



## Crops Improvement

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### The Effect of Pulse and Continuous Treatments of Ethanol and Gibberellic Acid on Vase Life and Quality of *Alstroemeria* Cut Flower (*Alstroemeria hybrida* c.v. Fuji)

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#### Abstract

Leaf yellowing is a major problem in postharvest of *Alstroemeria* cut flowers. For delaying of leaf yellowing and increasing flower quality a completely randomized factorial design was carried out on the *Alstroemeria* cut flowers ('Fuji' cultivar). In this research Ethanol (0, 2, 4, 6%), GA<sub>3</sub> (0, 50, 100, 150 mg/litre) in two methods (pulse and continuous) were investigated on the flower vase life and other qualitative traits. There is 4% sucrose in all treatments except control. Result revealed that continuous treatment had more effect on the vase life and quality of flowers than pulse treatment. 4% Ethanol prolonged vase life and increased solution uptake. Increasing GA<sub>3</sub> concentration in holding solution prolonged vase life and caused better retention of quality of cut flowers. However had no significant difference in 100 & 150 mg/L GA<sub>3</sub> in flower vase life, solution uptake and fresh weight. Moreover GA<sub>3</sub> in pulse treatment had more effect than continuous treatment on better retention of chlorophyll.

**Keywords:** *alstroemeria*, chlorophyll, continuous treatment, flower vase life, pulse treatment.

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### Evaluation of Essential Oil Content and Components in some Iranian Fennel Ecotypes

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#### Abstract

Fennel is one of the oldest herbs and possesses appealing flavor and beneficial medicinal effects. Fennel (*Foeniculum vulgare* Mill.) belongs to the Apiaceae family and its essential oil and seeds are used to flavor foods including meats, ice cream, candy, baked goods and condiments. The increasing commercial value of fennel necessitates the need to develop elite ecotypes with high essential oil content and other desired breeding and market traits. In this study fifty ecotypes of fennel from different part of Iran were collected and days to 70% pasty seed and essential oil content in two years and essential oil components were studied. The stage of pasty seed is the best time for essential oil extracting with the highest quantity. The results indicated that the ecotypes of Sari, Kaleibar, Qazvin, Chahestan and Haji Abad are late bearing, ecotypes of the Moqan, Kohin, Meshkin Shahr, Alamot, Khalkhal, Damavand, Ardabil, Marvdasht, Kashan, Givi, Khash and Fozve are middle bearing plants, while the remaining ecotypes were early bearing plants. As average of two year, ecotypes with the highest essential oil content (more than 3.5% per dry mater) were Razan, Fozve, Marvdasht, Kashan, Sari, Kaleibar and Arak (3.96, 3.69, 3.68, 3.66, 3.65, 3.65 and 3.54%), respectively. The GC-MASS results showed that maximum value of limonene is observed in the ecotype of Sanandaj, the maximum value of fenchone is observed in the ecotype of Sari, the maximum value of transe-anethole is seen in the ecotype of Khash and the maximum value of methyl chavicol belongs to the ecotypes of Kaleibar.

**Keywords:** anethole, essential oil, fennel, methyle chavicol, pasty.

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### Effect of Sowing Date and Pre-Planting Irrigation on Weed Seedling Emergence and Yield in Maize

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#### Abstract

Field experiment was conducted to predict shoot emergence of *Sorghum halepense* and *Chenopodium album* L. in different planting dates of maize with stale seed bed or conventional planting. 3-parameter weibul gave a good description of cumulative shoot emergence percentage of *S. halepense* against GDD. Planting dates were different in emergence rates. With delaying in planting time, the rate of emergence and the maximum cumulative emergence decreased. Irrigating the field before planting increased weed seedling emergence. There was no difference between sowing dates in the maximum seedling emergence, except for the last sowing date i.e. T5 that indicated a lower emergence rate. The last sowing date indicated the least emergence percentage. The current study showed that applying stale seed bed method provided an opportunity for the control of *S. halepense* and *Chenopodium album* L. however, with delay in planting time there was a less *S. halepense* and *Chenopodium album* L. infested seed bed. The knowledge of the relationship between seedling emergence time and the prevailing environmental conditions could be useful to maximise the efficacy of weed control.

