

The effect of plant density on comparison forage yield of spring barley cultivar

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ABSTRACT: In order to study the effect of plant density on comparison forage yield of plant density on of cultivar spring barley split plot experiment with three replication in Borujerd Agriculture year 2008-2009 performance. Main plot was including 2 cultivars: (LOCALIZE), (Nosrat) and sub plot including 4 plant densities: (300), (350), (400), (450 plant per meter). Also experiment traits plant height in stem elongation, plant height in harvest stage, spike length, forage yield, grain yield and harvesting index were determined. Results showed that differences level density and cultivar applied in experiment differences significant on traits all indicated. also interaction effect between the two factors were significant about plant height in stem elongation, yield forage and harvesting index Also the most forage yield per hectare due to the high level in the plant height, spike length and better distribution than in stems and leaves to get the desired amount of radiation associated with better growth and density of 350 seeds of victory with 24470 ha, with 22273 kg m ha.

Keywords: cultivar, plant density, forage Yield, spring barley

INTRODUCTION

Barley is a plant that has a wide range of emissions and climate adaptation, which has been planted for seed production. There are many uses in human nutrition and livestock. Forage seeds of barley, corn is comparable to the value of forage seed. Barley straw is used in livestock feed and forage value that is higher than wheat straw (Nourmohammadi, 2009). Planting density should be as good as the green herb, and the establishment of a development space for maximum use of environmental resources and may not face adverse conditions as possible to the density of the plant for requires knowledge of the physiological characteristics of plants, is also its relationship with environmental factors, the balance of plant density, row spacing or less balanced distribution of plant level, the better use of light, moisture and nutrients and increase the yield of the (Srmdnya, 1990). Achieving high performance under the influence of moisture, food, genotype and plant density is. If the density is low compared with the use of production capacity due to increased weed competition and yield per unit area than are possible at high densities is not only the cost of high seed yield but also due to increased competition inside, plant in achieving the production factors decreases, optimum use of growth factors is achieved when the plant population of all factors of production, utilize the maximum (Singh, 1973). Increased plant density reduces the size and density increased more than three to limit the amount of product decreases due to competition for water and nutrients, light, or a combination of them. Between individuals in a species of plant density increased, the roots of neighboring plants compete for water and nutrients in the soil. Large extent on the density of plant roots and reduce its sensitivity to drought is more the other hand, increased plant density may be increased if more than one function is not (majnon Hosseini, 2000). Abdul Rahman, (2006) found that

during the experiment as the number and density of the highest seed yield and biological yield to the highest seed in the 550 meters and the lowest seed yield and biological yield the lowest seed to seed in the 250 meters belonged to (Rahman,2004). Donald, (1976) stated that increased density of plant shoots and reduced weight, increased harvest index due to emission reduction in plant communities with high concentrations (Donald, 1976). The aim of this experiment to determine the number of digits used in the area under cultivation, the densities used to determine the density of the forage is to achieve highest performance.

MATERIALS AND METHODS

In this study, Agricultural Research Station Borujerd, the season was 2009-2010. A split-plot experimental design was a randomized complete block with two factors. The first factor included two levels of local varieties (two-row, spring, susceptible to powdery mildew and Wires) and Nusrat (six-row, spring - fall, Wires and resistance to fungal diseases) and the second factor involves different levels of density (300 350, 400, 450 seed m) each had three replications. Each experimental plot consisted of six lines grown to six meters and width of each stack was 60 cm. The planting was done manually at a depth of 3 to 4 cm using siphon irrigation after planting was done during the growing season, using information from class A pan evaporation and irrigation of field observations were timely action. stem elongation stage and 100 kg nitrogen per hectare of land was to weed by hand and chemical herbicide 2-4-D than in the control of barley powdery mildew disease and during the growing season using potash twice within 14 days of fungicide to control, thus reducing operating any product, such as pest and weed and plant growth as there was potential for measuring the height of the harvest in each plot experimental The random sampling was done by throwing a box of 50 × 50 cm in each plot 10 plants were selected within each box with a ruler along the length of each plant from the crown to the highest plant height per plant calculated as the number According cm were obtained. To measure the weight of the forage leaves, stems, spikes in each experimental plot were recorded and the operation was performed in three replicates and the spike length (mean 10 spikes) were recorded and measured using a ruler and The weight of grains from spikes in each experimental plot were recorded and the total weight of seeds from each plot were calculated Spikes. The harvest index were measured in each plot and conclusion of the Excel software and data were analyzed with SAS software.

