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

Mohammad MirAzami[1], Mohammad Vali Najafzadeh[1*], Abolfazl Faraji[2]

[1.] M.Sc. of Agriculture, Islamic Azad University of Gorgan, Golestan Province, Iran
[2.] Assistant Professor in Golestan Agriculture and Natural Resources Research Center (GANRRC)
m.v.najafzadeh@gmail.com

Abstract: To evaluate the effect of planting date and plant density on properties related to forage quality mustard field experiment 2010-2011, Gorgan Agricultural Research Station (Iraqi neighborhood) of affiliated stations Agriculture and Natural Resources Research Center of Golestan province. Using split plot design in a randomized complete block design with three replications in which main plots were planting dates at five levels (15 November, 30November, 15 December, 30 December, 15 Mars) and the density of 33.3, 50 and 100 plants per square meter were considered as sub-plots was carried out. Fiber traits of leaf, stem fiber, fiber, fiber sheath and the total amount of forage were measured at 50% flowering mustard. Analysis of variance results of this study showed that sowing date had a significant effect on the properties of fiber forage is harvested at 50% flowering mustard. In general, the delay in planting significantly decreased the total amount of fiber. In general, with planting delays in the take fiber to significantly decreased. By reducing the density of 33.3 per square meter impression to significantly reduce the amount of fiber found. The date of planting 15 November 14529 kg per hectare and the date of 30 December, 4962 kg per hectare, the highest and the lowest total forage fiber is produced.
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1. Introduction

As the first loop-forming plants Ecology chain, play an important role in human life. Humans for their daily needs, complete dependence and the need to plants, humans are required to assist the scientific methods and knowledge, more information about the optimal use of plants acquired to their nutritional needs due to population growth trends. This would not be possible without increasing the quantity and quality of agricultural products. Assess the quality of the forage crops fields of study provides interesting and unique, the purpose of determining forage quality, the ingredients include carbohydrates, proteins, minerals, vitamins and fiber, which is the amount of feed to it depends (Beheshti, 2002).

Thus, on the one hand, the lack of attention to increasing the quality and quantity of forage, causing shortages of meat and dairy products and reduce their quality and on the other hand excessive grazing pressure on pastures, livestock and the destruction of a large part of the existing vegetation, resulting in soil erosion.

Improve the management of forage plants with the aim to maximize the use of existing capacity and is also compatible cultivation forage plants have the potential yield and good quality can be degraded pastures and soil erosion have reduced the current trend and on the other hand to increase forage production for livestock production, in a way commensurate with the increasing demand for government funds.

Mustard is an herbaceous forage plants, annuals, self-propelled, of Brassica (Cruciferae) that grows wild in East Asia and Africa. In addition to the use of mustard seeds for food and medicine and industry, as well as green manure in high-level world is grown. In addition, the mustard forage for intercropping with forage crops or for pasture and for silage, mixed with maize, fodder beet leaves, etc. (Karimi, 1980).

Forage rape and mustard can be incorporated in animal feed, but in the field they must take precautions. These plants can palatability and feed for livestock, especially cattle and livestock should be fed in small amounts several days to adapt to the taste of it. These animals forage in the diet is a good protein source the ranchers to avoid adverse impacts on its allowed only 50 to 60 percent of it in the diet of livestock use, because most of it for livestock problems may be created. To obtain maximum dry matter and maintain good protein with higher energy levels, better plants in the early stages of pod just before the flowers fall, cut off from the falling leaves (Shahbazian, 2004).

Literature Review

To achieve greater performance fine millet and other crops that have a short growing season are more management is required (Nouri Maman, 2004). Planting date through the adaptation of different growth stages with different weather conditions,

changes in vegetative and reproductive growth of the plant, and the final performance will be affected. The delay in planting reduces the vegetative growth, loss of leaves and ultimately resulting in total leaf area and photosynthesis for growth and yield declines (Fathi et al., 2001).