**Keywords:** *Chenopodium album* L. Weibul model, *Sorghum halepense*, weed emergence.

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### Effects of Heading and Benzyladenine and Arbolin Spraying on the Quality of Sweet Cherry, Apple and Pear Trees in Nursery

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#### Abstract

This experiment was carried out to study effects of mechanical and chemical treatments for developing lateral shoot and increasing quality of sweet cherry, apple and pear trees in 2010-2011 in three independent experiments. In the first experiment, effect of the heading treatments in four levels (control, 40, 60 and 80 cm), in the second experiment, BA treatments in four levels (0, 200, 400, 600 mgL<sup>-1</sup>) and spraying times in three levels (1, 2 and 3 times) and in the third experiment, Arbolin treatments in four level (0, 5, 15, 25 mL<sup>-1</sup>) and spraying times in two level (1 and 2 times) were investigated. Results showed that mechanical and chemical treatments improved the branching of trees but the lateral shoot number with chemical treatments had significant increase in comparison with heading treatments. Therefore, the most lateral shoot number was induced with BA in concentration of 600mgL<sup>-1</sup> in three times. The mechanical and chemical treatments in sweet cherry induced lateral shoots more than apple and pear trees. 'Siah Mashhad', 'Red Delicious' and 'Spadona' induced more lateral shoot numbers in comparison with other cultivars.

**Keywords:** apple, arbolin, benzyladenine, branching, heading, pear, sweet cherry.

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# Modeling and Optimization of Stomatal Resistance in Olive under NaCl Salinity Stress by using Artificial Neural Network and Genetic Algorithm

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### Abstract

Stomatal resistance has an important role in plant water exchange and photosynthesis under stress condition hence it is a key parameter in ecological and biological models. In the present research, optimum values of effective parameters on stomatal resistance of olive to achieve maximum stomatal resistance were determined. Salinity levels (0, 25, 50 and 100 mg/l NaCl), percentage of leaf ions (chlorine, sodium, potassium, calcium, phosphor, magnesium), K/Na ratio, wet weight of leaf (mg), leaf area (cm<sup>2</sup>), relative water content (%) and leaf area ratio (cm<sup>2</sup>/g) were considered as effective parameters in stomatal resistance of olive. The stomatal resistance was modeled as a function of the variables using a radial basis function (RBF) neural-network model. The predicted results demonstrated that the neural network could provide a good performance since prediction results were in rather good agreement with measured results. The maximum percentage error between predicted and experimental data was less than 2.57% and the correlation coefficient between them was 0.994. Also, the statistical comparison between the predicted and experimental data indicates the reliability of the predictions using a RBF neural-network model. The trained neural network is used as objective function to get optimal parameters using the genetic algorithm. The optimum values of the parameters obtained at a 100, 0.15, 0.57, 0.78, 0.32, 0.06, 0.17, 1.29, 26.63, 5.03, 0.76 and 72.89 for the first parameter through the last parameter, respectively.

**Keywords:** genetic algorithm, neural network, olive, salinity, stomatal resistance.

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### Possibility of using Chlorophyll Fluorescence to Assess the Tolerance of a Number of Citrus Rootstocks to Waterlogging Stress

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#### Abstract

Changes in chlorophyll fluorescence is one of the physiological responses of plants to waterlogging stress. Due to easily measured in field and its inexpensive and non-destructive characteristics, it is one of the best ways to assess different genotypes tolerance to stresses. In this experiment, trends of chlorophyll fluorescence index ( $F_v/F_m$ ) of 'Satsuma' mandarin (*Citrus unshiu*) on seven rootstocks (sour orange, Swingle citromello, Carizo citrange, Troyer citrange, C-35, Smooth flat sevil and Gou tou) were determined in some soils of East Mazandaran. The experiment was conducted as factorial in a randomized complete block design. The results showed that effect of different factors on changes of chlorophyll fluorescence were significant. Soils 7 and 1 had the highest and lowest index, respectively. The effect of different rootstocks on fluorescence index showed that with increasing duration of waterlogging, this index drops increasingly compared to the beginning of waterlogging. Gou tou and Sour orange had the highest and lowest fluorescence during waterlogging, and Swingle, Carizo, Troyer, Smooth and C-35 placed after Gou tou, respectively. In addition, tolerance of rootstocks to waterlogging was different in various soils of this area.

