



## **The effect of harvest time and storage period on some qualitative characteristics of fruit and check correlation this characteristics with calcium and potassium content of fruit texture in Abbot and Hayward kiwifruit cultivars**

**\*F. Khazzaf Moghaddam<sup>1</sup>, M.M. Sharifani<sup>2</sup>, M. Alizadeh<sup>3</sup>, M.H. Pahlavani<sup>4</sup>  
and A.R. Shakeri<sup>5</sup>**

<sup>1</sup>Master of Horticulture, University of Agricultural Sciences and Natural Resources, Gorgan,  
<sup>2,3</sup>Associate Prof., Dept., of Horticulture, University of Agricultural Sciences and Natural Resources,  
Gorgan, <sup>4</sup>Associate Prof., Dept., of Biotechnology, University of Agricultural Sciences and Natural  
Resources, Gorgan, <sup>5</sup>Associate Professor, Dept., of Chemistry, Tehran University  
Received: 05/30/2016; Accepted: 01/31/2017

### **Abstract**

**Background:** Long shelf life is considered as an economically important feature for the kiwifruit. Several factors are involved in maintaining the quality of kiwifruit during storage that Among them harvest time and nutrient elements can be named. Harvest time and nutrient elements such as calcium has impressive effects on maintenance of fruit quality in storage. In this study effect of harvest time on kiwifruit quality during storage, the amount of calcium and potassium fruit tissue and the correlation of these elements with fruit quality characteristics were studied.

**Material and methods:** The experiment was conducted as a factorial experiment in a completely randomized design. Fruits used in this study from two cultivars Abbot and Hayward in two different harvest times with 9 and 12 Brix degrees were collected and refrigerated at a temperature of 5°C and a relative humidity of 70% for 4 months. Changes in quality of fruits using chemical and physical variables were measured monthly and the results were analyzed by SAS, 9 statistical software.

**Results:** The results showed that harvest time with 12 °Brix had higher quality in the amount of phenolic compounds, antioxidant capacity and vitamin C. Firmness, total soluble solid and vitamin C decreased during storage but the decline was slower in 12 °Brix at harvest time and this process in Hayward was slower than Abbot cultivar. According to the results of the correlation study, Ca had significant positive correlation in probability level of 5% with TSS and antioxidant capacity and in probability level 1% with flavor index. K had significant positive correlation in probability level of 5% with titratable acidity and significant negative correlation in probability level 1% with total soluble solid and antioxidant capacity. Harvested fruits in 12°Brix were indicated a higher calcium and lower potassium showing better quality of fruit.

**Conclusion:** Kiwifruit harvested in the area of study (Kordkoy), in the second harvest due to higher levels of calcium and lower potassium of fruit texture had higher fruit quality characteristics during storage. The Abbot cultivar compared to Hayward cultivar for both of the applied harvest time. In this respect, Abbot cultivar had lower calcium content in fruit texture which showed lower storage potential in comparison with Hayward cultivar. As a result to achieve optimal fruit quality during storage in addition to maturity level, cultivar and the nutrient element contents of the fruit also may be monitored.

**Keywords:** Correlation, Kiwifruit, Nutrient elements analysis, Storage, Soluble Solids Content

---

\*Corresponding author: f5169f765@gmail.com



## Evaluating the potential of carbon sequestration and global warming potential for saffron fields (Case study: Khorasan-e Razavi Province)

\*S. Khorramdel<sup>1</sup>, A. Mollafilabi<sup>2</sup> and H. Latifi<sup>3</sup>

<sup>1</sup>Associate Prof., Ferdowsi University of Mashhad,

<sup>2</sup>Assistant Prof., Research Institute of Food Science and Technology,

<sup>3</sup>Ph.D. Student in Agroecology, Ferdowsi University of Mashhad

Received: 03/22/2017; Accepted: 09/28/2017

### Abstract

**Introduction:** Increases in the concentration of CO<sub>2</sub> in the atmosphere have prompted renewed interest in enhancing the soil pools of carbon in the agroecosystems to mitigate climate change and global warming and also improve quality of soil. The soil organic carbon (SOC) pool represents a dynamic equilibrium of gains and losses of carbon. Conversion of natural ecosystems to agroecosystems causes depletion of the SOC pools. The depletion is intensified when the output of carbon exceeds the input and when soil degradation is intensity. Terrestrial ecosystems contributed to atmospheric CO<sub>2</sub> enrichment. Carbon sequestration implies transferring atmospheric CO<sub>2</sub> into long-lived pools and storing it securely so it is not immediately loosed. Thus, soil carbon sequestration means improving SOC and soil inorganic carbon pools through land use and recommended management practices. Our purposes were to determine a set of coefficients for calculating conversion coefficients, dry weight, organic carbon and carbon sequestration of above-ground and below-ground tissues for saffron in Khorasan-e Razavi province.