RESULTS AND DISCUSSION

| Resource changes | Degrees of freedom | of Plant height in stem elongation | Plant height in the late growing period | The spike length | Harvest index | Biological yield | Grain Yield |
|--------------------------|--------------------|------------------------------------|---|------------------|---------------|------------------|---------------|
| Repeat | 2 | 16.6 ns | 45.24 ns | 0.007 ns | 974.3 ns | 3.25174373** | 9.660489** |
| Density | 3 | 63.60 ** | 21.225* | 1.347** | 836.140 ** | 0.54246766** | 2.14808625** |
| Test error | 6 | 47.4 | 51.54 | 0.219 | 0.541 | 0.2900607 | 3.993683 |
| Figure | 1 | 37.570 ** | 63.564 ** | 15.200 ** | 621.23* | 0.757609777** | 4.100200793** |
| Density in figure | 3 | 90.43 ** | 74.15 ns | 0.655 ns | 917.44 ** | 0.24504509* | 0.0 ns |
| Test error | 8 | 7.08 | 93.38 | 0.18 | 37.3 | 5893543 | 62193 |
| Coefficient of variation | | 21.8 | 11.14 | 77.2 | 4.09 | 87.12 | 30.8 |

*, ** Significant at the level of 5 percent and 1 percent respectively - ns: not significant

Analysis of variance showed that the effect of different levels of density and numbers used in the experiments on biological yield, Plant height in stem elongation stage, plant height at harvest and yield per hectare and harvest index was significant. The interaction effect for barley at different levels of density, biomass yield, plant height and harvest index Plant height in stem elongation stage was significant (Table 1).

Plant height in stem elongation

The height of the most striking change is the result of growth in most plants. The results of the increases in plant height, form new leaves in the young leaves of plants with higher efficiency at the top of the old leaves and the amount of light they receive (Srmdnya,1990). Density and plant height of cultivars used in phase Plant height in stem elongation also showed a significant difference in the likelihood of an interaction effect was significant at the one percent level (Table 1). Showed that the number of varieties

with the highest average plant height 26.37 cm (Figure 1). Effect of different densities on the property showed that the average density of 400 seeds per square meter was ranked highest plant height 83.36 cm (Figure 2). Cultivars of this trait was significantly different because of local cultivars (two row) compared to the figure of victory (six-row) of the initial growth rate, is the earlier. Also among the different densities were significant for this trait. Because the density increased to a certain height, it increases the hormone auxin accumulation overcast, umber in high densities, but density increased due to a higher level of competition to attract and photosynthesis is reduced in height. In this experiment, the figure is higher than the growth rate figure of victory and this earliness nearly two-week figure was the figure of victory. Other researchers also have achieved these results (Khodabandeh,2005).

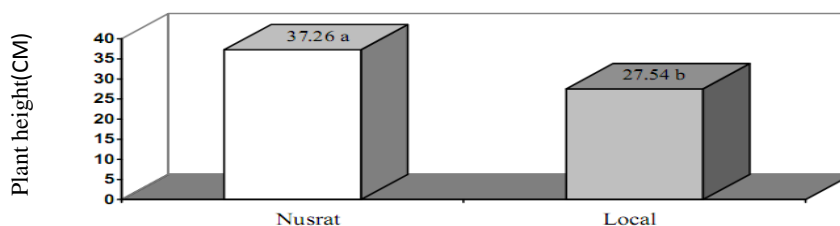


Figure 1. Average of plant height in stem elongation indifferent digits.

