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Research Article

THE EFFECT OF CULTIVATION METHODS ON YIELD AND YIELD COMPONENT OF BARLEY (HORDEUM VULGARE) AFZAL CULTIVAR

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ABSTRACT
Best method of planting can increase crop yield and reduce production costs. In order to investigate the best method of planting barley (Hordeum vulgare), a field experiment was conducted in a randomized complete block design with four treatments including different methods of planting (planting hill, hand sprayers, depth, and linear planting) in three replication in 2007 at Ardekan Payame Noor University. Traits of grain weight in main spike and sub-spike, plant height, yield, transpiration rate, and leaf temperature were measured. Results showed that all traits except plant height and grain weight per main spike were significant. The highest yield was obtained in planting hill that had no significant difference with planting of linear. The highest leaf transpiration rate and minimum temperatures were related to hand sprayers. So, the best method of planting of Barley is culture hill in Yazd province.

Keywords: *Leaf Temperature, Transpiration Rate, Planting Hill, Hand Sprayers Culture, Depth Planting, Linear Culture*

INTRODUCTION
Barely is a one-year, monocot, herbaceous, from Graminea family, of Hordeam. Its agricultural species is Vulgare. Accurate selection of planting method for each product highly depends on physical and chemical status of soil, land leveling situation, rainfall amounts, and irrigation method. In other words, there is no planting method-based classification for plants and work conditions (weather, machineries, soil, and irrigation) determine the best planting method for each plant in each farm. Planting methods of crops can be classified into four general groups of furrow, hill, furrow, and flat methods. Planting management, i.e. planting methods include a set of operations performed by farm manager to provide appropriate environment to achieve the maximum growth and maximum crop yield. Such a set of actions improves and modifies growth factors in favor of plant. Notable, management plays a significant role under the conditions of tension and particularly salinity tension. Planting method has an effective role in the way of alt distribution in plat root environment. Due to tillering property, barely has a high flexibility in terms of plant density such that in a wide range of plant density, the number of spike and seed yield will be identical. As some reports revealed, in case of considering seed yield, there is a desirable plant density in which the maximum density of seed yield is obtained (Hucle *et al.*, 1989). In case of low density, production potential is not optimally used and in case of considering desirable density, photosynthesis materials are used for growth or respiratory growth of the plant instead of being consumed to produce seed (Blye *et al.*, 1990). Another important factor in the quality of beet is its planting method. Beet is planted through linear, hill and basin methods while today, particularly in mechanized planting, beet is generally cultivated using flat hill or linear methods. In planting hill, some hills are created with the height of between 25 cm to 50 cm. In hill and linear methods, the distance between the rows is between 50 cm to 70 cm. on the one hand, the distance between the plants on the rows is between 15 cm to 25 cm. According to various experiments, the increase of plants' distance up to more than 24 cm leads to the decrease of root and sugar yield. In Ahwaz *et al.*, (2006) compared the arrangements of flat planting with the distances of 30 cm, 15 cm and 50 cm and furrow and planting hill techniques with the distance of 60 cm with two lines on the hill. The maximum yield was obtained in planting methods with the distance of less than 15 cm. the most important reason was the most uniform distribution of plants on the rows. In another study, hand sprayed and linear planting methods (rapeseed

and three types of combine's platform) of normal platform of grain harvest, attached platform equipped with mechanical lateral cut and additional platform equipped with hydraulic lateral cut (in terms of total seed loss). It was observed that due to the use of more seed, hand sprayers planting leads to the decrease of diameter in rapeseed's stem and since the cuts of narrower stems have had less movement and beat, harvesting time loss has been decreased. Moreover, additional platforms can significantly decrease the amount of single losses within combine by the increase of the distance between cutter-bar (Izadi *et al.*, 2005). Zarin (1992) also reported that the increase of electrical direction leads to the decrease of stored water which can be sued by plant in the soil. Therefore, planting methods are different in salty soils since seeds should be placed in those parts of the soil which are exposed to less salt accumulation. He recommended two-row furrow and gradient methods. Company and Deer (1981) also proposed flat in-row planting method with flat seeding for dry farming areas, planting on hill beds with hill seeding for regions with adequate and appropriate moisture and lister furrow method for regions with water resources and raining deficit. As he reported, using lister furrow planting method with small hills including 2-3 inches height from the bed of furrows and 6-10 inches width causes to the protection of seeds and bushes against wind, water deficit, salinity, and heavy rain. Khaje and Hamdi (1990) believe that undesirable effects of salt in soils depends on soil's physical and chemical conditions such that Alkali and Alkali-salty soils suffer from lack of different elements; accordingly, various planting methods such as normal furrow, two-plate furrow, wide furrow, lister furrow, flat planting hill with uniform plant distribution, gradient furrow, normal furrow with alternate irrigation, subsequent replacement of furrow and hills should be used to decrease salinity effects. Investigating one-year Lucerne's planting methods, Heydari and Tork (2000) reported that furrow planting method is superior over hand sprayers and surface methods. Azizi *et al.,* (2005) asserted that depth planting method is superior over hand sprayer's method. According to Gupta *et al.,* (2000), furrow and planting hill method is a new farming method in Asia. The main advantages of this method include the need of 59% storage of seed, the increase of yield and better efficiency of fertilizers.

