Effect of planting date and plant density on mustard forage proteins in Golestan Province

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Abstract: To evaluate the effect of planting date and plant density on related properties of mustard quality forage field experiment in years 2010-2011 in Agricultural Research Station of Gorgan (Eraghi Mahalleh) of affiliated stations Agriculture and Natural Resources Research Center of Golestan province. In this study, the split plot design in a randomized complete block design with three replications in which main plots were planting dates at five levels (15 November, 30 November, 15 December, 15 April, 30 April) and 33.3, 50 and 100 plants per square meter were considered as sub plots were used. Protein content, protein, stems, pods protein and total protein were measured at 50% flowering. Analysis of variance showed a significant effect of planting date and plant density on all traits was investigated. The highest weight of total protein in 50% flowering understanding of the history of planting 15 November 1743 kg per hectare and lowest weight of protein impression with the 655.2 planting 15 kg per ha. By reducing the density of 33.3 per square meter significantly decreased the total amount of protein. In vitro appears to be the first planting date and plant density of 100 per square meter, the highest amount of protein produced shoots and are recommended for planting mustard grass in Gorgan.
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1. Introduction

Scientific methods of planting and harvesting the various species must consider the characteristics and specific features of each region are set to lead to the desired result (Bmhart, 2007). According to the country's increasing demand for food and animal production, should be further studies on new plants with high performance, high quality and low water needs to be done and their use in animal nutrition research and further evaluation should be done. The provision of fodder in Golestan province is also due to the lack of 891 435 tonnes TDN and the number of livestock available and other comparative advantages in the livestock sector is of considerable importance.

Many Brassica species and other genera of the family of forage varieties that are used as fresh forage silage. The advantages of this type of winter forage species time that coincided with a severe shortage of fodder, especially in the climatic conditions of Iran. The average crude protein on dry matter of 10 to 12 percent up to 16 percent can be increased. The mean total digestible minerals as well as 50 to 55 percent or higher.

Literature Review:

Shir Ismaili Studies (2002) on four varieties showed significant effects of planting date on the number of days to heading, so that the delay planting to reduce the amount of this trait. Van Dynes et al (1992) reported that increasing row spacing, days to flowering canola delayed. By increasing the distance between rows from 15 to 45 cm, the amount of days to flowering from 57.58 to 60.83 days. The effect of row spacing on days to maturity, plant height, number of branches, number of pods per plant, seeds per pod and seed yield level, but a significant percentage did not show significant differences in the content of protein and oil.

In examining the impact spacing on yield and quality of forage sorghum crop varieties produced in Dezful was reported that the increased density, increased plant height (Zarbakhsh and Kholghi, 1995). Increase in plant height, stem along with the highest density, related to the phenomenon of dark hypocrisy and increasing auxin biosynthesis in shading in high density and the strategy for biomass yield and forage plants (Moadab Shabestari, 1980; Mohebbi, 1996, and Abbas and Elinus, 1998). Shepel and Aristarkha (1982) in Leningrad Russia reported with increasing plant density, plant height was significantly increased, which leads to weight gain, dry stem. Increase in plant height with increased density has been reported in other studies (Raei and Sayed Sharifi, 2009; Ayoubi et al., 2003). According kazemeini et al. (2010) Plant density did not affect protein. But Sharif et al (1990) reported that increasing plant population density, increased grain protein.

In experiments on corn grain yield by increasing the density, increased forage yield and dry matter accumulation. The physiological indices including the LAD, CGR, LAI increased to 85 days after planting

and NAR decreased (Mazaheri et al., 2002; and Avrick, 1992 and Cox, 1997) level of radiation and photosynthesis of leaves is necessary to get and set penetration of light in the canopy and plant growth rate. Leaf area index of plant, weed, and water use efficiency in plant and soil erosion plays an important role (Davidson et al., 1984). Increased leaf area index, or through genetic modification to increase the plant's leaf area or by increasing the density of plants per square meter is possible (Madras, 1998). A number of studies on crop growth, leaf area index linked with biological and economic yields and increasing it will achieve higher performance have mentioned (Benoit, 1980). Many researchers have reported that increased density is increased leaf area index (Rosental, 1993).