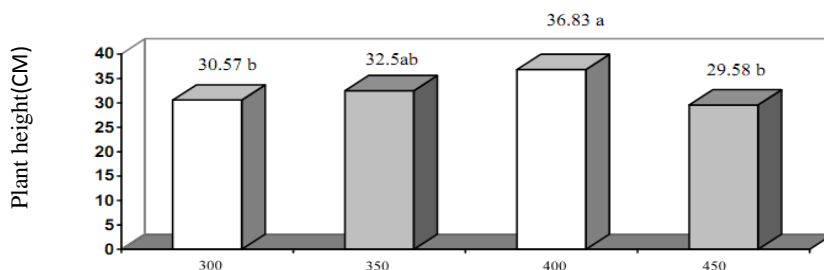


Figure 2. Average of plant height in stem elongation in different densities

Plant height at harvest stage

Increased seeding rates higher than optimum plant density, which makes much of the material produced, the vegetative parts are accounted for increasing the density of plants increased umber competition for access to sunlight and it will also stimulate excessive vegetative growth and increased The plant height (Rahman, 2004). Effect of different levels of density and cultivars on these traits were significant differences in the level of five percent and one percent indicated (Table 1). Nusrat average number of varieties that had the highest plant height 58.60 cm (Figure 3). Effect of different densities on the property showed that seed density of 400 m with an average height 88.62 cm, the highest ranked (Figure 4). The figures used in experiments on plant height trait was significant difference could be due to differences between two-row and six-row varieties mentioned that the six-row cultivars (victory) over a two-row varieties (local) with plant height are higher. The reason for the significant difference observed between the different densities is that the density increased, plant height increased, but this has given rise to the height of competition between herb happened in this experiment, the highest density of 400 plants m height Another reason was that it be noted that this increase in height with leaves up on each other's shadow rises and prevents degradation of the hormone auxin is the factor that the increase in plant height by increasing the density of more than 400 seeds m height was reduced due to competition within inside, other researchers have also found these results(When leishmaniasis, 2004; Srdnyha,2012; Stacey,2003).

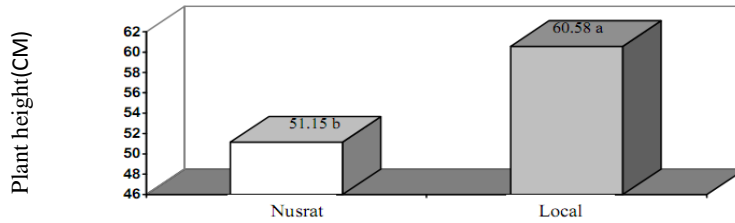


Figure 3. Average of Plant height in the late growing period indifferent digits

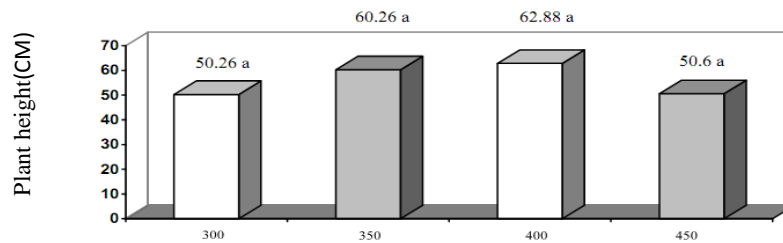


Figure 4. Average plant height in the late period of growth studied densities.

Spike length

High density development of inflorescence per plant (potential seed number) will compete in the situation and the smaller size of the spike (Srmunya, 2012). Numbers and densities of different levels on this trait were significant at the one percent level (Table 1). Figures showed that the effect of spike length had the highest number of victory with an average 20.16 cm (Fig. 5). Different levels of density on this trait showed a density of 350 seeds m ranked highest spike length (Fig. 6). Production of grains per spike, reduced photosynthesis and carbohydrate production materials produced by the spike was noted. These results are confirmed by other investigators (Srmunya, 2012; Rahman,2004).

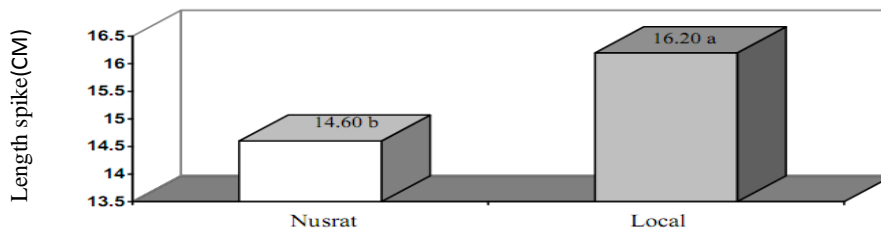


Figure 5. Average of length spike in different digits.

