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The Effects of Yield and Morphological Treats on Forage Sorghum (Speed Feed Variety) at Single Row and Double Row Patterns in Gorleston Province Fields

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Abstract

In order to comparing single row and double row planting arrangement of forage sorghum (Speed feed hybrid) and effects on yield and morphological treats, two separate experiments have been done on two regions (Gorgon and Aliabad). The experiment conducted on two levels of single row and double row with 15cm space by plant density of 250000 plants per hectare. The lengths of planting lines were 66.6 meters and inter row spacing for all treatments were 65cm. The number of planting reasebed for each treatment were 46 reasebed and harvested area were 2000m^2 for each treatment and totally 4000m^2. For measurements of agronomical and morphological treats i.e., plant height, number of tillers, stem diameters and number of node quadrate applied, and 10 bushes randomly sampled. Total planted area also harvested and recorded. For data analysis t test applied. Results showed that Fresh yield of double row with 15cm spacing had % 21 priorities on first harvest and %21.7 on the second harvest. It might be concluded that by using double row planting pattern the inter plant competition could be decreased and higher yield might be produced.

Keywords: Planting Pattern; Plant Density; Morphological Treats; Forage Yield

Introduction

With the increase in world population, demand for food consequently will grow. It is expected that human population will increase to over 8 billion by the year 2020 and this will worsen the current scenario of food security. Improved crop productivity over the past 50 years has resulted in increasing world food supplies up to 20% per person and reducing proportion of food-insecure peoples living in developing countries from 57% to 27% of total population [1]. It is predicted that at least 10 million people will be hungry and malnourished in the world by the end of this century [1]. Thus, to reduce the food insecurity, crop production will have to be doubled, and produced in more environmentally sustainable ways [2]. This can be achieved by expanding the area of crop production, increasing per hectare yield and improving crop quality. Furthermore, during the second half of the past century, rise in per hectare crop productivity was due to improved or high yield potential [3]. The relationship between growth of forage sorghum under different planting pattern and plant density is not well understood. Many changes take place in plants to enable them to compete and maintain photosynthetic activity.

A consideration of the adaptation mechanisms by which density affects photosynthesis would aid the improvement of growth conditions and crop yield and would provide useful tools for future genetic engineering. Works in the late 1980s demonstrated that yields can be raised two to three-fold by using available improved varieties and appropriate agronomic techniques. But these findings need to be refined, improved and tested for local climatic, soil and crop conditions [4]. These include in the aspects of to what extent of planting pattern and plant density affect the yield and morpho-physiological parameters of forage sorghum. In addition, no comprehensive database is available on sorghum under combination of pattern and density in northern Iran. Thus, studies are still needed to improve our understanding of the effects of pattern and density for sorghum. Hence, the present study was to design with the following objectives:

Objectives

a) To determine the performance of forage sorghum

b) at different levels of plant density.

c) To study the effect of planting arrangement on yield and morphological parameters of forage sorghum.

d) To identify how interaction of planting pattern and plant density affect yield and yield components of forage sorghum.

Materials and Methods

In order to the development and management for sorghum in summer season, the current study was conducted to find the effects of different planting pattern and plant density on yield and yield components of forage sorghum. A field experiment was conducted in 2015 at Gorgon (36ºN 54.00´ 54ºE 25.00´, 51m altitude) and Aliabad, Northern Iran. The experiment was laid out in a farmer field. The experiment conducted on two levels of single row and double row with 15 cm space by plant density of 250000 plants per hectare. The lengths of planting lines were 66.6 meters and inter row spacing for all treatments were 65cm. The number of planting reasebed for each treatment were 46 reasebed and harvested area were 2000m^2 for each treatment and totally 4000m^2. For measurements of agronomical and morphological treats i.e., plant height, number of tillers, stem diameters and number of node quadrate applied, and 10 bushes randomly sampled. Total planted area also harvested and recorded. For data analysis t test applied.

Fix distance of maize was 65cm and the space among bushes on the furrow double row arrangement was 15cm, and for forage harvested at douching - milking stage. All observations on dates of recording were in accordance with the related statistical design. The selected field was under wheat cultivated, after harvesting wheat on 15 June of 2015. The considered land ploughed in deep of 20-25cm, then with cross of desk made ready for planting. At the end the analysis of variance (ANOVA) of data was performed using the software of SAS (2004) by the proc [5]. GLM procedure and significant of means between the treatments were obtained using Duncan Multiple Range Test at P<0.05.

