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# Effects of organic fertilizers and drought stress on Physiological traits in barley

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**Abstract**

**Stress the most important factor limiting agricultural production in arid and semi-arid systems is considered. Distribution of rainfall in these areas (arid semi-arid), sometimes not consistent with crop needs and develop products that are temporary or prolonged drought. To study the effects of spray irrigation on winter barley trial at year 2011 in the field region of Damghan. These Split plot experiment in randomized complete block design with three replications. Cares were Treatments was included two water treatment interruption (control and Cut of irrigation 41 BBCH scale), two barley cultivars (Kavir and Nusrat) and four levels at spray (control, Humax(100%), Biomin (100%), Humax and Biomin 50:50). Results showed the most Grain yield amount with normal irrigation of variety Nusrat foliar Humax + Biomin (8998.7 kg.ha$^{-1}$) and the lowest grain yield of the water deficit stress conditions (41BBCH) of variety Nusrat foliar Humax + Biomin (912.7 kg.ha$^{-1}$) was. Rates Protein affected foliar Humax + Biomin both normal irrigation and water deficit stress conditions (41BBCH) solution were (11.42% and 11.53%) most of the proteins themselves. The study found that proline Nusrat victory both in normal irrigation and deficit stress conditions (41BBCH) , without spray (control) solution were (63.03 µmol/g and 80.33 µmol/g) more proline compared to other treatments showed. Farmers to increase their performance today acre foliar spray methods are used for fertilization. Foliar spray of plant response to fertilizer is fast methods. This approach makes the environment by fertilizing it in order to achieve sustainable agriculture is also very helpful. It was found that the variety kavir of normal watering with foliar Humax + Biomin potassium levels showed more than other treatments. The different effects on different plants using soil dry organic fertilizer such as Humax and Biomin can be drought resistant plants to rise.**

***Keywords:*** Barley, BBCH scale, Biomin, Humax, Irrigation, Potassium.

## Introduction

The BBCH scale code is included as a check list in several IT-Systems for reporting and analysis of agricultural field trial data. ARM and PIAF (Gyllng and Stratmann, 2007 ;Michei et al. 2007; Schmidtke and Zink 2007) are two commercial systems in which the BBCH coding system is integrated as check lists. The Guidelines for Plant Phenological Observations of World Meteorological Organisation (WMO) highly recommend the phase definition according to the BBCH scale codes in a chapter of its own (Koch et al., 2007). The Global Phenological Monitoring programme (In-tern. Society of Biometeorology) is fully compatible with the BBCH scale system. The International Phenological Garden and many other national programmes provide a compar-European Phenological Data Platform for Climatological Applications (COST 725) hosted by the Austrian Central Institute of Meteorology and Geomagnetism (ZAMG) in Vi-enna manages its phenological data using the corresponding BBCH scale codes (Koch *et al*., 2006). Soil and water two important natural resource for agricultural development and economic benefits of the acquisition will be accounted for in any country (Rajak *et al*, 2006). Agricultural irrigation is an effective way to cope with the increase of the demand food and fiber in the world (Du et al, 2006). Fear of rapid population growth, the problem of decreasing water resources, particularly in arid and semi-arid regions of the world (Sepaskhah and Akbari, 2005). Drought and non-living factors that limit agricultural production (Lawlor, 2000; Flexas *et al*., 2004; Por mohamad kiani *et al*., 2007; Reddy *et al.*, 2002). The most important factor limiting the successful production of dry products of social wealth in the world and is considered to be a factor when a combination of physical and environmental factors in stress in the plant is made result of reduced production. This is also a factor in reducing the stress that this is true even in cases where the damage is not visible (Sarmadnya and Kochaki, 1999). Today the fourth after wheat, barley, Rice, corn and barley in cereals has fallen, however, as a product of the time and needed to be addressed, climate conditions and shows good tolerance adverse inappropriate in terms of rainfall and soil K function is able to grow and produce (Khodabandeh, 2010). Trace amounts of organic acids due to hormonal compounds have beneficial effects on increasing production and improving the quality of agricultural products (Samavat and Malakooti, 2005). Organic matter humus compounds, two major organic acids called acid humic and acid Foloic, Humin of the various sources such as soil, humus, peat, brown oxide, coal and ... Are extracted and the molecular size and chemical structure of different (Sebahattin and Necdet, 2005). Humic acids with a molecular weight of 30-300 kg Dalton form stable and insoluble complex with micro elements and has been is but Foloic percent more carbon acid Foloic acid has more oxygen. Acid carboxyl groups of the acid Humic (Samavat and Malakooti, 2005). Humus material with aggregates and increased availability of nutrients to plants particularly iron can have an important role in increasing agricultural production (Gracia *et al*., 1995). Humic acid can be produced important benefits of cheeked nutrients such as sodium, potassium, magnesium, zinc, calcium, iron, copper and other elements in order to overcome nutrient deficiencies.