**Materials and Methods:** A survey experiment was conducted based on a completely randomized design during 2016. Sampling was performed with random-systematic method from 10 fields by using 30 plots of 0.5 m<sup>2</sup> and along three transects of 50 m. Below-ground tissues by using cylinder were manually sampled and then separated from the soil. After sampling, the above-ground tissues (such as flower and leaf) were separated from below-ground tissues (including tunic and corm) as to measure the above-ground and below-ground biomasses, respectively. Above-ground and below-ground biomasses were separately dried to constant weight and expressed on a dry matter basis. Conversion coefficients of above- ground and below- ground tissues were determined with combustion method separately. Then, sequestration carbon potential for above- ground and below-ground tissues of saffron and soil were computed. Final, after the calculation of emission for greenhouse gases including CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> based on emission indices, global warming potential (GPW) were calculated. For statistical analysis, analysis of variance and least significant difference (LSD) were performed using SAS version 9.3.

**Results:** The results showed that dry weights, organic carbon contents, conversion coefficients and carbon sequestration for above- ground and below- ground tissues of saffron were significantly different. Biomass of below- ground tissues were higher than above- ground tissues. The highest and lowest carbon sequestration for above- ground and below- ground tissues were calculated for corm and flower with 5.83 and 0.14 t.ha<sup>-1</sup>, respectively. The highest emission of greenhouse gas was belonged to fossil fuels with 39.78 kg CO<sub>2</sub>- equiv. per one ha.

**Conclusion:** It is therefore concluded that organic management and use of crop residues, cow manure and organic fertilizers seems to be a rational ecological approach for sustainable management of saffron agroecosystem with a consequence of reduction in greenhouse gases and mitigation of climate change.

**Keywords:** Greenhouse emission, Climate change, Cow manure, Ecological approach

---

\*Corresponding author; khorrampdel@um.ac.ir



## Response of some characteristics of two local rice cultivars to integrated management of irrigation and drainage

A. Darzi-Naftchali<sup>1</sup>, M. Ghasemi-Nasr<sup>2</sup>, A. Mokhtassi-Bidgoli<sup>3</sup>, F. Karandish<sup>4</sup>

<sup>1</sup>Assistant Prof., Dept., of Water Engineering, Sari Agricultural Sciences and Natural Resources University, Sari, <sup>2</sup>M.Sc. Graduated, Dept., of Water Engineering University of Zabol,

<sup>3</sup>Assistant Prof., Dept., of Agronomy, Tarbiat Modares University, Tehran,

<sup>4</sup>Associate Prof., Dept., of Water Engineering, University of Zabol

Received: 05/09/2017; Accepted: 07/30/2017

### Abstract

**Background and objectives:** Alternate wetting and drying (AWD) the soil significantly increase rice production and improve water use efficiency. Other advantages of AWD over continuous flooding are a decrease in arsenic accumulation in rice grains and an increased availability and uptake of some micronutrients such as zinc in the grain. Under such practice, the paddy field does not need to be continuously flooded and is allowed to dry out for a certain number of days and the soil water regime is transformed from saturated to alternately saturated and unsaturated. However, no information is available on the effect of AWD on rice quality parameters in subsurface-drained paddy fields. In this study, the effect of this type of water management was evaluated on some quality parameters of Daylamani and Hashemi rice cultivars including grain protein, milling recovery, brown rice, white rice, hard shell, fine bran, grain moisture, broken rice, seed long before backing and seed width before backing in surface-subsurface drained paddy fields.

**Materials and methods:** The experiments were carried out as split plot based on randomized complete block design with three replications at the Sari Agricultural Sciences and Natural Resources University during two rice growing seasons (2014-15). Different subsurface drainage systems and a surface drainage system or control were considered as main plots and rice cultivars were considered as sub plots. Field water management was as flooding irrigation combined with three drainage periods at different times of the growing season. At harvest time, the protein content, milling recovery and other quality parameters of the rice grain were determined. Analysis of data was performed using SAS software.

**Results:** Minor differences in the water management during the growing seasons resulted in various responses of the two cultivars to alternate irrigation and drainage. Subsurface drainage treatments significantly affected on fine bran, milling recovery and grain protein in the first growing season while their effect was only significant on the soft rice bran in the second growing season. In subsurface drained area, grain protein of both cultivars was lower than treatment. Protein content of Daylamani cultivar (8.18 %) was significantly higher than of Hashemi cultivar (7.73 %). Also, white rice and milling recovery of both cultivars in the subsurface drainage treatments were significantly greater than those in the control. The maximum milling recovery (67.32 %) was observed in subsurface drained area.