In a study in the dome, Faraji (2010) showed that due to the warm weather in the region during the months of May and June, more precocious genotypes with high temperatures and lack of late-stage growth of desirable characteristics for cultivation in the region. For each planting date, enter the reproductive stage later genotypes in the first year due to their reproductive stage coincides with higher temperatures and as a result during the period between flowering to maturity is less than the first year. Late flowering genotypes in the first year to second year (due to cooler temperatures early in the growing season in the first year to second year), in the first year flowering and grain filling period is delayed and thus be faced with higher temperatures. This led to a period between the start of flowering to maturity in the first year will be lower than in the second. Changes in planting dates by changing the temperature during different developmental stages of plant phenology canola to be effective. In fact, the high temperatures during flowering to maturity, due to delayed planting was to reduce the length of phonological periods. It is for this reason that rape is a plant cool areas (Brandt and McGregor, 1997; Angad et al., 1999) and high temperatures accelerate plant development, reduces growth period (Gan et al., 2004).

In general, forage plant, planting delays will have a significant effect on forage production and protein content (Norouzian and Hasani, 1992). Plant height due to competition for light, may have to be increased. As a result of the increase in height, forming new leaves at the top of the plant where the new leaves with more efficiency, greater amount of sunlight they receive and increases the yield. With increased early and timely planting during the growing season, plants to produce more opportunities to increase node and internode length and thus increasing the yield and plant height (Howell, 1990). According to experiments in 2001 in Gorgan Agricultural Research Station on foxtail millet was done, it was shown that the delay in planting panicle length, diameter, number of seeds per plant and grain yield decreased but plant height and grain weight rose (Shekari, 2003).

Drilling to the desired level reduces the cost of seed, lodging reduce product and plant disease problems will improve. Sunlight, moisture and soil fertility are major environmental factors that affect plant density to achieve optimum performance. If the density is too low does not make full use of all the potential output, if too much competition and too many plants, especially due to moisture stress, reduces the efficiency of the entire product (Choukan, 1992).

Number of branches can be affected by planting date and plant density on forage production and effective. For example Kazerani studies and Ahmadi (2004) showed that the highest number of branches per plant. This can be caused by environmental conditions favorable for plant growth in the know, however, the increase in the number of branches per plant caused a delay in addressing problems created product, and in mechanized harvesting. So in addition to achieving the optimum planting date, plant density, it should also be considered.

In forage crops, stem diameter and plant traits, in addition to significantly affect plant species and varieties, crop management factors such as history goes. On the other hand, as one of the characteristics of stem diameter growth that can be affected by several factors such as density (Ayoub et al., 2003). Increased density, forage sorghum were reduced diameter (Dehghani, 1998).

Reese (1986) Effects of plant density, row spacing and intercropping radiation energy received on a broom in semiarid conditions and the results showed that sorghum has increased in wet conditions increase the density of leaf area and dry matter and under water stress conditions reducing these factors is density (Rashed Mohasel et al., 1993).

Olsen et al (1988) reported that in the low-density optical degradation due to distance auxin reduced internodes and reduced height, but in high concentrations of plant communities due to less radiation, optical degradation results in less auxin plant height increases. Plant density and plant growth during the early stage is important because it represents the amount of leaf area can be modified and made more vertical leaves. The increased harvest index and total dry matter decreases, because the high density of some plants or claws are they enter the reproductive stage, resulting in low economic performance. Some tillers per plant and fierce competition are eliminated and performance is greater (Rashed Mohasel et al., 1997).

In general, increased solar radiation requires sufficient leaf area and leaf uniform distribution of the vegetation (Ikeda, 1992). One of the most important management tasks farm planting density and perfect makeup for maximum absorption of solar radiation. Perhaps the main reason some plants yield loss and poor vegetative growth followed by leaf area index down in early stages of growth. Obviously in this case are able to fully absorb radiation vegetation and plenty of it without the plant will not. In this case, increasing plant density may help to absorb more radiation in the early stages of plant growth and effective in

improving performance. In other crops if LAI maximum performance in a shorter time to reach the optimal level will be achieved (Kouchaki and Banayan, 1994).

