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Influence of Planting Dates and Varieties on Stem Girth and Leaf Morphology in Sweet Sorghum (*Sorghum bicolar* L.)

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Department of Agronomy, School of Agriculture, Lovely Professional University, Phagwara, Punjab, 144411 LANTING DATES AND VARIETIES ON SWEET SORGHUM

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Abstract

A field trial was carried out to assess the effect of sowing dates and varieties on morphological parameters like stem girth (cm), leaves numbers, leaf area and LAI in sweet sorghum on the research farm of Lovely Professional University, Punjab. Growth of all the morphological parameters were recorded highest at first date of sowing and decreased as the planting date moves from timely (D_1) to late planting (D_3). The morphological parameters except to stem girth were recorded maximum at 90 DAS while stem girth was recorded at 120 DAS at each planting dates. The varietal response against the dates of sowing shows the better performance in V_3 (CSV-24 SS) followed by V_1 (CSV-74) and V_2 (SSV-84) in respect of all the morphological observations while the stem girth was recorded maximum in CSV-74.

Key words: Planting date, leaf morphology, sweet sorghum, leaf area index

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Influence of Planting Dates and Varieties on Stem Girth and Leaf Morphology in Sweet Sorghum (*Sorghum bicolar* L.)

Introduction

Sweet sorghum (*Sorghum bicolor* L.) is a member of Poaceae family. It is an annual herbaceous species, with Chromosome no. 2n=20. Sweet sorghum is one of the most vibrant and popular crops because of multiple uses. It is also known as sugar sorghum or sugarcane of the desert and it varies from grain sorghum due to variation in height; juice and sugar existence in stems that help to outlive the farmers of semi-arid tropics (Ratnavathi et al. 2010 and Reddy et al.2012). It is being contemplate to be reasonable biofuel feedstock to a tropical nation (like-India) whereas sugarcane is developed principally for sugar and corn is utilized in nourishment and poultry industry (Zhangetal.2010). It is a rich source of vitamins, unsaturated fatty acids, phosphorus, potassium, zinc, iron and minerals. Sorghum is a multipurpose crop which modified well to wide range of environmental diversity ranging from tropical to temperate conditions within 40 ^{0}N and 40 ^{0}S of the equator (Rao et al. 2009). It is grown in Brazil, as a source of ethanol production while in Kenya, it is utilize as a potential crop to avoid food insecurity by providing food and feed and its cane to sugarcane industries for ethanol production (Channappagoudar et al. 2007 &Balole, 2001). It requires 10 to 14 hours of day length and 550 to 800 mm optimum annual rainfall, it can survive in the less rainfall conditions also and 15 to 50% of relative humidity (SrinivasaRao et al. 2009).

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Materials and Method

The present piece of research work was carried out at farm of Lovely Professional University, Punjab to know the effect of planting dates and varieties on stem girth and leaf morphology in sweet sorghum. The experiment was comprises in RBD with three sowing dates by keeping 10 days intervals from 3rd March to 23rd March, (D_1, D_2 and D_3) and three varieties viz. SSV 74, SSV 84 and CSV 24 SS along with three replications. The varieties of sweet sorghum were procured from Directorate of All India Co-ordinated Sorghum Improvement Project, Andhra Pradesh. The healthy and surface sterilized seeds were placed in the soil.The recommended cultural and Agronomical practices were followed to grow the crop under all sowing dates. The five random plants were selected from each plot to record stem girth (cm) through digital Vernier Caliper, leaves number and leaf area plant^{-1} while the leaf area index was calculated as per (Watson, 1952) at regular intervals i.e. 30, 60, 90 and 120 DAS (Days after sowing).

$$\text{Leaf area index} = \frac{\text{Total leaf area (cm}^2\text{)}}{\text{Total ground area}}$$

The statistical analysis of the data generated in present piece of research work was carried out with the help SPSS V. 23 software.