**Conclusion:** The results showed that having drought periods during a suitable period of rice growing season, can lead to improved quality of rice grain in subsurface drained paddy fields.

**Keywords:** Flooding irrigation, Drought, Protein, Milling recovery

---

\*Corresponding author: [mokhtassi@modares.ac.ir](mailto:mokhtassi@modares.ac.ir)



## Effect of jasmonic and salicylic acids on some antioxidants, total sugar and lipid peroxidation in *Echinacea purpurea* L. under field conditions

\*F. Rasouli<sup>1</sup>, M. Gholipour<sup>2</sup>, K. Jahanbin<sup>3</sup> and H.R. Asghari<sup>2</sup>

<sup>1</sup>Ph.D. Student, Dept., of Agronomy, Shahrood University of Technology,

<sup>2</sup>Associate Prof., Dept., of Agronomy, Shahrood University of Technology,

<sup>3</sup>Assistant Prof., Dept., of Food Industry, Shahrood University of Technology

Received: 06/01/2017; Accepted: 10/19/2017

### Abstract

**Background and objectives:** The most important problems of commercialization of plants, from which the secondary metabolites are extracting, are low production and high demand for their metabolites. Nowadays, researchers use elicitors such as jasmonic acid and salicylic acid to increase the production of secondary metabolites that can induce physiological changes of the target living organism. Elicitors as key messenger compounds cause biosynthesis and accumulation of secondary metabolites through stimulation of plant defensive responses. So, the purpose of this experiment was to investigate the effect of jasmonic and salicylic acids on some non enzymatic antioxidants (which are often medicinal), total sugar and lipid peroxidation in *Echinacea purpurea* L. under field conditions.

**Materials and methods:** This experiment arranged as randomized complete blocks design with 12 treatments and three replications in agricultural faculty of Shahrood University of Technology in 2015-2016. The factorial arrangement was not used as it aimed at finding the best treatment combination of jasmonic acid and salicylic acid, not interpretation of nature of their interaction (32). Experimental treatments were spraying the jasmonic acid with 4 concentrations (0, 5, 20 and 50 micro molar), the salicylic acid with 3 concentrations (0, 5.0 and 1 mill molar) and spraying both of them three times with ten-day intervals, starting at reproductive stage initiation. The reason for choosing ten-day intervals was the fact that jasmonic acid remains effective only for 8 to 10 days, and the simultaneous application of jasmonic acid and salicylic acid possibly imposes antagonistic effects on plant. In this research the role of jasmonic acid and salicylic acid in increasing secondary metabolites was studied by measurement of total sugar, hydrogen peroxide in leaf, lipid peroxidation and antioxidants including phenols, flavonoid, anthocyanin, ascorbic acid and carotenoid.

**Results:** The analysis of variance showed that different concentration of jasmonic acid and salicylic acid and spraying both of them in ten-day intervals appeared to have effect (with 99% confidence) on studied traits. For most of the treatments, the concentration of phenols, flavonoids, anthocyanin, ascorbic acid and carotenoids was higher than control. The greatest amount of ascorbic acid was observed for treatment 5 micro molar jasmonic acid with an average of 4.604 mg per gram of fresh tissue, which was 1.6 times of control. The highest amount of phenol was obtained for treatment 0.5 milimolar salicylic acid and treatment 20 micro molar jasmonic acid and 1 milimolar salicylic acid with average of 1.957 and 10.669 mg per gram of fresh tissue, respectively. The lowest value was observed in control treatment with an average of 2.974 mg per gram of fresh tissue.

**Conclusion:** The result of this experiment showed that foliar spraying of jasmonic acid and salicylic acid could stimulate production and accumulation of secondary metabolites. Spraying increased antioxidant concentration in most of the treatments, and regarding to antioxidant target the appropriate concentration can be used. Due to the fact that phenol is one of the most important metabolites in *Echinacea*, and treatment 0.5 milimolar salicylic acid could increased the amount of phenol, the application of this material for *Echinacea purpurea* could be important, especially as it is cheap and accessible.