**Keywords:** citrus unshiu, fluorescence chlorophyll Index, genotype, soil, waterlogging.

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# Effect of Drought Stress on Physiological Characteristics of Different Salad Burent (*Poterium sanguisorba*) Ecotypes under Different Irrigation Regimes

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### Abstract

To evaluate the effect of drought stress on the physiological characteristics of salad burent (*Poterium sanguisorba*), a field experiment was conducted in split-plot based on randomized complete block design with three replications during 2010 growing season. Four levels of irrigation (20, 40, 60 and 80 percentage of available soil moisture) and three different ecotypes of Tehran, Semirom and Fereidon Shahr were used as main and sub plots, respectively at the three harvest stages (82, 112 and 142 days after planting). Water stress significantly affected on the shoot dry weight, leaf relative water content, protein (%), total chlorophyll and chlorophyll a and b, but effect of the ecotypes was only significant on shoot dry weight at all three stages and relative water content at second and third stages. Maximum shoot dry weight obtained in Tehran ecotype under 20 and 40% of available water at each three harvest stage. More relative water content was observed at 40% of available water at each harvest stage.

**Keywords:** drought stress, ecotype, protein, relative water content, total chlorophyll.

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### Relationships among Grain Yield, Transpiration Rate and Stomatal Length in Seven Corn Cultivars under Salt Stress Condition

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#### Abstract

Salt stress is a factor limiting crop growth and productivity around the world. Developing salt tolerant cultivars using desired plant features has been considered as a way to cope with the problem. In this study, a factorial experiment was used in order to determine the effects of salt stress on stomatal length at abaxial and adaxial leaf surfaces, relative water content (RWC) and transpiration rate (TR) under controlled condition. In another experiment yield performance (GY) of the same hybrids was evaluated in a split-plot experiment under field growing condition. Both experiments were based on a RCBD with 3 replications and conducted at the Faculty of Agriculture, Shahid Bahonar University of Kerman in 2011. Results showed that salt stress and hybrid have significant effects on all plant characteristics. Generally, all plant characteristics were decreased by increasing salt stress level. Significant correlation coefficients were found between TR and GY and also RWC and GY. Results also showed that the hybrid SC-704 has the highest levels of RWC and GY under salt stress conditions compared to the others indicating that it can be considered as a salt tolerant one.

**Keywords:** correlation, hybrid, relative water content, stomatal length, tolerant.

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### Effect of Salinity Stress on some Germination and Vegetative Growth Indices of Lentil (*Lens culinaris* Medik.) Genotypes

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#### Abstract

To investigate the effects of salinity stress on some germination and vegetative growth indices of lentil (*Lens culinaris* Medik) genotypes, two separate experiments were conducted at glasshouse and laboratory of College of Agriculture, Vali-e-Asr University of Rafsanjan. In the first one, three electrical conductivities (including one, three and seven  $\text{dS}\cdot\text{m}^{-1}$ ) were applied on germinating seeds of seven accessions and two cultivars of lentil and germination indices were investigated. In the second experiment, same salinities were applied on soils of pots on the same genotypes. After four weeks, dry mass and leaf areas were measured. Results showed that germination percentage, radical to plumule ratio, leaf area and dry matter per plant reduced with increasing in salinity levels; however there was no significant difference between  $\text{EC}=4$  and  $7$ , except for germination percentage. On the other hand, considerable genotypic variation was observed in response to salinity in both stages but there was no significant correlation between tolerance to salinity in germination and vegetative growth phases. In the situation of this study, it seems that damage to growth at germination and vegetative phase induced by  $\text{EC}=7$  was relatively higher than  $\text{EC}=4$ .