The high point density, prevent the development of many branches and pods in them. Due to the uniformity of response addressed (Malé and Gill, 2004). Gill and tangerines study (1993) showed that increasing plant density caused so much competition within, the closure of vegetation and lack of proper distribution of light in the community, leading to a decrease in juice production plant to be processed.

The amount of seeds and planting dates had significant effect on grain yield and often the determinants of successful products. Maximum utilization of the factors necessary for plant growth are achieved when plant density maximum pressure on all producers to import agents (Mazaheriyeh et al., 1989).

In addition to the planting date and plant density on the quality and nutritional value forage plants can have an impact. Researchers nutritional value of corn silage with different planting densities and reported to Compare 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).

In general, forage production in terms of dry matter until mid or late flowering stage increases. However, the maximum nutrient or early flowering about 10 days earlier to maximize forage production, is produced (Chasmour, 1979). Growth stage is the most important factor affecting the composition and nutritional value of forage. With increasing age of the plant tissues in need of building construction increased and then the amount of carbohydrates (such as cellulose and hemicellulose) and lignin is high. This is also reflected in the crude fiber plants which can be 20% dry matter in young plants and up to 40% dry matter increase in mature plant. The amount of protein is reduced with aging plant, so between the protein and crude fiber in a kind of inverse relationship exists, although it can by using nitrogen fertilizer on his time (MacDonald, 1990). As the plant reaches levels of soluble in ether and reduced crude protein, nitrogen-free extract is increased while crude values (Walton, 1992).

Crude fiber:

Today, most trials in forage evaluation to determine the cell wall hemicellulose without consideration (Hall, 2001). Cell wall minus hemicellulose for more careful separation wall carbon hydrated insoluble initially by Van Sousse (1963) were noted. Since the cell wall digestibility inverse relationship and this represents a cell wall components that are considered to estimate digestibility (Hall, 2001). In general, cellulose and hemicellulose with increasing age of the plant is reduced and amount increased with an increase in age of the plant and the digestibility of nutrients other than carbohydrates reduces solution. Feed directly related to cell wall digestibility characteristics because the chemical structure of the cell wall of plants and aging plant with increased fiber content in the whole plant (Pritchard, 1987).

Construction of the cell wall composed primarily of carbohydrates that can digest will change in terms of lignin content, so with the increasing development of phonological stages of construction carbohydrates to follow the decrease forage digestibility (Ebrahim Zadeh, 1998).

In experiments on corn planting delays in the ADF concentration and 30% NDF and 10%, respectively, decreased (Stroke, 1997). In experiments on wheat planting delays in Argentina was concluded that the ADF and NDF concentrations decreased (Arzadoun, 2006). George and colleagues (1999) in experiments on maize concluded that by increasing the density from 44500 to 104500 plants per hectare and increased dry matter, crude protein, 6-8 grams per kilogram dropped, ADF and NDF concentrations on the order of 20 to 35 kg, and 19 to 29 grams per kilogram increased as a result of reduced digestibility of 16 to 23 g per kg. Stephen et al (2004) concluded that the effect of density on yield of soybean leaf and stem dry matter digestibility by reducing the density increases. While ADF and NDF decreased with increasing plant density and crude protein content goes up.

Materials and methods

The field experiment 90-1389Dr Gorgan Agricultural Research Station (Iraqi neighborhood) of affiliated stations Agriculture and Natural Resources Research Center of Golestan province were laid. The station is located 6 km north of the city of Gorgan. Test height of 5 meters above sea level, longitude 54 degrees 20 minutes east and latitude of 36 degrees and 55 degrees minutes north. The mean annual precipitation is 450 mm station. Component test area is warm and temperate regions. Soil test results is shown in Table 1.

To evaluate the effect of planting date and plant density on yield and some morphological characteristics mustard forage quality and quantity of research a split plot in a randomized complete block design with three replications was conducted in Gorgan Agricultural Research Station. The genotyping S83 mustard seed for fodder imported

from Canada who has been in Gorgan Agricultural Research Station were studied.