The efficiency of absorption of radiant energy that falls on the surface of a product to have sufficient leaf area and leaf area duration needs that by changing the density and distribution of plants on the soil surface radiant energy absorption efficiency increases. Represents total dry matter yields of plant utilizes radiation is sunlight during the growing season (Sarmadnia and Koochaki. 1993).

Karavata and colleagues (2005) reported a decrease in density from 5 to 60 cm forage dry matter yield linearly from 10.9 to 8.1 kg per hectare fell. Dry weight of the sorghum was under the influence of different densities (Falson, 2004). In cases where the aboveground plant parts as sectors are concerned, dense planting can be effective in increasing dry matter and therefore in forage crops, seed rate compared to cultivation to produce seeds were used (Abbas and Elinus, 1998; Rafie et al., 2005 and Saber et al., 1994).

Khalili Mahaleh et al. (2007) reviewed the qualitative and quantitative characteristics of sorghum plant density on dry matter yield reported that China first had an impact. So that highest dry matter yield with the 13.82 tons per hectare density of 350 thousand plants per ha and lowest dry matter yield to the lowest level with an average density of 9.242 tons per hectare allocated.

Reports of Sheppel et al (1982) in Leningrad Russia suggests that increasing plant density, plant height increased significantly, leading to weight gain becomes dry. Nasri et al. (2005) on 4 reviews densities, 250, 300, 350 and 400 thousand plants per hectare dry matter yield in the highest density of 350 thousand plants were observed.

The effect of density on quantity and quality of forage sorghum was observed in Karaj that increased density leads to increased plant dry weight per unit area (Roshdi and Reza Doust, 2002). Sarikhani and Razmju (2006) The effect of plant density on yield and yield components of forage sorghum cultivars reported Tuesday that the decrease in plant density, shoot dry weight per square meter fell. With increasing plant density on forage sorghum increased shoot dry weight per unit area (Khalili Mahalleh, 2002; Dehghan, 2000). Moadab Shabestari (1990) expressed in high density plant stems and leaves of the plant dry weight is reduced, but the decline is more intense in the stem.

Management strategies in terms of having good quality forage can be controlled largely by environmental factors and their effect on forage quality applied (Arzani, 1987). Several factors including the stage of growth, species and cultivar, soil fertility, climatic conditions, injury and damage during harvesting, transportation, storage and use of feed on organic matter and mineral food included (Kopuk, 1981). Research has shown that the quality of foxtail millet stalks of the plant, fully developed and compared to millet and sorghum forage dries faster and more convenient (Balton Asperger, 1992).

Crude Protein (CP):

Regardless of its quality fodder production for animal feed is of little value, because the whole food be put at the disposal of livestock and livestock not only digestibility of the hay to absorb percent of food and Decreased mainly due to a decrease in protein and increased digestibility of cellulose in plants which may be due to environmental factors such as aging plants (Akin, 1982).

Crude protein content varies at different stages of plant growth and generally increases with age grasses and legumes reduced rates of crude protein, but the amount of added fiber and so much of global Crude protein forage harvesting time is important. In grasses and legumes maximum crude protein heading aground when 10 to 15 percent. Usually the leaves of plants to stem forage digestible energy, protein and nutrient needs are higher, but less fiber. So usually the nutritional value of the leaves more than stems. Unless you shoot is stored organs. This makes the anomaly stems more nutritional value than the leaves have grown, especially in the early stages (Arzani, 1998).