Results

The results of comparing agronomic parameters of forage sorghum at four plant densities (Tables 1 & 2) showed, that most of the forage sorghum studied characters included; total fresh weight, total dry yield, stem dry weight, leaf dry weight, stem diameter and plant height were statistically significant at 5% probability level. In addition, above yield and yield components parameters with an increase in plant density increased. While morphological parameters got from medium plant density, in contrast plant height increased at low and high plant density. As shown at Tables 1 & 2, the main effect investigation of planting arrangement could not change significantly number of above treats, just increased forage dry weight, it means the benefit of planting pattern would be appear if arrange with suitable plant density. Interaction of planting pattern and plant density become significant at most forage sorghum studied characters. Combination treatment of planting patterns and location; showed: double row pattern in Gorgon produced the most total fresh weight (42.50 t/ ha) and total dry weight (5.70 t/ ha).

Table 1: Mean comparison of yield and some agronomic characteristics of forage sorghum on deferent plant density (2 years results).

Mean Comparison of Yield and Some Agronomic Characteristics of Forage Sorghum on Deferent Plant Density (2 Years Results)					
Experiment Location	**Treats/ Treatment**	**Total Fresh Weight (Kg/H)**	**Differences with Cheeck (Kg/H)**	**Total Dry Weight (Kg/H)**	**Differences with Cheeck (Kg/H)**
Gorgon	Single row	33.92	-	5.43	-
	Double row	42.50	25.2	5.70	2.10
	T value (Calculated)	2.95	= =	0.88	=
	T value (table)	2.65	=	2.62	=
Aliabad	Single row	34.44	=	5.07	=
	Double row	40.70	18.1	5.17	3.63
	T value (Calculated)	3.6	=	0.36	=
T value (table)	T value (table)	2.62	=	2.62	=

Table 2: Mean comparison of yield and some agronomic characteristics of sorghum on deferent planting pattern (2 years results).

Mean Comparison of Yield and Some Agronomic Characteristics of Sorghum on Deferent Planting Pattern (2 Years Results)						
Experiment Location	**Treats/ Treatment**	**Number of Leaf's**	**Number of Nodes**	**Number of Tillers**	**Plant Height (Cm)**	**DiameterStem (mm)**
Gorgon	Single row	7.2	3.9	1.8	12.7	160. 1
	Double row	6.9	4.0	3.3	11.9	159.7
	T value (Calculated)	0.58	0.30	4.36	0.85	0.62
	T value (table)	2.62	2.62	2.62	2.62	2.62

Aliabad	Single row	5.16	5.16	1.98	13.05	158. 3
	Double row	5.1	5.1	3.2	11.8	156.5
	T value (Calculated)	0.10	0.10	4.08	1.59	0.62
T value (table)	T value (table)	2.62	2.62	0.62	2.62	2.62

Note: Plant density at single row and double row were same =250000 plant/ha

The highest plant height obtained from single row in Gorgon (160.1 cm) and the most stem diameter also obtained from single row in Aliabad (13.05 mm), while production of dry forage at double row pattern (at the same plant densities) showed better performance. Other morphological parameters and yield components such as, number of nodes per plant (3.3) and number of tillers per plant (5.1) were the best at double row planting pattern (Table 1). Results on the second harvest showed that Fresh yield of double row with 15cm spacing had 25.2% and 18.1% priority in Gorgon and Aliabad respectively. It might be concluded that by using double row planting pattern the inter plant competition could be decreased and higher yield might be produced.

Discussion

The results showed with changing planting arrangement from single row to double row plant density would increase by 21.7% without negative effect on yield. It means at minimum and medium plant density especially on one double - row pattern, the sorghum bushes grow better and produce a good yield component [6-8]. Increasing the yield at high plant density due to double row pattern, may is because of closing to square planting arrangement. The yield at low plant density due to lacking number of plants per surface and at high plant density because of competition for absorption growth elements and interference of male and females' flowers become limited [9-11] (Tables 1 & 2) and (Figure 1).

Figure 1: General pictures from experiments, showing canopy of double row planting pattern.

Conclusion

With considering double row planting arrangement, plant density would increase by 15% without negative effect on yield component and the yield could increase by 21.7%. The highest forage yield was produced by 250000 plant density and 15-centimetre double row at 5% significant (41.6t/ha). It might be concluded that by using double row planting pattern the inter plant competition could be decreased and higher yield might be attained.

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