Table 1. Analysis of the soil in the test run

Crop year	soil pattern	Sand (percent)	Lay (percent)	Clay (percent)	Iron (ppm)	Organic carbon (percent)	Available potassium (ppm)	Total acidity saturation	Available phosphorus (ppm)	electrical conductivity (ds / m)	Depth (CM)
2010-2011	Si-L	24	52	24	15.3	1.8	458	13.9	7.8	1.5	0-30

Mustard forage harvesting by hand, carried out the 50% to 50% of flowering plants in each plot were reached. Each of the plots by harvesting due to the difference between sowing dates differed in terms of maturity together. In each plot, the fifth line of seed sowing, planting and harvesting the last of the parties as well as the beginning and end of the plot as much as 0.5 meters were considered marginal, then plant the remaining area of the plot, by Das, was on the floor. Harvested plants divided into small batches and each batch with Jute yarn package and put at the bottom of each plot was secondary. Plants were then harvested by weight scales and became a kg/ha. Assessed to determine traits randomly selected from each plot 7 samples were taken to measure.

Plant height of each plot, 7 plants were selected randomly at harvest and plant height from the ground to terminal flower stalk from the start with accurate ruler, was measured. The mean it was considered as plant height in cm.

Number of branches: on the average number of branches 7 plants randomly in each plot was obtained in the soft dough stage.

Diameter main stem diameter was measured by calculating the diameter of the middle portion of the caliper.

How to measure raw fibers:

To measure the raw fibers of the fiber system analysis method was used. For this purpose, three tenth of a gram of sample milled with sensitive scales with filter weight and the glass was poured device. Then, in the vicinity of dilute acid solution of sulfuric acid and dilute solution of caustic potash for 20-25 minutes, during this two completely separate the organic matter and at each stage of production and extraction of separate isolated and the device was taken out of it. After these two steps by the samples washed with acetone solvent the pigment in the sample be destroyed. The samples in the dryer at temperatures of 70-80 °C and put to dry completely. The samples are then cooled in the desiccator, weighed and registered office notes that the initial weight the samples were then placed into the furnace at a temperature of 600 °C to completely burn. Samples within 4-2 hours after burning kiln is that it brought out and put in desiccator to cool completely. Then the secondary sample weight and weight we burned it down. How to calculate the percentage of raw fiber or fiber contents obtained by the formula:

CF%= Initial sample weight - Secondary sample weight after burning/ weight of the sample×100.

Curve significant amount of rainfall during the growing season 2010-2011 and long-term 26-year-old.

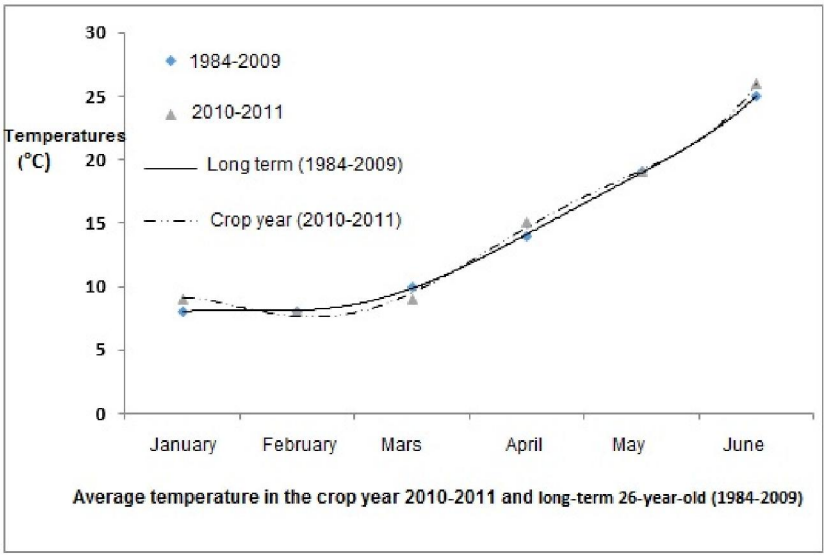

Figure 1. The curve of long-term 26-year average temperature of 2010-2011 of the crop year

