management

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Determination of weather conditions associated with the production of rainfed barley crop (Case study: East Azerbaijan)

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Abstract

Temperature and precipitation are two climatic variables having the most significant impact on the variability of crops yield. In this study, the relationship between rainfed barley yield, temperature and rainfall were assessed with both simple correlation and iterative chi-square analysis for Eastern Azerbaijan in four districts (Tabriz, Maragheh, Sarab and Miyaneh). The iterative chi-square analysis identified relationships of low and high yield years to the maximum and minimum of temperatures and rainfall. The same patterns in all regions found in the relationship between rainfed barley yield and climatic indicators. In all regions, the main climatic factors limiting rainfed barley production were low, high and very high temperatures occurring during February (cardinal value rang, $T_{\min} \leq -10^{\circ}\text{C}$ to $T_{\min} \leq -20^{\circ}\text{C}$), before the onset of winter (cardinal value rang, $T_{\max} \geq 15^{\circ}\text{C}$ to $T_{\max} \geq 20^{\circ}\text{C}$) and at anthesis stage (early May to early June) (cardinal value ranging, $T_{\max} \geq 25^{\circ}\text{C}$ to $T_{\max} \geq 35^{\circ}\text{C}$) respectively. Cold nights (cardinal value rang, $T_{\min} \leq 10^{\circ}\text{C}$ to $T_{\min} \leq 20^{\circ}\text{C}$) and enough rainfall (cardinal value ranging, $pp \geq 5.8$ mm to $pp \geq 10.6$ mm) led to increasing yield in ripening stage (early June to early August) and in the early planting, respectively. In all regions, the anthesis stage was the critical time in which high temperatures and low precipitation led to yield loss. Determine the impact of temperature and rainfall on crops yield provides advantage information for adopting appropriate management practices in order to decrease adverse effects.

Keywords: Iterative chi-square analysis, Rainfall, Temperature

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An evaluation on the effect of the residue management and different nitrogen sources on yield and yield components of wheat (*Triticum aestivum* L.)

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Abstract

In order to assess the influence of the plant residue management and application of different nitrogen sources on yield and yield components of wheat, an experiment was carried out at the Agricultural Faculty of Shahid Chamran University of Ahvaz during growing season of 2011-2012. The experimental design was split-plot based on randomized complete block design with three replications. The main plot was different wheat residue management at three levels (1-residue moving, 2- residue incorporated to the soil and 3- burning) and the subplot was various nitrogen resources (control, 75 and 150 kg.ha⁻¹ urea, Supernitroplus biological fertilizer (SNBF) and 75 kg.ha⁻¹ urea fertilizer+ SNBF). The result showed that the plant residues affected yield and yield components of wheat. Whereas, the residue burning increased and the residue moving decreased the most traits. Although residue incorporated to the soil treatment had the highest 1000-seeds weight and harvest index but it had negative effect on biological yield. The highest (6.6 t.ha⁻¹) and the lowest (2.6 t.ha⁻¹) grain yield were obtained at Supernitroplus and residue removing treatments. There were no significant differences between biological fertilizer and no nitrogen application (Control) treatments in most traits. Whereas, the application of biological fertilizer in combined with chemical fertilizer had the highest seed number in spike and 1000-seed.

Keywords: Biological Yield, Grain protein, Residue incorporated, Super nitro plus, Urea fertilizer

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Assessing biodiversity of agronomical, horticultural and livestock productions in Kerman province

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Abstract

Sustainability of productions in agricultural ecosystems depends on conservation and amplification of biodiversity. This study was conducted to determine the planting area, species richness, species evenness and biodiversity of different agronomical, horticultural and livestock productions in Kerman province. For this purpose, information about planting area of agronomical and horticultural plants and population of various livestock species for different regions of Kerman was gathered. The results showed that Jiroft and Kerman regions had the highest and Rafsanjan had the lowest agronomical planting area. The highest planting area of horticultural plants was observed in Jiroft and Rafsanjan and the lowest amount of the trait was gained in Baft. The highest and lowest livestock populations were related to Jiroft and Ravar, respectively. Jiroft and Kerman regions were contained the highest species richness of agronomical (20 and 22 species, respectively) and horticultural (34 and 31 species, respectively) productions. Wheat, Pistachio and sheep were the dominant species in majority regions of Kerman. The highest Shannon index was gained in Jiroft (2.27) and Kerman (1.99) for agronomical, Jiroft (2.31) and Baft (2.05) for horticultural and Kerman (0.99) for livestock productions. Rafsanjan was included the lowest Shannon index in all agricultural productions. Jiroft had the highest species evenness of agronomical (0.76) and horticultural (0.66) and Kerman was contained the highest amount (0.75) for livestock productions in different regions of Kerman province. The results showed that correlation of Shannon index with species evenness was higher than planting area or species richness.

Keywords: Dominant species, Shannon index, Species evenness, Species richness

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