It was observed that planting date has a significant effect on crude protein levels in wheat and crude protein in all stages of wheat that were planted in August was less than the wheat that was planted in September (Lyon, 2001). Nitrogen concentration decreases with increase in growing degree days (Aaron, 2005). Crude protein yields when planting date is late rise (Gribyl, 1991). In experiments on feed wheat was the result of delayed planting is higher forage Crude protein (Arzadun et al., 2006).

Sanderson et al (1995) concluded that experiments on maize plant density of forage production for grain production is more than density. Also with increasing plant density from 18500 to

143300 plants per hectare reduced the amount of Crude protein digestibility resulting in reduced net. Hatab et al (1991) find that the effects of planting date and plant density on forage Crude protein not affect their suffering kg of dry matter, Crude protein 124-80 been the first to the fourth planting date.

Materials and methods:

In order to measure soil characteristics, before conducting the experiment in December from a field of several samples from different parts of the Earth, random samples were taken from the depth of 0-30 cm, all samples were then mixed choice on a consistent basis, at the end of a one kilogram samples were selected and sent to the laboratory. Based on the results, levels of phosphorus and potash fertilizers at the rate of 50 kg per hectare of phosphorus oxide and potassium oxide (from fertilizer sources phosphate and potassium sulfate) before planting the land was given. The amount of nitrogen fertilizer required 50 kg ha nitrogen (urea), for a third before planting, one-third in the jointing stage and a third stage to the ground was flowering.

After each harvest, a sample is sent to a lab to determine the percentage of crude protein. To calculate the crude protein, 0.5 grams of samples in tubes for digestion shed and 7 ml of concentrated sulfuric acid (96%) and a catalyst tablets (containing copper sulfate + potassium sulfate + selenium) were added. Stage sample digestion at 350 ° C for approximately 45 minutes took place. After clearing solution cooled and 25 ml of distilled water was added and using the Kjeldahl determine the amount of urea in solution and protein content of the samples was calculated by the following formula (Modir Shanehchi D, 1990).

$CP= (a \div 6.25 \times G) \times 100$

CP = crude protein %, a = weight of sample, G = amount of sample urea

Protein function

To calculate the protein yield per unit area, percent protein forage dry matter yield was multiplied each experimental unit.

Statistical calculations and used software:

This experiment split-plot in a randomized complete block design with three replications were analyzed. The application of Excel for data processing and statistical software from SAS for simple and combined analysis of variance was used. Mean LSD least significant difference test was evaluated at the level of five percent.