**Keywords:** Ascorbic Acid, Carotenoid, Lipid Peroxidation, Phenol

---

\*Corresponding author: F.rasouli86@gmail.com



## Effects of regulated deficit irrigation regime on vegetative and pomological characteristics and yield of oil olive Amphis cultivar

\*R. Gholami<sup>1</sup> and A. Hajiamiri<sup>1</sup>

<sup>1</sup>Crop and Horticultural Science Research Dept., Kermanshah Agricultural and Natural Resources Research and Education Center, Kermanshah, Iran

Received: 08/06/2017; Accepted: 10/19/2017

### Abstract

**Background and Objectives:** Olive (*Olea europaea* L.) is an ever-green and drought-tolerant tree grown on regions with limited water resources to produce oil and table products. Due to existing appropriate environmental conditions in our country for its growing, and also considering public desperate needs to its oil product, olive is economically considered to be an important fruits to be cultivated. The problem of supplying sufficient water for irrigation olive orchards, due to serious threats of ongoing drought and reduction in water resources, is one of the main limiting factors on the way to develop olive industry in country. Accordingly, some suitable approaches like using tolerant cultivars, mulches, reducers of plant transpiration, plant growth regulators, and recently evaluating proper time for irrigation have been examined to increase efficiency of watering. According to this approach, irrigation schedule is designed mainly based on maintaining plant's water status internally and regarding maximum level of water potential at particular stages of plant cycling, especially at time of lowest sensitivity of fruit growth to drought stress.

So far, many studies performed over effects of drought stress and water deficit on vegetable growth of olive under pot conditions. With respect to establishing olive orchards on different regions of country and appearing serious drought threats, it is imperative to investigate effects of regulated irrigation deficit on all bearing fruit trees. Hence, determining the insensitive stages of fruit growth toward regulated irrigation deficit has been received great attentions in terms of economical yield. The purposes behind doing the current study were to investigate and compare effects of different regulated deficit irrigations on vegetative and reproductive parameters of olive grown under field conditions.

**Materials and methods:** This experiment was conducted in Dallaho Olive Research Station located in Kermanshah Province (45°E, 34°N, and 581M) in 2015 under field conditions. It was designed based on CRB with three replications and three trees (sixteen-year Amphis cultivars cultivated at 6×6 m<sup>2</sup>) for each. Six irrigation regimes consisted of: 1) using full irrigation (F<sub>1</sub>) throughout fruit growth (as control), 2) using 25% F<sub>1</sub> at pit hardening stage, 3) using 75% F<sub>1</sub> during pit hardening to harvesting stages, 4) using 25% F<sub>1</sub> during fruits' color variation, 5) using 60% F<sub>1</sub> throughout fruit growth, and 6) no irrigation. It is necessary to say that F<sub>1</sub> was employed at all stages of fruit growth except stages received treatments and also it was done through drip irrigation system. According to daily meteorological data received from synoptic station of Sarpole Zahab and an equation purposed by Penman Mantis, the potential rate of transpiration and perspiration as well as water requirements were calculated from April (the time of stopping rainfall) to October (time of starting new rainfall in following year). Irrigation schedule was designed once per three days on the basis of plants' transpiration and perspiration, and the amount of water requirements as well as employing plant indexes of olive.

**Results:** The results of this research demonstrated that employing 25% F<sub>1</sub> treatment not only at pit hardening stage brought about a higher yield of fruit and oil, fruit diameter, and pulp percent, but also at fruit color variation caused to an increase in oil percent per pulp fresh and dry weight and oil yield a hectare compared to other treatments.

---

\*Corresponding author: gholami.rahmat@yahoo.com

**Discussion:** In the arid and semi-arid as well as sub-tropical regions, water shortage is a normal phenomenon and seriously limits the agricultural potential. Therefore, under irrigation or rain-fed conditions, it is important for the available water to be used in the most efficient way. Regulated deficit irrigation is an optimizing strategy which crops are allowed to sustain some degree of water deficit and yield reduction. During regulated deficit irrigation the crop is exposed to certain level of water stress either during a particular period or throughout the growing season. The main objective deficit irrigation of is to increase water use efficiency (WUE) of the crop by eliminating irrigations that have little impact on yield, and to improve control of vegetative growth (improve fruit size and quality).

**Conclusion:** The results of this research revealed that the value of WUE gained by applying RDI during fruit color variations and pit hardening were higher than those gained by other irrigation regimes in terms of oil and fruit production. Overall, employing RDI during fruit color variations and pit hardening without leading to any reduction in fruit size and yield caused to elevate WUE in olive orchards.