Pointed out that increasing the length and weight of roots and root beginning side (Aiken e*t al*., 1985). Positive effects on growth Humic studies suggest the optimal value without depending on the type of nutrient that is important (Yidirim, 2007). Increase the absorption of nutrients in the humic acid has been reported by other researchers have reported that the metabolic activity of buds humic acid increases, so increases the mobility of grain protein (Kosar and Azam, 1985). The aim of this study was to compromise the environment and use of spraying water deficit is one of the fundamental aspects of organic fertilizer to improve and enhance the quality of its products. Due to the variety of plants on dry soil using organic fertilizers such as Humax and Biomin can enhance drought resistance in plants.

## Materials and Methods

To evaluate the effects of spray humax and biomin, irrigation on winter barley trial at year 2011 Cover in the city region between 53˚ 42 ̄ until 45˚ 49 ̄ East longitude and 36˚ 34 ́ north latitude was and altitude is 1170 meters above sea level Implementations. These experiments split split plot in a randomized complete block design with three replications. Treatments included two treatments to help cut of irrigation (control and water cut at 41 BBCH scale ) As the main factor and two-crop barley cultivars (Kavir and Nusrat) as a sub-agent spray at four levels (control, Humax, Biomin, Humax and Biomin 50:50) as the sub-subplot was. Field test site on 15 Operations in November 1389 after the deep plowing and seed bed preparation both perpendicular to the disk and finally the rotating field cultivator barley were cultivated. After leveling the ground ammonium phosphate fertilizer according to soil test phosphorus source at the rate of 150 kg per hectare of land, air and atmospheric, and stack frames Faroe devices were created on earth. 200 kg N ha urea fertilizer before planting the base of the stem elongation stage road was as fertilizer in the spring. Each plot has 10 rows, 5 m long, with a line spacing of 30 cm and plant spacing on plant line was 1 cm. The following traits: grain yield, protein and potassium are proline. Measurements proline by Bates (1973) was performed. Protein Kjeldahl method using factor 6.25 is measured (Anonymous, 2002). Finally, statistical analysis of data using statistical software SAS Performed by comparing the test Duncan In the five percent level, respectively.

## Results and Discussion

### *Grain Yield*

Analysis of variance results are consistent with the Table attribute of all resources of a percentage change in the yield statistically significant level (Table 1). Comparison between treatments showed that water deficit reduced yield of 100% was irrigated with normal conditions. Comparison between the two cultivars that yield well digits victory with more than 3760 $kg.ha^{-1}$ figure was desert. The comparison showed that the mean foliar treatment Humax + Biomin 4005 $kg.ha^{-1}$ grain yield accounts that were not significantly different Biomin (Table 2). The three-factor interaction effect spraying × the Cultivar × stress it was found that the cultivar Nusrat foliar of normal irrigation with water deficit conditions Humax + Biomin highest and lowest grain yield than the other treatments showed (Table 3). Increase in crop yield due to changes in attributes that have a large role in shaping performance (Moghadam, 2008). Since the yield-related traits spike, number of grains per spike and grain weight with grain yield and yield components of these traits were observed in the non-application of treatments, spraying Humax and Biomin (control group) were increased significantly, the result tested by testing Azin pour (2010) conflicts can be no significant difference in grain yield due to the use of these used the elements Micronutrients applied (sprayed) and rainfall of micronutrient elements is used. Comparison between treatments showed that water deficit reduced yield of 100% was irrigated with normal conditions. Certain plants have the capacity to store a bit of grain filling photo assimilate, may be the stress of short result in greatly reduced performance. Performance depends heavily stressed and stress is yield potential and escape from stress (Afzali far, 2009). Humic acid from the positive effects of physiological effects on cell metabolism and increase plant yield is increased chlorophyll concentrations (Nardi *et al*, 2002). The effect of spraying acid humic and nitrogen for Triticum durum were studied. Results showed that grain yield, spike fertility and grain protein content increased in both treatments increased foliar nitrogen in acid simultaneously humic were much larger (Delfine *et al*, 2005). Application was Humic acid on wheat yield increase 24% (Delfine *et al*, 2005 ). In the study of spray material Humic heading stage of wheat yield 7 to 8 percent increase compared to the control treatment (Xudan, 1986).