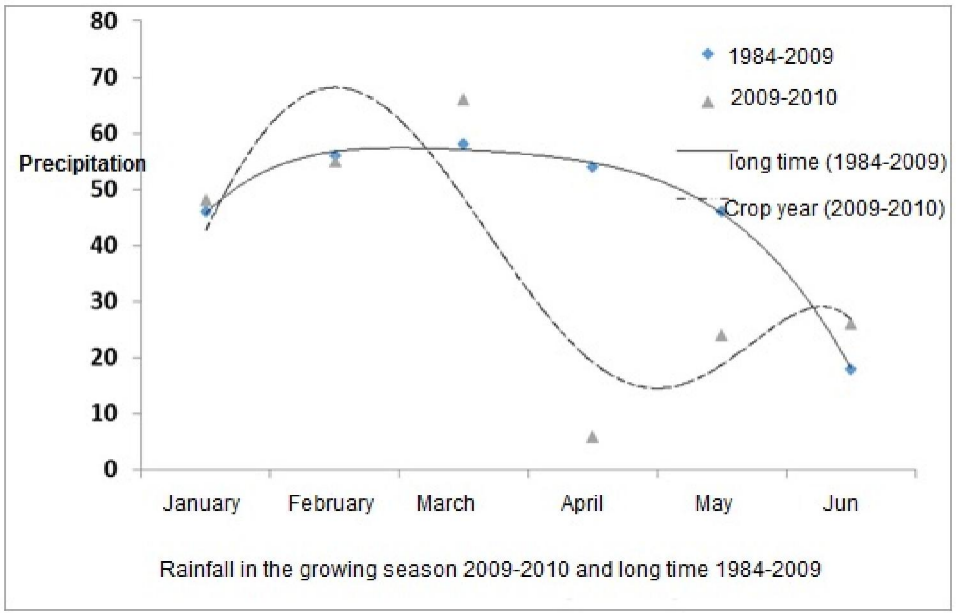

Fig. 1. Rainfall in the growing season 2009-2010 and long time 1984-2009

Results and discussion

More weight at 50% flowering shoots of the plant influenced the history of the study was significant. The maximum total weight is 50% flowering shoots in the second sowing date in the amount of 73235 kg per hectare and the minimum weight of harvesting organs from the air and fifth planting date with 36148 kg per ha, although the first and second planting date in terms of total weight more flowering shoots statistically significant difference was observed in 50%. A similar experiment was observed in maize planting date later than the appropriate reduced leaf area index, leaf area duration and total dry matter produced. (Swanson and

Wilhelm, 1996). On this basis it was found that the total weight of the 50% flowering shoots was affected by plant density was significant.

The comparison showed that the highest yield impression of density of plants per hectare with 57,590 Five hundred kg per hectare and the lowest air harvesting organs weight of 53688 kg per hectare density three ha. It was reported in a study that plant density had no significant effect on forage yield of forage sorghum, so that the sowing density of 350 thousand plants per hectare 74.59 tons of forage yield per hectare than three level density was higher plants and the least fresh fodder with 56.06 tons per hectare in the lowest density (200 thousand plants per hectare) was observed (Khalili Mahalleh et al., 2007).

Significance of the mean square interaction between planting date and row spacing on total weight of more in 50 percent of flowering at the level of one percent means that in all planting date and row spacing tested first planting date (15 November) and second (30 November) was the highest this trait. A number of studies on crop growth, leaf area index and biological yield and economic knowledge and increase it will achieve higher performance have mentioned (Benoit, 1980). Many researchers have reported that increased density is increased leaf area index (Rosental, 1993).

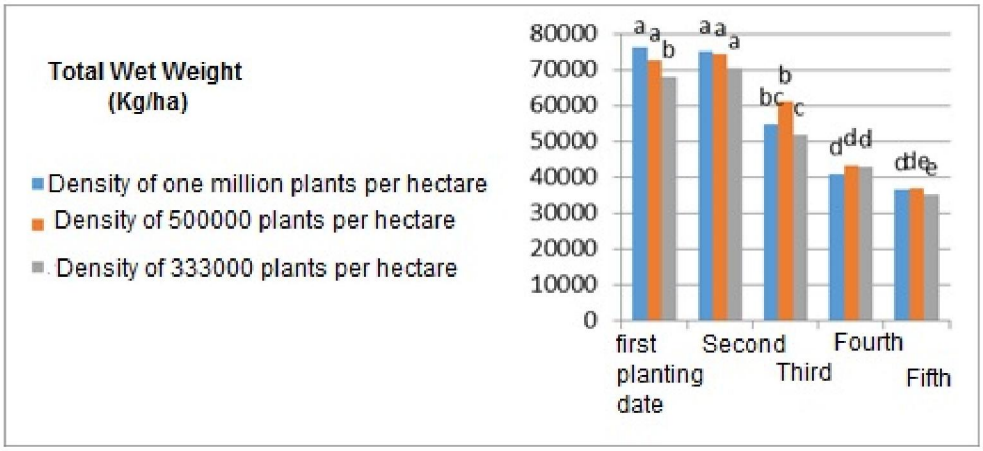

Fig. 2. Interaction between planting date and plant density on yield than the total weight at 50% flowering