**Keywords:** *Olive, Deficit irrigation, Oil, Fruit characteristics*



## Effect of sowing dates and plant densities on flower yield and some important agronomical characteristics of European borage

\*H. Hasanvand<sup>1</sup>, S.A. Siadat<sup>2</sup>, A.M. Bakhshandeh<sup>2</sup>, M.R. Moradi Telavat<sup>4</sup> and A. Poshtdar<sup>5</sup>

<sup>1</sup>Ph.D. Student of Agronomy, Khouzestan Agricultural Science and Natural Resources University,

<sup>2</sup>Professor, Dept., of Plant Production and Genetic, Khouzestan Agricultural Science and Natural Resources University, <sup>4</sup>Associate Prof., Dept., of Plant Production and Genetic, Khouzestan Agricultural Science and Natural Resources University, <sup>5</sup>Senior Expert, Dept., of Plant Production and Genetic, Khouzestan Agricultural Science and Natural Resources University

Received: 08/06/2017; Accepted: 11/28/2017

### Abstract

**Background and objectives:** Borage (*Borago officinalis* L.) is an annual plant and belongs to the Boraginasea family that afford curative properties. Increasing people's tendency toward medicinal plants to treat diseases has conduct to and essential the cultivation of medicinal plants globally and in Iran. The production of medicinal plants like other plants is influenced by environmental factors such as sowing date and plant density per m<sup>-2</sup>. There is optimal sowing date for each crop and delay causse reducing of yield. Optimum plant density at farm is foundation of farming system (1). Thus, this experiment carried out in order to study the effect of sowing date and plant density on flower yield and some important agronomical characteristics of Borage (*Borago officinalis*).

**Materials and methods:** A field study was conducted as a split plot arrangement based on randomized complete blocks design (RCB) with three replications at farm at experimental field of Khouzestan Ramin Agriculture and Natural Resources University, Iran during 2016-2017 cropping season. Five sowing date (15 October, 5 and 25 November, 15 December and 5 January) as main plat and four plant densities including of 6, 10, 14 and 18 plant per m<sup>-2</sup> as sub plots comprised experimental treatments. Dry flower yield, number of flowering branche per plant, number of flowers per m<sup>2</sup>, plant height, number of leaf per plant, leaf area index, dry weight of leaves and stems and oil percent of Borage were measured. Analysis of variance and comparison of means was performed by SAS software and test (Duncan), 5% level probability. Respectively.

**Results:** The result of analysis of variance showed that sowing date and plant density had significant effect on plant height, flowering branches per plant, number of flowers per m<sup>2</sup>, dry flower yield and dry weight of stems. Also interaction effect of sowing date and plant densities on number of leaf per plant, leaf area index and dry weight of leaves was significant. Delaying in sowing date decreased the majority studied traits. 15 October is the best date with 72.08 gr m<sup>-2</sup> (dry flower yield). Increasing of plant density was reduced oil percent and increased plant height, dry weight of stems and flower yield. So that the highest dry flower yield was achieved with an average of 58.63 gr m<sup>-2</sup> at a density with 14 plant per m<sup>-2</sup>. Sowing dates of 15 October at 18 plants per m<sup>-2</sup> had the highest leaf area index and dry weight of leaves and sowing dates of 15 October at 6 plant per m<sup>-2</sup> had the highest number of leaf per plant.

**Conclusion:** Based on results, the best sowing date for borage was 15 October and the best planting density was 14 plant per m<sup>-2</sup> in Ahvaz region.

**Keywords:** Borage, Leaf area index, Oil percent, Yield components

\*Corresponding author: h1167.hasanvand@gmail.com



## Effects of organic, biological and chemical fertilizers on quantitative traits of seedless barberry in on-year

A. Zare<sup>1</sup>, \*M.R. Asgharipour<sup>2</sup> and B.A. Fakheri<sup>3</sup>

<sup>1</sup>M.Sc. of Horticulture, Dept., of Horticulture, University of Zabol, Zabol, Iran,

<sup>2</sup>Associate Prof., Dept., of Agronomy, University of Zabol, Zabol, Iran,

<sup>3</sup>Professor, Dept., of Plant Breeding, University of Zabol, Zabol, Iran

Received: 08/17/2017; Accepted: 12/25/2017

### Abstract

**Background and objectives:** In order to have a sustainable agricultural system, it is essential to use inputs that help improve the biology and reduce the contamination. Since centuries ago barberry has been used as a food additive, as well as a medicine to lower blood pressure, strengthen the heart, relieve stomach, urinate and hemorrhoids and is very beneficial to strengthen and eliminate liver obstruction. This plant is widely distributed in Iran and it can be seen on steep slopes, especially calcareous soils in Azerbaijan, Gilan, Mazandaran, Golestan, Tehran, Khorasan (Qaen, Sarbishe, Salm Abad, Dargaz) and Fars. The cities of Qaen and Birjand in South Khorasan Province account for more than 97% of the country's barberry crop area and produce 95% of the world's barberry. With regard to the importance of food and medicinal products of barberry shrub, this experiment was conducted with the aim of applying chemical, organic and biological fertilizers on the quantitative characteristics of barberry.