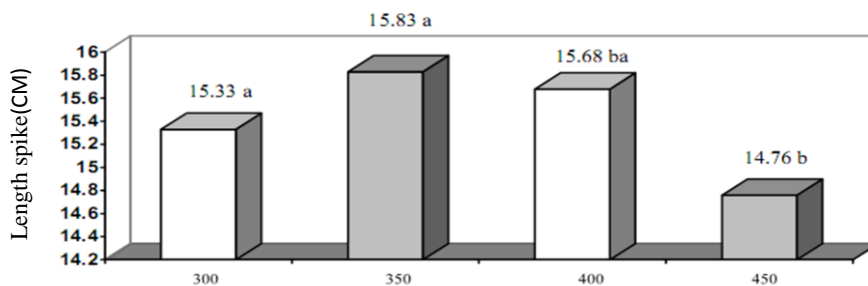


Figure 6. Average of length spike in different densities.

Yield forage

One of the most reliable methods for evaluating the rate of growth is the shoot dry weight. The dry weight of plants that have less ability to use fewer resources and other environmental conditions, poor environmental conditions reduced the physiological processes involved in the process is assimilation. Good indicator of biological function is to assess the growth and yield. Generally, the biological function of the varieties on Yield forage victory showed that the mean number of 24 470 ha had the highest biological yield (Fig. 6). Different levels of plant density on this trait showed that seed density of 350 m has the highest biological yield (Figure 7). Despite the significant difference between victory and local figures on this trait to be noted that the figure of victory because most of the harvested plant height, spike length in stems and leaves more and better distribution of the radiation received favorable and more desirable Yield forage was a total of more than local varieties. Also, the densities used, the maximum density of 350 seeds m Yield forage was having a fit because the distribution of plants on the earth's surface and absorbs solar radiation at the maximum density as compared to other densities. The results with other researchers was similar (Srmdhya, 2012).

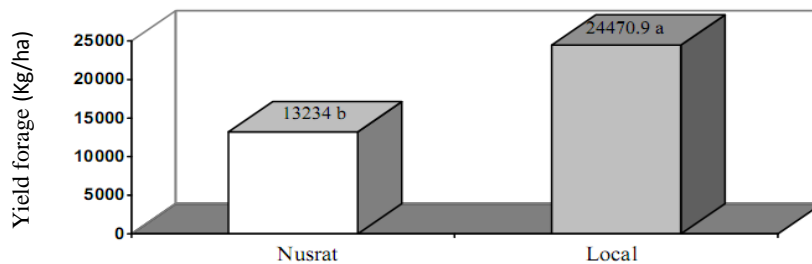


Figure 7. Average of forage yield in different digits

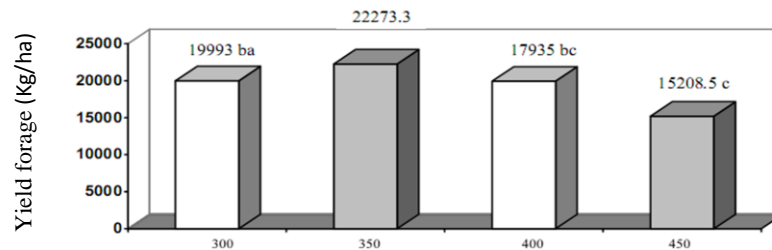


Figure 8. Average of forage yield in different densities

Yield

There is a good density for grain yield than the high density of photosynthetic plant material rather than grain growth or the growth of plant respiration, solar radiation, humidity, soil fertility are the major factors that the optimal plant density for grain yield effect (Holliday,1960). Numbers and densities of different levels on this trait were significant at the one percent level (Table 1). Different numbers of digits that victory with the highest average yield per hectare was 10,622 kg (Fig. 9). Different levels of density on this trait showed that seed density of 350 m had the highest grain yield (Fig. 10). The total yield of the varieties were significant differences could be due to higher plant height at harvest stage, spike length, yield a figure of victory than the figure noted. Also among the different densities of the significant difference in yield was due to the high density of 350 seeds m spike length, forage yield, harvest index and plant height was noted in the density. The results of this study is consistent with others (Singh, 1973).