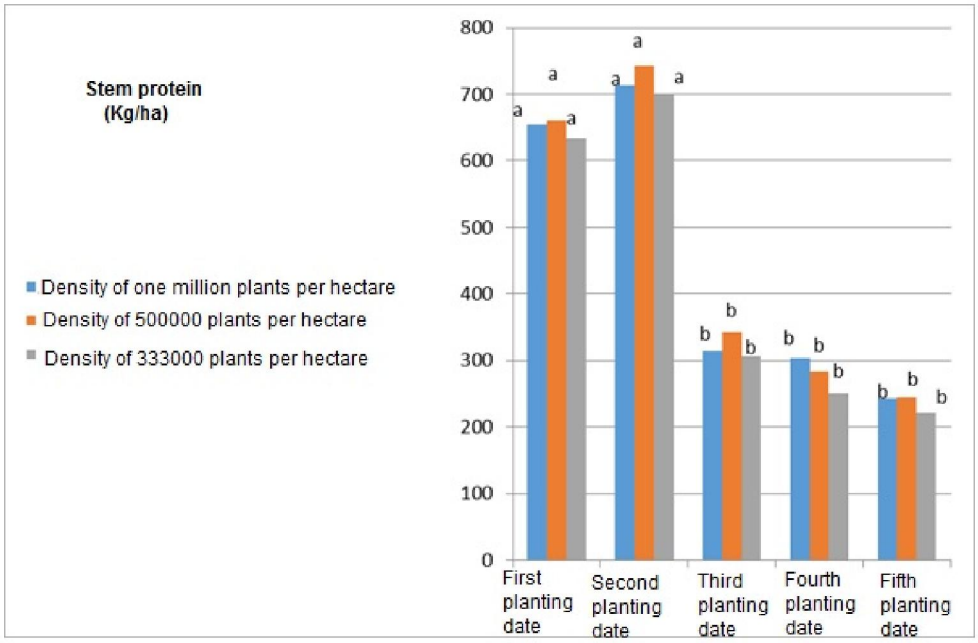

Figure 3. Interaction sowing date on density as the weight at 50% flowering stem protein

Analysis of Effect of planting date on weight at 50% flowering stem protein suggests that the effects of planting date on stem protein weight is significant. Forage value of plants and plant ash is the mineral composition and amount of minerals in different plant organs is different. For example, stems and leaves contain minerals more than roots. As well as the minerals are different in different families of plants (Karimi, 1996).

Analysis of variance showed that the effect of row spacing on stem protein weight is significant. Significance of the mean square interaction between planting date and row spacing on weight at 50% flowering stem protein on the surface of one percent means that In all planting dates and the distance between rows of sowing date (30 November) was the highest this attribute so that the second planting date (30 November) and row spacing of 10 cm highest attribute (742 kg ha). In addition to the planting date and plant density on the quality and nutritional value of corn silage can have an impact. Researchers' nutritional value of maize with different crop density compared and reported in dairy cows with feed obtained from 60 to 65 thousand plants per hectare density fed the amount of milk production, and weight compared to cows fed with feed obtained with densities of 90 and 100 thousand plants per hectare were fed group (Burgess and Nicholson, 1980).

Analysis of Effect of planting date on the weight of the protein in 50% flowering pod stating that the effect of planting date on the weight of protein sheath is significant. Based on the results of data analysis, protein most weight sheath belonging to the first planting date (15 November) with the 664.89 kg per hectare, and lowest weight of protein sheath in the fifth planting date (15 December) with the 363.44 kg per hectare allocated.

Analysis of Effect of row spacing on weight proteins in 50% flowering pod suggest that the effect of row spacing on the weight of protein sheath is significant. Based on the results of data analysis, protein Most weight sheath belonging to 5 cm row spacing with the 496.2 kg per hectare and lowest weight of protein sheath in the third row spacing (15 cm) with 448.5 kg per hectare allocated.