**Materials and methods:** This experiment was conducted as split plot randomized complete block design with three replications in commercial garden in Qaen, during 2016. Main treatments comprised four application types of fertilizer (1-no fertilizer application, and application of 2-Chemical fertilizer, 3-organic fertilizer and 4-50 percent of chemical along with 50 percent of organic fertilizer). Sub treatments were no fertilizer, application of Phosphate Barvar-2, humic acid, and Phosphate Barvar-2 + humic acid. The studied characteristics were measured at the end of the growing season (early November) when the fruits were in physiological maturity. For sampling from each shrub, 7 branches were selected randomly. The average number of berries per spike, number of spikes per branch and fresh weight of 100 berries as the values of these traits were reported for that shrub. The mean length of 7 leaves and berries were reported as the length of barberry leaf and berries. In addition, the yield of the berries and the weight of the branches were measured for all shrubs.

The total number of fertile and non-fertile branches was counted in each shrub and the ratio of non-fertile to fertile branches was obtained. Dry weight of 100 berries and dry yield of berries (economic yield) were measured by drying them.

The measured characteristics included the length of the berries, leaf length, number of berries per spike, number of spikes per branch, fresh weight of 100 berries, dry weight of 100 berries, impure fresh yield, fresh weight of berries, dried weight of berries, number of fertile branches and number of young branches (next year's fertile branches).

**Results:** Fertilizer treatments significantly influenced all traits, so that combined application of chemical and organic fertilizer along with fertigation of humic acid and Phosphate Barvar-2 produced the greatest length of berries and leaves, fresh and dry weight of 100-berries, fresh and dry yield of berry and fresh weight of fertile branch. Application of organic fertilizer along with

---

\*Corresponding author: [m\\_asgharipour@uoaz.ac.ir](mailto:m_asgharipour@uoaz.ac.ir)



fertigation of humic acid and Phosphate Barvar-2 produced the greatest berry numbers per panicle, panicle number per branch and fertile branches. The highest season branches and ratio of infertile/fertile branches was observed in plants fertilized with chemical fertilizer along with humic acid and Phosphate Barvar-2. Dry weight of berries (economic yield) increased in plant fertilized with combined application of chemical and organic fertilizer along with humic acid and Phosphate Barvar-2 by 10.48, 20.11 and 27.30 percent in comparison with the organic fertilizer+ humic acid+ Phosphate Barvar-2, chemical fertilizer + humic acid+ Phosphate Barvar-2 and control, respectively.

**Conclusion:** These results suggested that the greatest berries and leaf length, fresh and dried weight of berries and impure fresh yield were obtained at combined application of chemical and organic fertilizer along with fertigation of humic acid and Phosphate Barvar-2. Accordingly, it can be concluded that the combined use of organic, chemical and biological fertilizers increased the yield and yield components of barberry more than their separate application.

**Keywords:** Combined Nutrition, Humic acid, Manure, Qayenat, Quantitative yeild



## Evaluation the characteristics of additive and replacement series of garlic (*Allium sativum* L.) and pea (*Pisum sativum* L.) intercropping in Gonbad Kavoods and Sari regions

A. Abbasian<sup>1</sup>, A. Nakhzari Moghaddam<sup>2</sup>, \*H. Pirdashti<sup>3</sup> and  
E. Gholamalipour Alamdari<sup>2</sup>

<sup>1</sup>Ph.D. Student of Agronomy, Gonbad Kavoods University, <sup>2</sup>Assistant Prof., Gonbad Kavoods University,

<sup>3</sup>Associate Prof., Dept., of Agronomy, Genetics and Agricultural Biotechnology Institute of Agronomy,  
Sari Agricultural Sciences and Natural Resources University

Received: 11/27/2016; Accepted: 02/14/2017

### Abstract

**Backgrounds and objectives:** Nowadays, intercropping is highlighted as a solution to optimize usage of inputs, to decline pesticides and to produce safe food in agriculture. The previous studies represent relative advantages of multiple cropping versus sole cropping. Since, garlic and pea are well-adapted plants to northern climatic conditions of Iran and there were no comprehensive studies about their intercropping, the present study was aimed to evaluate and determine the best intercropping treatment between garlic and pea in terms of yield.

**Materials and methods:** The research was conducted at research farm of Gonbad Kavoods University and Sari region during 2013-2014. The experiment was arranged based on randomized complete block design with three replications. Treatments were nine levels including sole cropping of garlic and pea and replacement series of 25:75, 50:50 and 75%:25% pea: garlic and additive series of 25, 50, 75 and 100% pea +100% garlic.