Results and discussion

With ever increasing needs of human societies, including Iran, the need to increase livestock production is inevitable. Meet these needs depends on the development of animal husbandry. The current situation in Iran, there is a relatively large and permanent population according to the situation, increase in animal population is not logical in any way, because by increasing the number of livestock, exacerbating the pressure on food resources and production efficiency and even the amount of the total production will be reduced. Therefore, to achieve higher production output will remain no choice but to increase the efficiency of livestock production when the crowd realized this will look at some advanced countries (Hoseini, 1990). If you want to have maximum production with minimum nutrient intake, in addition to recognizing the nutritional requirements of the composition and nutritional value of feed animals should be sufficient, accurate information. On the surface it may seem nutritious and high quality, but it does not, to ensure feed and exercise proper judgment to do with physical methods, chemical or biological decomposed. The matter may seem similar, but one containing 12 percent crude protein and the other containing 18 percent crude protein, determine the chemical composition of the feed is not enough, but must use the tests to determine the material nutrients in livestock and poultry feed used for animals (Ansmiger, 1990).

One of the major problems in protein production and livestock products, lack of forage and enough food to feed livestock (Torbatinejad et al, 2001). Depending on the species composition and nutritional value of forage in pastures stage it is used and the different plant species are very different nutritional value (Arzani, 1998).

Analysis of Effect of planting date on the weight of leaf fibers at 50% flowering suggests that the effect of planting date on the weight of leaf fibers. Based on the results of analysis of variance, with the largest weight of leaf fibers belonging to the fourth planting date (30 December) with the 240.33 kg per hectare and lowest weight of leaf fibers in the third planting date was assigned to the 144.11 kg per hectare. In experiments on corn planting delays in the ADF concentration and 30% NDF and 10%, respectively, decreased (Corece, 1997). In experiments on wheat planting delays in Argentina was concluded that the ADF and NDF concentrations decreased (Arzadoun, 2006).

In most forages, increasing age is associated with reduced quality. Should be noted that age (when cutting) and physiological maturity not have the same meaning. Therefore, factors such as temperature and light with delayed puberty increase forage quality are a certain age. In addition, most studies show that during the spring and early summer is usually the first cutting is done that in this time of global warming and maturity (puberty) are positively interact. It studies the rapid decline in digestibility and protein content and an increase in the amount of lignin and fibers, and other cell wall components. Plants such as corn, are exceptions in this case that formed the seeds, stems and leaves its vessels are compensated. In the fall due to lower temperature nutrition value with age, increases (Hayes, 1985; Underwood, 1981).

The results of analysis of variance showed that the effect of row spacing on leaf fibers was not a significant. This attribute is not significant for the average squares of row spacing suggests leaf fibers at different intervals row that trend was statistically similar. George and colleagues (1999) in experiments on maize concluded that by increasing the density of 44500 to 104500 ha dry matter yield increases, Crude protein, 8-6 grams per kilogram dropped, ADF and NDF concentrations in the order of 20 to 35 g per kg and 19 to 29 grams per kilogram increased as a result of reduced digestibility of 16 to 23 g per kg. Significance of the mean square interaction between planting date and row spacing on the weight of leaf fibers at 50% flowering at the level of five percent means that in all planting date and row spacing tested fifth planting date (15 December) was the highest this trait. So that the fifth planting date (15 December) and row spacing of 15 cm highest attribute (345 kg) and the third planting date (15 December) and row spacing of 5 cm to 138 kg per hectare with the lowest weight fiber leaves at 50% flowering.