Significance of the mean square interaction between planting date and row spacing on weight at 50% flowering pod protein on the surface of one percent means that in all planting date and row spacing tested first planting date (15 November) was the highest this trait. So that the first planting date (15 November) and 5 cm row spacing highest attribute (706 kg) and fifth planting date (15 December) and row spacing of 15 cm to 310 kg per hectare with the lowest weight flowering pod protein in 50%.

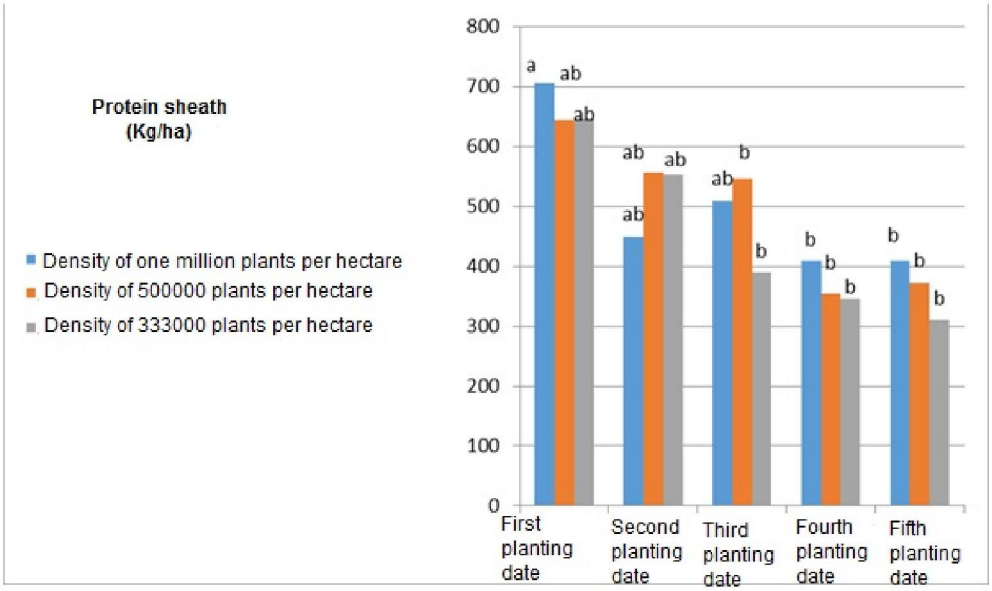

Figure 4. The interaction between planting date on density as the weight of protein at 50% flowering pod

Analysis of Effect of planting date on the weight of the protein in 50% flowering interpretation suggests that the effects of planting date harvest is the weight of protein. Based on the results of data analysis, interpretation greatest weight of proteins belonging to the first planting date (15 November) with the lowest weight protein 1530.11 kg per hectare and harvested in the fifth planting date (15 December) with the 677.44 kg/ha allocated. Forage quality factors on forage yield and forage plant that puts the impact

in other words, part of the total potential forage quality (performance) is a forage (Cherny and Hall, 1992). Planting date has a significant effect on crude protein levels in wheat, crude protein in all stages of wheat that were planted in August was less than the wheat that was planted in September (Lyon, 2001). Nitrogen concentration decreases with increase in growing degree days (Aaron, 2005). Crude protein yields when planting date is late rise (Gribiel, 1991). Experiment was concluded on Feed wheat planting is delayed more crude protein (Arzadun et al., 2006).

Analysis of Effect of row spacing on weight proteins in 50% flowering interpretation suggests that the effect of row spacing on harvest weight is protein. Based on the results of the data analysis, the greatest weight of proteins taken from row 5 cm 1105.3 kg per hectare and minimum weight with protein taken from the third row spacing (15 cm) at a rate of 999.2 kg hectares allocated. Significance of the mean square interaction between planting date and row spacing on weight proteins in 50% flowering understanding at the level of five percent means that in all planting dates, row spacing tested and the first planting date (15 November) and the second planting date (30 November) was the highest this trait. So that the first planting date (15 November) and row spacing of 10 cm highest attribute (1570 kg per hectare) and fifth planting date (15 December) and row spacing of 15 cm to 582 kg per hectare with the lowest weight protein was harvested at 50% flowering. Forage plants usually leaves than stems, digestible energy, protein and essential nutrients are higher but less fiber. Therefore, the nutritional value of the leaves more than stems. In some parts stored stem grasses that this makes, unlike the rule, especially in the early stages of growth stems to the leaves have more nutritional value.