***Protein***

Table Analysis of variance showed that the effect of water deficit stress, foliar application and effect of Stress × spray in statistical 1% and the two cultivars × spraying the level statistically significant at 5% (Table 1). Compared between treatments showed Water stress reduced the protein levels of 10 to 8.6 percent seed. The comparison between the two varieties of protein, were similar in both cultivars statistics. The comparison showed that the mean foliar treatment Humax + Biomin won the highest amount of protein (Table 2). According to Table 3 the three-factor effects foliar applications × cultivar × drought stress were defined factor Kavir Desert normal irrigation and drought stress conditions associated with foliar Humax + Biomin get the most protein. The results showed that the intensity of water deficit of total soluble protein was significantly decreased in the treated water. Rubs enzyme large subunit protein treatment was more dry farming and water treatment. It can be concluded that the decrease in total protein in plants under drought stress, primarily due to the sensitivity of barley to water shortages in the stage. It seems that decrease in soluble protein during drought stress was due to a severe decrease in photosynthesis. Photosynthesis decreased in Drought stress and Material for protein synthesis weren't provided, therefore, protein synthesis dramatically reduced or even stopped (Mohammadkhani and Heidari, 2007). The progressive reduction of total soluble proteins during water deficiency in the plants was induced by proteolysis, with the liberated amino acids used during the plant osmotic adjustment; this fact indicates a slow recuperation of this parameter probably because the proteins depend on other nitrogen compounds for synthesis (Costa and LoBato, 2009). Our result are in agreement with those of (lqbal and Bano, 2009; Bayramov *et al*., 2010).

***Proline***

Results Table Analysis of variance showed that the difference of one percent of drought stress, cultivar, foliar application the characteristic proline were significant treatment effect mutual Stress × spraying of five percent was significant (Table 1). Compared between treatments showed Water stress increased the proline content of 42.48 to 57.22 $\mu m.g^{-1}$ fresh weight was Proline also compared between the two cultivars, cultivars Nusrat with 58.41 μm/g wet weight Above Kavir (4.28 μm/g wet weight) were. Mean comparison showed that the foliar spray treatment without (control) group was statistically different than the other treatments (Table 2). According to Table 3 the three-factor effects foliar applications × cultivar × drought stress were factor Nusrat figure in normal conditions, without spray irrigation control more proline compared to other treatments showed the the results Movahedi in 2004 Not match. Plants during water stress, osmotic adjustments for a series of friendly Asmolits such as proline, wisteria, Betaine, sugars and inorganic cations within their cells that synthesize or assemble to keep inflammation at the time of loss water to plants (Turner and Jones, 1980). A study on two durum wheat varieties resistant and susceptible cultivars was observed that the increase in water soluble carbohydrate content in comparison with the better indicator is to show the potential for drought resistance, because proline under drought stress increased and the increase was similar in both susceptible and resistant varieties (Kameli and lose, 1993). An existence report is the under tension Drought and Salt content Proline at figure wheat resistant more of figure sensitive (Kao, 1981). A common response to water deficit in plants is the accumulation of osmo protectants such as proline (Moradshahi *et al*., 2004). Proline accumulation is responsible for the hydration of biopolymers surviving as areadily utilizable energy source and serving as a nitrogen source compound during periods of inhibited growth (Kala and Godara, 2011). A marked increase in proline content in the leaves of could be an indicator of its high drought tolerance (Ashraf and Iram, 2005). Proline accumulation is believed to play adaptive roles in plant stress tolerance (Mafakheri *et al*., 2011). Also, Din et al., 2011 found that metabolic factors such as free proline contents in leaves increased significantly under severe drought stress. Thus, it appears that increase in proline contents during drought stress induction is an adaptive mechanism in castor oil.

Table 1. ANOVA results Mean squares yield variety barley on the treated The Stress and spraying.

| Changes in resources | DF | Grain Yield | Potassium | protein | Proline |
|---|---|---|---|---|---|
| Repeat | 2 | 382249.7 | 631.18 | 0.12 | 1.28 |
| Factor A (stress) | 1 | 168939428.1** | 128754.8** | 23.49** | 2608.24** |
| One error | 2 | 332464.1 | 26.27 | 0.06 | 13.03 |
| Factor B **(**variety) | 1 | 2869207.5** | 302418.75** | 0.43ns | 3519.70** |
| A × B | 1 | 11179042.9** | 8216.33ns | 0.18ns | 3.61ns |
| Two error | 4 | 134515.7 | 1793.10 | 0.50 | 7.41 |
| Factor C (spraying) | 3 | 2460830.8** | 134387.61** | 23.03** | 1163.96** |
| A × C | 3 | 5974385.9** | 8852.13* | 1.73** | 65.98* |
| B × C | 3 | 2322597.3** | 1384.36ns | 0.73* | 12.41ns |
| A × B × C | 3 | 4077412** | 7476.72ns | 0.45ns | 2.44ns |
| EROR | 24 | 22489 | 2913.75 | 0.21 | 14.76 |
| CV% | | 14.16 | 10.96 | 4.96 | 7.70 |

ns,** and *: The respectively non significant and significant in level of percents the 1 and 5**.**