Weight of stem fibers in 50 percent of flowering:

Analysis of Effect of planting date on the weight of stem fibers and 50% flowering suggests that significant effects of planting date on the weight of stem fibers. Based on the results of analysis of variance, with the largest weight of stem fibers of the second planting date (30 November), 10527.1 kg per hectare and minimum weight with fiber stem fourth sowing date of 4020.4 kg per hectare allocated. Analysis of Effect of row spacing on fiber weight at 50% flowering stem is suggests the effect of row spacing on the weight of stem fibers meaningful. Based on the results of analysis of variance, with the largest weight of stem fibers belonging to the row spacing of 10 cm with the 6884.5 kg per hectare and lowest weight of stem fibers in the third row spacing (15 cm) with 6329.8 kg per hectare allocated. Stephen et al (2004) concluded that the effect of density on yield of soybean leaf and stem dry matter digestibility by reducing the density increases. While ADF and

NDF decreased with increasing plant density and will enhance the value of crude protein.

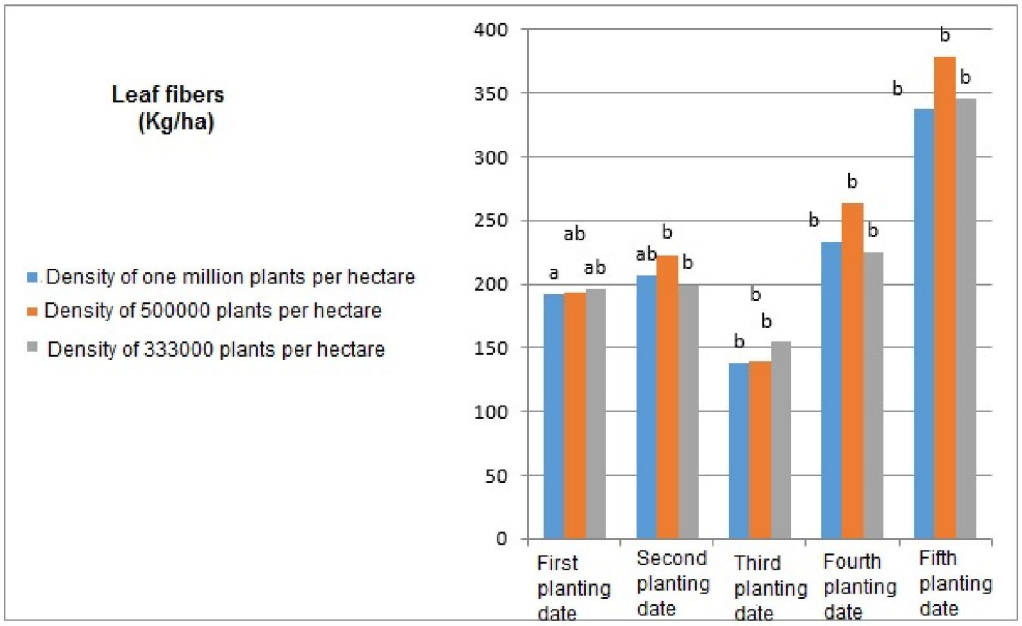

Figure 2. The interaction between planting date on density as the weight of leaf fibers at 50% flowering

Conclusion:

The role forage plants for fodder, and thus meet the needs of the animal products of importance is undeniable. However, unfortunately in our country the production and management of forage plants, less attention has been compared to other crops. With planting delays in the take fiber to significantly decreased. By reducing the density of 33.3 per square meter impression to significantly reduce the amount of fiber found. The date of planting 15 November 14529 kg per hectare and the date of 30 December, 4962 kg per hectare, the highest and the lowest total forage fiber is produced.