**Keywords:** dry matter, germination percentage, leaf area, lentil, salinity.

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### Determination of the best Harvest Time of Pistachio Nut based on Physiological and Biochemical Indices

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#### Abstract

This study was done to evaluate the effects of harvest time on some factor of 'Ahmadaqaie' pistachio nuts in Rafsanjan. In three consecutive years (2009-2012) during three stages of fruit ripening (40, 70 and 100 percent of hulling), fruit was harvested and physiological and biochemical parameters were measured. The experiments were conducted as randomized complete block design with compound analysis in three replications. Most of the traits were influenced by harvest time more than latitude and length of pistachio. The highest amount of protein (20.5%), chlorophyll content (6 mg) and inflorescence bud retention (61%) was in immature nuts (40 percent). Pistachios harvested in stage two (70%) had the best quality and quantity despite of green kernel and good taste of immature pistachio nuts. Although third harvest (100%) increased the dry weight and percent of nut splitting, but have some problems including increasing early splitting, endocarp yellowing, nut drop under the trees, and finally difficult to harvest operations which will increase fungal infections and reduce the nutritional value. In the best time of harvesting in normal condition, the nutritional value, splitting and dry matter were high that roughly coincides with the 70 to 80 percent ripening stage.

**Keywords:** biochemical and physiological parameters, fruit ripening stage, nutritional value, pistachio.

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# Evaluation of Competition and Nutrient Consumption of Nutrifid Millet and Green Pea in Intercropping

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### Abstract

This experiment was conducted as a RCBD at a research farm at Kerman in Spring 2012 using millet and green pea as intercrop. The treatments were cultivation of sole nutrifid millet and green pea, 75% millet+25% green pea and vice versa, 50% millet+50% green pea, cultivation of mix seeds of two crops on the same row. The highest and lowest dry forage yield was obtained from sole millet and green pea. The ratio of 75% and 50% of millet was not significantly different with sole millet. Mineral nutrition uptake of intercrop was higher than sole ones. The intercrop treatments were not significantly different for N uptake, except for mixed cropping, while the highest uptake of P and K were recorded for 75% millet + 25% green pea. Mean RYT of 1.68 obtained from intercrop indicates the complementarity of two crops. Competition ratio of millet to green pea for N, P, K, Fe, Mn, Cu and Zn was more than 1 showing the higher competition ratio of millet compared to green pea. Aggressivity of millet was positive implying the dominancy of millet. Dry forage production near to sole millet, mean RYT of about 2 for mineral uptake, competition ratio of more than 1 and a positive aggressivity value indicates that 75% millet+25% green pea is the best planting ratio.

**Keywords:** aggressivity, competition, complementarity, planting ratio, total relative yield.

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### Effects of Mycorrhizal Symbiosis on Physiological Indices and Yield of Grain Sorghum under Different Irrigation Intervals

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#### Abstract

In this research the effects of mycorrhizal symbiosis and irrigation intervals on growth indices and grain yield of two sorghum cultivars was studied. Field experiment was laid out as a split plot factorial based on randomized complete block design with three replications. Irrigation intervals as main factor in three levels (7, 14 and 21 days) and factorial combination of two sorghum cultivars (Kimia and Sepideh) with three levels of seed inoculation (non inoculation, inoculation with *Glomus intraradices* and inoculation with *Glomus mossea*) were considered as sub-plots. Results showed that maximum values of leaf area index (4.21), crop growth rate ( $50.8 \text{ g m}^{-2} \text{ day}^{-1}$ ) and total dry matter ( $1852.5 \text{ g m}^{-2}$ ) without significance difference with 14 days irrigation interval, were achieved at 7 days irrigation interval. In comparison with non inoculation treatment, *Glomus mossea* increased leaf area index, crop growth rate and total dry matter up to 17.4, 11 and 8.6 percent, respectively. Also, growth indices of Kimia cultivar were superior to Sepideh cultivar. Without significant difference with plants inoculated with *Glomus mossea* and 14 days irrigation interval, maximum grain yield was achieved at plants inoculated with *Glomus mossea* and 7 days irrigation interval which in comparison with treatment of non-inoculation and 21 days irrigation interval, increased grain yield of sorghum by 56.47 percent. In general, results indicated that mycorrhizal fungi especially *Glomus mossea* improved plant growth indices and yield of sorghum under deficit irrigation (14 days irrigation interval).