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Results

Data pertaining in fig-1 reveals the effect of different sowing dates and varieties on stem girth, leaves number, leaf area plant^{-1} and LAI of sweet sorghum (*Sorghum bicolor* L.). The observation regarding the stem girth, leaves number, leaf area and LAI plant^{-1} were recorded at regular intervals viz. 30, 60, 90 and 120 DAS (Days after sowing). Among the tested genotype i.e. SSV74, CSV 24 SS and SSV84, most of the time the maximum stem girth was observed in V_1 (SSV74) followed by V_3 (CSV 22 SS) and V_2 (SSV84) at every times of observation. The performance of varieties among the dates of sowing shows that variety SSV 74 has maximum stem girth in every dates of sowing (i.e. D_1, D_2 and D_3) followed by variety CSV 24 SS and SSV84. Statistical analysis regarding the dates of sowing reveals that D_1, D_2 and D_3 are highly significant among them at DAS (60, 90 and 120 DAS) except to 30 DAS at which D_1 is significant for D_2 and D_3 but non-significant difference exist between D_2 and D_3. While the varietal response shows that V_1 is significantly differing with V_2 and V_3 but V_2 and V_3 is not significant among them up to 30 and 60 DAS whereas the variety V_2 is highly significant with V_1 and V_3 at 90 DAS and in between V_1 and V_3 are showing the non-significant difference (fig-1). Varietal response at 120 DAS are showing non-significant difference among the tested genotypes. Data from fig-2, 3 and 4 reveals that the maximum value of leaves number, leaf area and LAI plant^{-1}were recorded at first date of sowing (D_1) and it started to decrease gradually up to third date of sowing (D_3). Among the tested genotypes, the maximum leaves number, leaf area

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and LAI plant^{-1}were observed in V_3 (CSV 24 SS) followed by V_1 (SSV 74) and V_2 (SSV84) at 90 DAS). Overall the performance of varieties among the dates of sowing shows that variety CSV 24 SS has maximum leaves number, leaf area and LAI plant^{-1} at D_1 and D_2 while the

variety V_1 (SSV-74) perform well under late sown condition (D_3) for same parameters. Data from the (Fig-2, 3 and 4) also reveals that the leaves number, leaf area and LAI increased gradually up to 90 DAS and then decline in every dates of sowing. Statistical analysis regarding the dates of sowing reveals that D_1, D_2 and D_3 are highly significant among them at every DAS (30, 60, 90 and 120 DAS) while the varietal response shows that V_2 is significantly differing with V_1 and V_3 but V_1 and V_3 is not significant among them at 30 DAS and 120 DAS while at 60 DAS, V_3 shows significant difference.

Discussion

The varieties of sweet sorghum were evaluated under three different dates of sowing viz. D_1, D_2 and D_3. The outcomes of this finding reflected that the girth of stem increased with the advancement of days after sowing (DAS) from 30 DAS to 120 DAS in each varieties while same was decreased gradually under late sown condition (D_2 and D_3) as compare to D_1. However, the variety V_1 was recorded maximum stem girth followed by V_3 and V_2 (fig-1).The results of the study also reveals that leaves number, leaf area and LAI plant^{-1}were gradually decreased up to third date of sowing (D_3) as compare to first date of sowing (D_1). While all the morphological parameter related to leaves were recorded at 90 DAS in every varieties and dates of sowing except to stem girth. The results are accordance with the finding of Almodares &Darany (2006) who reported that the stem girth decreased under late sown conditions (Reddi (2006). It is also

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reported that along with the stem girth other morphological parameter viz. leaves number, leaf area and LAI were affected by different dates of sowing specially under late sown conditions (Almodares & Hoseini (2015); Reddi (2006); Almodares &Darany (2006). Under late sown condition, plant struggle a lot because of various adverse situations, in which heat stress, water stress and nutrient availability is one of them. Therefore, plant hastened their growth by escaping the phase of growth that reduce the leaves number and leaf area and hence LAI. Reduction of number of leaves, leaf area and LAI are enough to cause the ultimate production in respect of photosynthesis and sugar yield in the juice of sweet sorghum (Allen et al. (2011); Yan et al 2013; Zegada- Lizarazu&Monti 2013; Mastrorilli et al. 1999; Massacci et al. 1996).

Conclusion

The present piece of work is clearly indicated that the late planting of sweet sorghum crop have negative effect on stem girth and leaf morphology hence the efficiency of photosynthesis sugar production may decrease. However, the varietal response showed that the genotype CSV 22 SS performed well at every dates of sowing especially under late sown conditions.