Table 2. Comparison of barley yield under the three-factor interaction between Stress and cultivar barley and solution spray.*

| Treatments<br>Stress × barley cultivars × Solution spray | Grain Yield<br>(kg.h) | Potassium<br>(mg.100g) | Protein<br>(%) | Proline<br>(µmol/g) |
|---|---|---|---|---|
| control × Kavir × Concentration control | 4360.7c | 510.33cd | 8.38ed | 44.33 |
| control × Kavir × Concentration Humax | 4588c | 608bc | 10.11b | 32.43 |
| control × Kavir× Concentration Biomin | 4834.3c | 605bc | 10.11b | 32.83 |
| control × Kavir × Concentration Humax + Biomin | 4765.3c | 718a | 11.56a | 27.15 |
| control × Nosrat × Concentration control | 4905.3c | 205.33e | 8.80d | 63.03 |
| control × Nosrat × Concentration Humax | 4512.7c | 469.67d | 9.81bc | 49.46 |
| control × Nosrat × Concentration Biomin | 5948.3b | 478.67d | 9.85bc | 49.30 |
| control × Nosrat × Concentration Humax + Biomin | 8998.3a | 657.33ab | 11.42a | 41.26 |
| 41BBCH× Kavir × Concentration control | 1932e | 442d | 6.98f | 62.16 |
| 41BBCH× Kavir × Concentration Humax | 1270.3ef | 517.67cd | 9.11cd | 44.96 |
| 41BBCH× Kavir × Concentration Biomin | 2855.3d | 465d | 7.43f | 50.40 |
| 41BBCH× Kavir × Concentration Humax + Biomin | 1343ef | 707a | 11.53a | 36 |
| 41BBCH× Nosrat × Concentration control | 1398ef | 309e | 7.31f | 80.33 |
| 41BBCH× Nosrat × Concentration Humax | 1841e | 287.33e | 8.80d | 63.43 |
| 41BBCH× Nosrat × Concentration Biomin | 1564ef | 311e | 7.64ef | 70.36 |
| 41BBCH× Nosrat × Concentration Humax + Biomin | 912.7f | 484d | 10.05b | 50.10 |

***Potassium***

Table Results of analysis of variance with stress, cultivars, foliar application of potassium statistically significant attribute of a one percent (Table 1). Comparison between treatments showed that water deficit reduced 103.58 (100g.$mg^{-1}$) Potassium than conditions were normal irrigated in seed. The comparison showed that the mean foliar treatment than other treatments Humax + Biomin group was statistically different (Table 2). Table 3 the three-factor effects foliar applications × cultivar × drought stress were defined factor Kavir with water at normal conditions foliar Humax + Biomin Potassium much more than that from other treatments. Results showed that increasing drought stress on shoot potassium is added and the increase in the osmotic pressure of the cations in the regulation of stomata control as they are (Zhao, 2000). Erdei *et al* (1993) reported that the effect of drought stress on the accumulation of sodium and potassium in shoots and roots of sorghum and corn are added that if the conditions ABA No significant increase in their use. The comparison between two cultivars, cultivar Kavir with 571.63 (100 g.$mg^{-1}$) Potassium was higher than the figure of victory. Fernandez *et al* (1996) in terms of greenhouse and field spraying olive extract Leonardit the potassium concentration of magnesium and iron found in leaf and stem growth increases, but increases the amount of leaf nitrogen, potassium and less adequate h d If it cannot compensate spraying Humic acid. During the trial Simrin and Yylmaz (2005) was rejected by Humic acid was found carbidopa on uptake of potassium and calcium in lettuce is ineffective. Report Gliessman *et al* (1990) also showed no effect of organic matter on nutrient uptake in strawberry leaves. Humic when using acids and micronutrients simultaneously due to increased root growth by Humic acid, nutrient uptake increases (Azin pour, 2010). Humic acid minimal impact on plant growth can be partly attributed to its effect on the absorption of nutrients by the plant (Torkmen *et al*., 2004). Therefore, considering the lack of effect of humic acid on the absorption of some nutrients can be attributed to the lack of effect on plant growth.

## Conclusion

To improve grain quality in terms of nutritional value, especially to increase the amount of iron in the late stages of the growing season when leaves and seeds is not too yellow spray these elements is essential. One of the important objectives of the rapid supply of nutrients for crop spraying, resulting in an increase in yield is. The results showed that water deficit reduced yield, protein and potassium than normal irrigation conditions and increase in collagen content. Nusrat also compared the yield and prolines were higher than the figure of the desert. The comparison showed that the mean foliar treatment Humax + Biomin highest grain yield and proline to themselves.

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