**Keywords:** correlation, crop growth rate, grain sorghum, limit irrigation, symbiosis fungi.

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### Study on Enzymatic Activity and Biochemical Responses of Two Citrus Rootstocks to *in vitro* Salinity Stress

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#### Abstract

Enzymatic activity and biochemical responses of two citrus rootstocks [sour orange (*Citrus aurantium* L.) and trifoliolate orange (*Poncirus trifoliata* Raf.)] to *in vitro* salinity stress were studied. Explants of both rootstocks were transferred to Murashige and Skoog (MS) solid proliferation medium containing 8.9  $\mu$ M Benzyladenine (BA) and 0.5  $\mu$ M Naphthaline Acetic Acid (NAA) supplemented with 0, 50, 100, 150, 200 mM of sodium chloride (NaCl) with six replicates. After six weeks, results showed that, rootstock, salinity levels and their interaction, had a significant effect on all of the measured parameters. Antioxidant enzymes activity such as: catalase, peroxidase, ascorbate peroxidase, proline content, soluble sugars and malondialdehyde (MDA) content increased in both rootstocks by increasing salinity level. The amounts of increasing in sour orange rootstock were greater than trifoliolate orange, except for peroxidase enzyme and MDA. Total protein content decreased by increasing salinity level in both rootstocks. Sour orange rootstock has higher total protein content than trifoliolate orange. According to the results, sour orange rootstock was more tolerant to salt stress.

**Keywords:** antioxidant enzymes, malondialdehyde, proline, soluble sugars, total protein.

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### Effect of N Fertilizer of Different Levels and Cultivated Density on Yield and Essential Oil Content on Moldavian Dragonhead (*Dracocephalum moldavica* L.)

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#### Abstract

A filed experiment was conducted to assay the effect of nitrogen fertilization and cultivated density on essential oil content on dragonhead (*Dracocephalum moldavica*) in semi-arid conditions in 100 km of South East of Mashhad. The experiment was done as factorial based on randomized complete blocks design with three replications, factor included four levels of nitrogen fertilization (0, 50, 100, 150 kg/ha) and three levels of cultivated density (20, 30, 40 cm). The results showed that the effect of nitrogen fertilization and cultivated density had significant effect on plant height, number of primary shoot, fresh and dry weight of plant, essential oil content and herbage yield of dragonhead. The highest plant height, number of primary shoot, fresh and dry weight of per plant was obtained from 40 cm cultivated density with 100kg/ha N treatment. The highest herbage yield (10.4 ton/ha), essential oil content (0.46 percent) and essential oil yield (44.9 kg/ha) obtained from 40 cm with 100kg/ha N treatment. In conclusion, application of 100 kg/ha N fertilizer with cultivated density 40 cm can be recommended for the maximum of herbage and oil yield of dragonhead in this condition.

**Keywords:** cultivated density, *dracocephalum moldavica* L, essential oil content, N fertilizer, yield.

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### Studying the Response of Yield Components, Grain and Green Pod Yield of two Faba Bean Cultivars to Inter- Row Spacing in Normal and Late Seeding Dates

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#### Abstract

Gorgan is one of the most important regions for faba bean (*Vicia faba* L.) production in Iran. However, there is no enough quantitative information about the various aspects of production management of this crop plant. To investigate the effects of inter-row spacing, cultivar and seeding date on the yield of green pod and grain, this experiment was carried out at research farm of Gorgan University of agricultural sciences in 2011-2012 growing season. The experimental design was a randomized complete block design as split-plot factorial with four replications. Inter-row spacing (30, 45 and 60 cm) and factorial of planting dates (15 Nov. and 23 Dec. 2011) and cultivars (Barakat and French) were arranged in main- and sub-plots, respectively. The results indicated non-significant effect of cultivar and the significant ( $P = 0.01$ ) effects of seeding date, inter-row spacing and their interactions on the grain, green pod and biological yields, and pod number per plant, while the effects of cultivars were not significant, statistically. Based on the obtained results, any increase in inter-row spacing or delaying in planting of faba bean will reduce the grain, green pod and biological yields. The maximum yield of green pods and grain yield (21753 and 4530 kg ha<sup>-1</sup>, respectively) produced in normal planting date (15 Nov.) and 30 cm inter-row spacing. In contrast, the lowest grain and green pod yield (2527 and 13041 kg ha<sup>-1</sup>, respectively) obtained from delayed planting date (23 Dec.) and 60 cm inter-row spacing.

**Keywords:** density, faba bean, grain yield, green pod yield, seeding date.

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