So, in salty lands, the place of planting seed in the soil is of the most important managerial points and applying the best planting method can be called one of the important farming parameters. Therefore, the present study attempted to investigate the best planting method of barely.

MATERIALS AND METHODS

Methodology

In order to investigate the best method of planting barley (Hordeum vulgare), a field experiment was conducted in a randomized complete block design with four treatments including different methods of planting (planting hill- the cultivation of the plant for the complex on the row, hand- sprayers, depth planting- creating a cavity with a rod and several seeds within it and linear planting) in three replication in 2007 at Ardekan Payame Noor University. The Regional climate was the semi-arid and dry type of area and soil type was clay loam and pH was 7. Land preparation operations included simple hard disk immediately after harvest sunflower. The preparation process included a simple disk immediately was done after sunflower harvest. The other irrigation was conducted according to the convention and all the operations, including fertilization, combating weeds were set up as needed break. Traits of grain weight in main spike and sub-spike, plant height, yield, transpiration rate, and leaf temperature were measured. After normalizing and analyzing the data by Minitab software, the averages were compared through Duncan's multiple range tests at 5% level.

RESULTS AND DISCUSSION

Findings

Leaf Temperature

Analyzing variance for trait of Leaf temperature (Table 1) showed that the effect of different methods of cultivation was significant at five percentage probability level. So, different methods of cultivation on the trait of Leaf temperature affected differently, and the means comparison (Table 2) indicated that the

highest different methods of cultivation was related to planting hill with an average of 27.57 centigrade that was not significant with the linear treatments planting at the five percent probability level. The lowest Leaf temperature was related to spray planting with an average of 26.33 centigrade that with the planting in depth was significant at the five percent probability level.

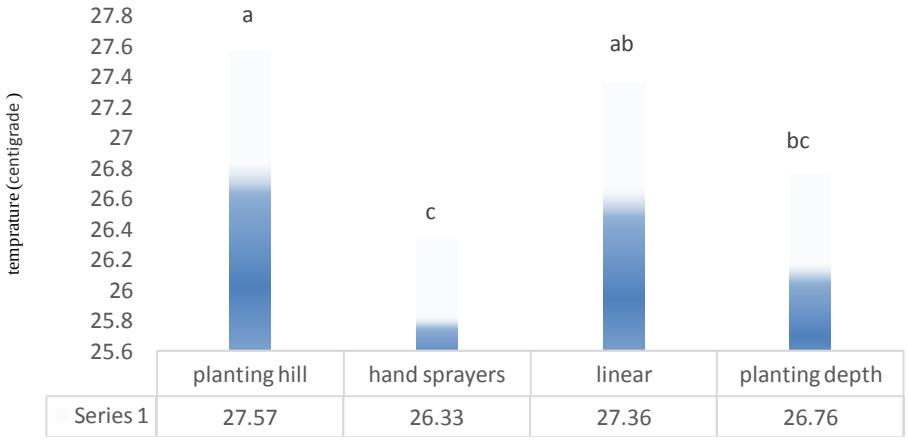

Figure 1: Mean of temperature under different planting methods

Transpiration Rate

The analysis of variance for trait of transpiration rate showed that the effect of planting methods was significant at one percentage probability level (Table 1). The comparison of average (Table 2) indicated that the highest transpiration rate was related to spray planting with an average of 6.44 the water molecules per second per unit weight of fresh (g), that was significant with the other treatments at the five percent probability level. The lowest transpiration rate was related to planting hill with an average of 1.30 the water molecules per second per unit weight of fresh (g), which with the spray planting was significant at the five percent probability level.