**Results:** The biological yield of garlic in Gonbad Kavoods region (2357.21 g/m<sup>2</sup>) was 10 percent lower than Sari region. Means sulfur percentage in garlic bulb was recorded 0.81 and 0.94 for Gonbad Kavoods and Sari region, respectively. The maximum bulb yield (1193.42 g/m<sup>2</sup>) was belonged to sole cropping of garlic in Sari conditions. Seed yield of pea was 399.3 and 736.17 kg/ha in Gonbad Kavoods and Sari, respectively. Results indicated that the maximum seed yield of pea was recorded in sole cropping and followed by additive series of 100% garlic + 100% pea by 53.3 g/m<sup>2</sup>. In Sari region, the seed nitrogen and phosphorous content in was 4.85 and 0.29 %, respectively, which these rates were about 3 and 11.5 % more than Gonbad Kavoods region. Also, the maximum seed potassium (1.53%) was related to additive series of 25% pea + 100% garlic in Sari conditions. The highest land equivalent ratio (1.76), relative crowding coefficient (7.4), aggressivity (0.79) and relative value total (1.53) was recorded when additive series of 75, 25, 100 and 75 % of pea + 100% garlic intercropped in Sari climatic conditions, respectively.

**Conclusion:** Overall, results of different additive and replacement series of intercropping showed that the additive series intercropping of 75 and 100 % pea + 100% garlic resulted the maximum quantitative and qualitative yield in both studied regions.

**Keywords:** Garlic, Pea, Land equivalent ratio, Relative crowding coefficient, Aggressivity, Relative value total

---

\*Corresponding author: [h.pirdashti@sanru.ac.ir](mailto:h.pirdashti@sanru.ac.ir)



## Effects of different levels of selenium and nitrogen on some growth and biochemical characteristics of onion (*Allium cepa* L.) plant

M. Amerian<sup>1</sup>, \*F., Dashti<sup>2</sup> and M. Delshad<sup>3</sup>

<sup>1</sup>Ph.D. Student, Dept., of Horticultural Sciences, Bu-Ali Sina University, Hamedan,

<sup>2</sup>Associate Prof., Dept., of Horticultural Sciences, Bu-Ali Sina University, Hamedan,

<sup>3</sup>Associate Prof., Dept., of Horticultural Sciences, Tehran University, Karaj

Received: 04/01/2017; Accepted: 01/04/2018

### Abstract

**Background and objectives:** Selenium (Se) is an essential micronutrient for animals and human. Although, an effect of Se on plants is scarcely distinguished, there are increasing evidences that Se functions as an antioxidant in plants. Selenium has been show a positive effect on crop growth and stress tolerance at low concentrations, whereas at higher concentration it acts as an antioxidant and reduces plant growth. Plants play a key role in recycling and delivering Se from the soil to the food chain. Also, selenium affects nitrogen metabolism; Because onion leaves are used as vegetables in Iran. in this study, the time interaction of selenium by nitrogen was investigated on growth and biochemical characteristics of onion leaf for the first time.

**Materials and methods:** In the present experiment, the effects of different levels of selenium and nitrogen (N) on some growth and biochemical characteristics of onion (*Allium cepa* L.) cv.Ghermez Azarshahr were studied under hydroponic. Selenium at two levels (0, 1 and 1.5 mg L<sup>-1</sup> sodium selenate, and four levels nitrogen (56, 112, 168 and 224 mg L<sup>-1</sup> N) were studied in a factorial experiment based on a completely randomized design with three replications. At the early stage of blubbing (three months after seed sowing) some growth characteristics (Plant fresh weight, Plant height, leaf fresh weight and Pseudostem fresh weight), yield and biochemical characteristics (chlorophyll, antioxidant activity, total phenol, total flavonoids and ascorbic acid) and nitrate of onion leaves were measured.

**Results:** Based on the results, seedling growth characteristics of onion including plant fresh weight (29.01 g), leaf fresh weight (18.37 g), plant height (54.14 cm) and yield (148.04 g/m<sup>2</sup>) at concentrations of 1 and 1.5 mg L<sup>-1</sup> sodium selenite with nitrogen increased compared to 0 mg L<sup>-1</sup> sodium selenite with nitrogen. The simultaneous application of selenium and nitrogen had a significant effect on chlorophyll b content and the highest chlorophyll b levels were observed in treatments 1 mg L<sup>-1</sup> sodium selenate along with 224 mg L<sup>-1</sup> nitrogen and 1.5 mg L<sup>-1</sup> sodium selenate along with 224 mg L<sup>-1</sup> nitrogen, The lowest chlorophyll b levels was observed at 0 mg L<sup>-1</sup> sodium selenate along with 56 mg L<sup>-1</sup> nitrogen. Addition, the highest total phenol (9.03 mg fresh weight), total flavonoid (0.0094 mg fresh weight), ascorbic acid (0.70 mg fresh weight) and antioxidant activity (69.08%) of onion leaves were observed at sodium selenate treatments with nitrogen. While, the highest amount of nitrate was recorded in the 224 mg L<sup>-1</sup> nitrogen without any sodium selenate.