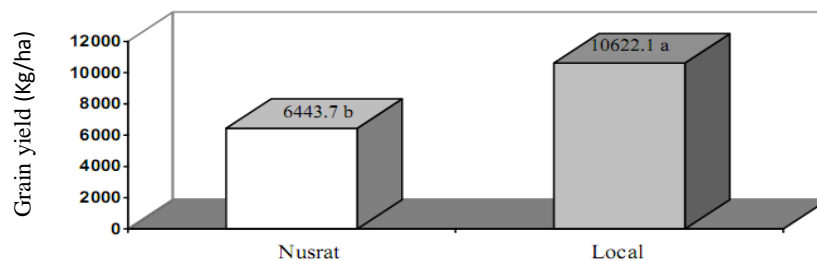


Figure 9. Average of grain yield in different digits

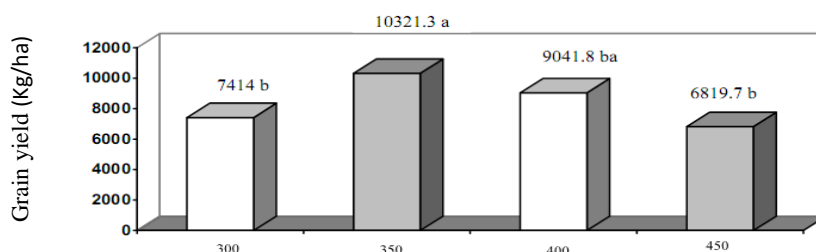


Figure 10. Average of grain yield in different densitie

Harvest index: The index represents the percentage of material transported from source to sink, the cultivars with higher harvest index carbohydrates are more capable than the green parts of plants and seeds to increase the yield (Sing., 1973). Numbers and densities of five percent and one percent levels, respectively, were also significant interactions between the two levels, a percentage significantly (Table 1). Effect of cultivars on harvest index showed that the mean number of 87/45 per cent was the highest harvest index (Fig. 11). Different levels of density on this trait showed that seed density of 350 m with an average of 64 percent was the highest harvest index (Fig. 12). The results showed that harvest index of cultivars showed significant differences in the trait plant height was noted in the stage of two-row varieties (local), compared to the six-row figures (NOSRAT) plant height, which had less reduced the shoot weight and harvest index increase in the number of the victory. Also among the different densities of these traits were significant differences in the harvest index decreased with increasing density. Because with increasing plant density, plant height also increased and this increase was a growth and yield of the harvest index was reduced from 350 seeds m where the density of radiation than other densities enough vegetative and reproductive growth received its proportion of the harvest index was higher. Other researchers also obtained similar results (Zolfaghari, 2008; Rahman, 2004; Moradi-Str, 2007).

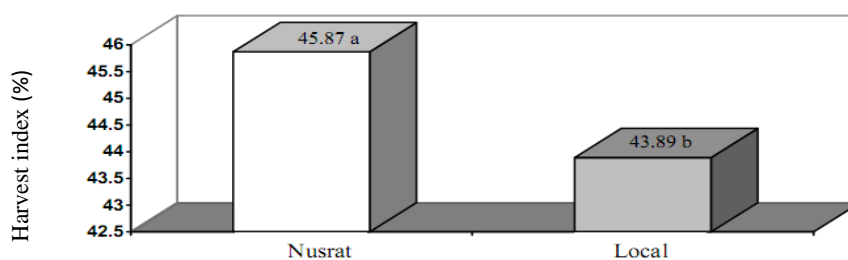


Figure 11. The Average of Harvest index in different digits

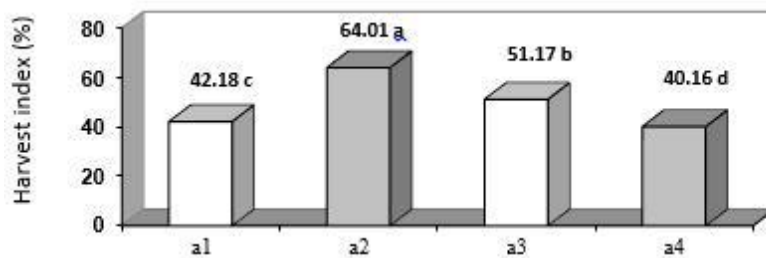


Figure 12. the Average of harvest index in different densities

The overall result

The results of this experiment can be concluded that the densities were used, the seed density of 350 square meters, the highest yield in a plant suitable for distribution on the ground and absorb the maximum amount of solar radiation 22,273 ha of production of the figures used by Nusrat highest yield compared to a rate of 24,470 ha due to better distribution of leaf and stem growth and better production to obtain the desired radiation.

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