Grain Weight in Main Spike

Grain weight in the main spike was not found significant at the confidence level of 5% among various planting methods. But, grain weight in sub-spike was significant at the confidence level of 5% (Table 1). According to mean comparison, the trait of grain weight in sub-spike revealed that the highest grain weight in sub-spike with the mean of 3.60 g belongs to hand sprayer method and there is a significant difference this method and other planting methods. Also, the lowest mean of grain weight in sub-spike was obtained in depth planting method which was significantly different from other methods (Table 2).

Grain Yield

In the present study, it was revealed that the effect of various planting methods on seed yield is significant at the confidence level of 5% (Table 1).

Comparing the mean of seed yield showed that the highest seed yield belongs to 6.09 tons in hectare in planting hill method. Also, the lowest mean of seed yield (4.78 tons in hectare) was observed in depth planting and there was a significant difference between this method and hand sprayers method at the confidence level of 5% (Table 2).

Discussion

The reason of low leaf temperature in hand sprayer's method can be attributed to the increase of transpiration. The increase of transpiration causes the entrance of carbon dioxide into the leaf. On the other hand, it causes water out of stomas, leading to cooling the plant. Therefore, the increase of transpiration in hand sprayer's treatment leads to the decrease of leaf temperature due to high transpiration and water exits.

According to the research results, showing transpiration rate, and sometimes the transpiration related to the respiration and the respiration is important factor to decrease or increase on yield, the spray method had the lowest yield due to high transpiration. An experiment which was performed as Lepidium sativum seed priming by respiratory inhibitor materials that brought about the maximum rate of traits of dry weight and stem height related to salicylhydroxamic acid and CN. However, the minimum rate was observed in control plants (Abadikhah, 2012).

The number of seeds in spike is related to spike fertility and built photosynthesis material transportation to the spike which is influenced by genetic factors as well as environmental conditions (Hashemi *et al.*, 1996). Given that the number of seed is genetically identical in the treatments, the increase and decrease of seed number in spike is related to the environmental factors. In this experiment, hand sprayers planting method with the least density has the least seed number and depth planting method with the highest density has the highest seed number in the spike. Additionally, the decrease of seed number in hand sprayer's method can be due to salt accumulation in the soil surface. By the way, in this method, seed is placed in the nearest point to the soil surface. Accordingly, due to lack of root expansion in lower parts of soil, the plant suffers higher salinity tension relative to other methods and such a fact has a significant effect on the decrease of seed number and seed yield. The increase of density in planting hill method could more widely and appropriately cover the surface of farmer and use environmental factors more optimally. Accordingly, higher yield could be produced at surface unit. Furthermore, the increase of yield can be attributed to the increase of spike and sub-spikes' length and the lack of decrease in grain weight in spikes and sub-spikes. Moreover, it should be noted that various planting methods have no effect on the quantity and quality of light and photosynthesis amount in. Therefore, in identical conditions, the change in grain weight has been identical.

Finally, high importance of seed yield for human and livestock and importantly, consumed water and probable waters relate to planting hill method.

Table 1: Analysis of variance mean squares of the traits in barley Afzal cultivar

	D.F	Plant height	Temperature	Grain weight in sub-spik	Grain weight in main spike	Transpiration rate	Seed yield
Replication	2	58	0.23	0.36	0.66	0.05	1.12
Treatment	3	44	**19.46	*1.24	1.08	*0.91	*7.78
Error	6	19	0.05	1.31	0.39	0.12	1.27

**, **, and Ns indicate 5%, 1% significance level and not significant respectively.*

Table 2: Comparison of mean of barley Afzal cultivar traits

Planting methods	Plant height(cm)	Seed yield(ton/h)	Grain weight in sub-spik(g)	Grain weight in main spike(g)	Transpiration rate)%H_2O_2/se(	Temperature
hill planting	69.66A	6.09A	2.86AB	5.33A	1.30B	27.57A
hand sprayers	67.33A	4.96B	3.60A	4.73A	6.44A	26.33C
linear	69.33A	5.86A	2.95AB	5.39A	1.41B	27.36AB
planting depth	61.33A	4.78B	2.03B	6.2A	1.32B	26.76BC

Similar letters in every column mean that they are not significant at 5 % probability level.

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