**Conclusion:** Generally, it can be concluded that the positive effect of selenium on the growth of onion seedlings has been associated with an increase in antioxidant activity and phenolic compounds. Nitrate levels increased at three levels of selenium with increasing nitrogen concentration, but decreased with increasing selenium levels. Finally, we recommend the use of 1 mg L<sup>-1</sup> sodium selenate with 224 mg L<sup>-1</sup> nitrogen in soilless culture system for the production of onion seedlings with maximum antioxidant compounds and yield.

**Keywords:** Antioxidant activity, Sodium selenate and Soilless culture system

---

\*Corresponding author: [dashti1350@yahoo.com](mailto:dashti1350@yahoo.com)



### Short Technical Report

## Effects of different drying methods (Technical Report: Natural method and oven) on drying time and some secondary metabolites of lemon balm (*Melissa officinalis* L.)

\*K. Hassanzadeh<sup>1</sup>, Kh. Hemmati<sup>2</sup> and M. Mehdipoor<sup>1</sup>

<sup>1</sup>M.Sc. Graduate, Medicinal Plants, Dept., of Horticulture Sciences, Gorgan University of Agricultural Sciences and Natural Resources, <sup>2</sup>Associate Prof., Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran

Received: 05/27/2016; Accepted: 03/06/2017

### Abstract

**Background and objectives:** Lemon balm is a medicinal herb that its essential oil has a wide range of applications in the pharmaceutical, health and food industries. It also contains rosmarinic acid (RA) which is presently utilized against HIV1 viruses and treatment of AIDS disease. Drying is one of the oldest methods of preserving agricultural products after harvest. This process involves the removal of moisture by evaporation to reach a certain threshold. The product can be stored for a long time. Actually, this process will stop the enzymatic activity of microorganisms and yeasts which cause decay of plant tissues. The drying process according to the type of active ingredients (alkaloids, essential oils, flavonoids, etc.), an appropriate method must be selected. In addition to great effect during the process of drying the durability of the product, the results of some studies have also shown that the method used for drying influence on yield and secondary metabolite content in herbs and ingredients.

**Materials and methods:** The experimental design was as a randomized complete blocks design with three replications and treatments were included: drying in room, shade and under sunlight, seven temperatures: 30°C, 35°C, 40°C, 45°C, 50°C, 55°C and 60°C. The drying process was continued until the mass of the sample reduced to a moisture content of about 0.10 on a dry weight basis or 10% on a wet weight basis. The dried samples used for extraction of essential oil (Essential oil content) and methanolic extraction applied for the measurement of some secondary metabolites (antioxidant activity, total phenolic, and rosmarinic acid content). The essential oils of dried samples were obtained by hydro-distillation, and the Rosmarinic acid (RA) contents were analyzed by HPLC, while their antioxidant activity was assessed by DPPH free radical scavenging capacity and total phenolic compounds were determined by the Foline-Ciocalteu method.

**Results:** The results showed that the highest level of essential oil (0.38%) and antioxidant activity (83.19%) was achieved in the treatment of drying with oven at 30°C. The highest total phenol content (58.77 mg/g DW) was obtained in the dry treatment with oven at 40°C. Additionally, The highest level of rosmarinic acid (39.78 mg/g DW) was observed in the treatment of room drying. The lowest amount of essential oil (0.22%), antioxidant activity (20.58%) and rosmarinic acid (0.26 mg/g DW) was achieved in the treatment of drying at 60°C. Increase in oven temperature (60°C) and decrease in oven temperature (30-40°C) in different methods of drying, respectively cause the fall and rise in the amount of secondary metabolites of lemon balm.

**Conclusion:** According to the results, if the aim of drying of *Melissa officinalis* L. is achieving higher levels of essential oil, drying at 30°C will be recommended. However, if the aim is achieving high levels of rosmarinic acid, drying at the room and 40-45°C be recommended.

**Keywords:** Essential oil, Rosmarinic acid, Lemon balm, DPPH, HPLC

---

\*Corresponding author: medicinalplants7@gmail.com