Sanderson et al (1995) concluded that experiments on maize plant density of forage production for grain production is more than density. Also with increasing plant density from 18500 to 143300 plants per hectare reduced the amount of crude protein digestibility resulting in reduced net. Hatab et al (1991) find that the effects of planting date and plant density on forage crude protein not affect their suffering kg of dry matter, crude protein 124-80 been the first to the fourth planting date.

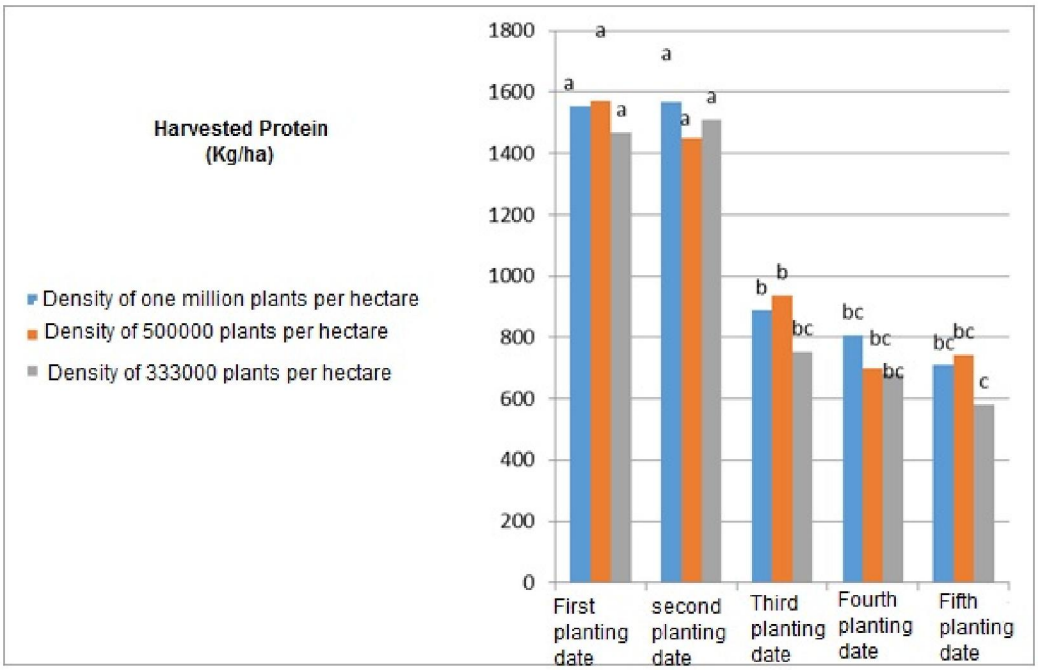

Figure 5. The interaction between planting date and plant density on understanding protein weight at 50% flowering trait

Conclusion:

The country needs protein through meat and animal products using agricultural resources potential of our country is the country's main agricultural policies that the high-yielding forage crops and utilization of ships systems is possible. Analysis of variance showed a significant effect of planting date and plant density on all traits was investigated. The highest weight of total protein in 50% flowering understanding of the history of planting 15 November 1743 kg per hectare and lowest weight of protein impression with the 655.2 planting 15 kg per ha. By

reducing the density of 33.3 per square meter significantly decreased the total amount of protein. In vitro appears to be the first planting date and plant density of 100 per square meter, the highest amount of protein produced shoots and are recommended for planting mustard grass in Gorgan.

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