References:

1. Shirani Rad, and AS. Dehshiri. 2002. Manual of rape (planting and harvesting). Research and Education Organization of Tehran. 116 pages.
2. kimberly, DC. And McGregor. Canola 1999. (Physiology, agronomy, plant breeding and biotechnology). Translated by Mehdi Azizi, A. Soltani and S. East Khorasani, printing. Publications Jihad Mashhad University. 330 pages.
3. Shirani Rad, and AS. Dehshiri. 2002. Manual of rape (planting and harvesting). Research and Education Organization of Tehran. 116 pages.
4. Sarmdniya, G. and AS. Koochaki. 1989. Physiological aspects of dryland farming (Translation). Publications Jihad Mashhad University.
5. Heresbach, K. 1570. Reivustica libriquator. Cologne (translated by G. Markam, 1631, London).
6. Torssell, B.1959. Hardiness and survival of winter rape and winter turnip rape. Department of plant Husban dry (crop production). Royal school of Agriculture, Sweden, publication. No.15.
7. Angadi, S.V., H.W. Cutforth, P.R. Miller, B.G. McConkey, M.H. Entz, S.A. Brant, and K.M. Volkmar. 2000. Response of three Brassica species to high temperature stress during reproductive growth. Can. J. Plant Sci. 80: 693-701.
8. Beheshti, S. 2002. The effect of changes in canopy structure on Eco physiological aspects of hybrid varieties of maize in connection with radiation use efficiency and nitrogen uptake. Agriculture doctoral dissertation. Ferdowsi University of Mashhad.
9. Sarmdniya, G. and AS. Koochaki. 1993. Crop Physiology (Translation). Publications University of Mashhad, 467 pages.
10. Baumhardt, L.J.A. Tolk, T.A. Howell, and W.D. Rosenthal. 2007. Sorghum Management Practices Suited to Varying Irrigation Strategies: A Simulation Analysis. Agron. J. 99: 665-672.

11. Jeon, B., T. Lee, L. Sum, D.w. shin, and S.H. moon. 1992. Density and planting pattern on the growth characteristics, dry matter yield and feeding value of sorghum- sudangarss hybrid. Jornal of the Korean Society of grass land Science. 12:1, 49-58.
12. Fouman, A. 1996. Sorghum breeding in iran in 1985-1996. Seed and Plant Improvemant Institute Publications, Karaj, Iran.
13. Caravetta. C., J. cherney and H. Johnson. 2005. Within Row spacing influence on diverse sorghum genotypes: II. Dry matter yield and forage quality. Agron. J. 82(2): 210-215.
14. Shepel, N.and M.L,Aristarkhova. 1982. Effect of stand density on variation on quantiative characters of hetrotic hybrid of grain sorghum. Russian Jornal of Agriculture true Research. No.124,44-47 (Abstract).
15. Cherney. J.H., M.H. Hall. 1992. Determinants of forage Quality. J. Rang Mange. 43: 186-189.
16. Gardner, F. P., Pearce, R. B. and Mitchell, R.L. 1985. Physiology of crop plants. Iowa State Univ. press, Ames. P: 187-208.
17. Jeon, B and S. Lee., D. Shin, and S, Moon. 1992, Effect of plant density and planting pattern on the growth characteristics, dry matter yield and feeding value of sorghum Sudan grass hybrid. J. the Korean society of grass land Sci., 12: 49-58.
18. Khalili Mahalleh, c., D. Tajbakhsh, a. Fayyaz Moghadam and .a. Siyadat. 2007. Effect of plant density on forage sorghum hybrids quantitative and qualitative characteristics of the second crop. Research and Development in Agriculture and Gardening magazine, Issue 75, Pages: 59-67.
19. Sumi, A. 1988. The early growth in sorghum plant under combined treatments of soil moisture and ammonium sulphate application. Memoris of Agriculture, Kagoshima University, Japan. 24: 75-82.
20. Turget, j., u. Bikkgiki, A. Dumon, and E. Acikgoz. 2005. Production of sweet sorglum (sorghum bicolor L.moench) increase with increased plant densities and nitrogen fertilizer levels-acta Agricalture sconinavic (a) section B. plant soil Sci. p: 236-240
21. Kumar, A., and D.P. Singh, B. Singh, Y.P. Yadav. 1999. Phenology and physiology of Brassica genotypes with nitrogen levels on aridisols. Indian. J. Agric. Sci. 69: 258-260.
22. Bueno, A., and R. Atkins. 1982. Growth analysis of grain sorghum hybrids. Iowa state Journal of research. 56: 367-381.

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