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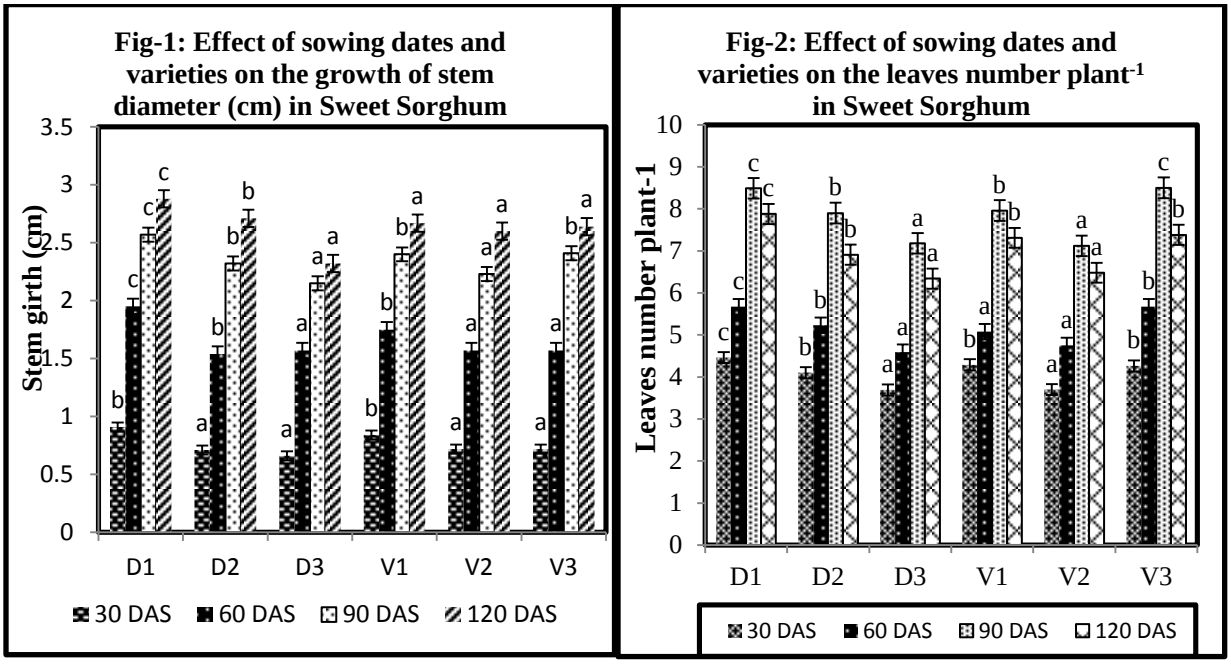

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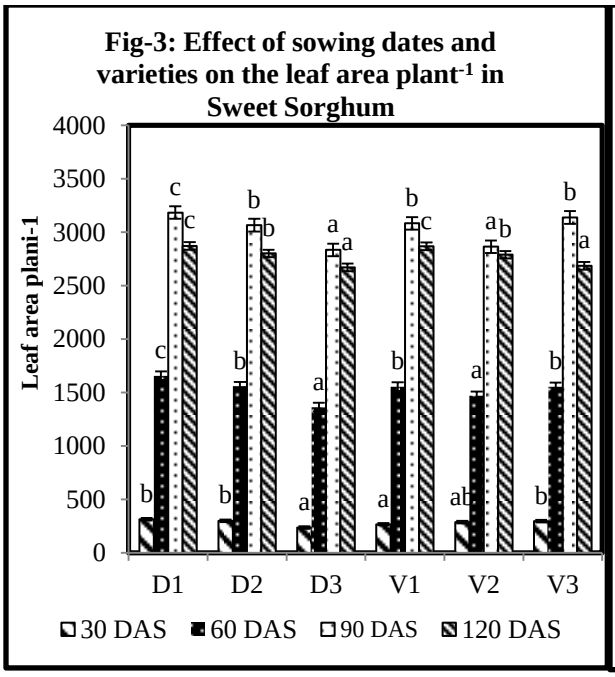

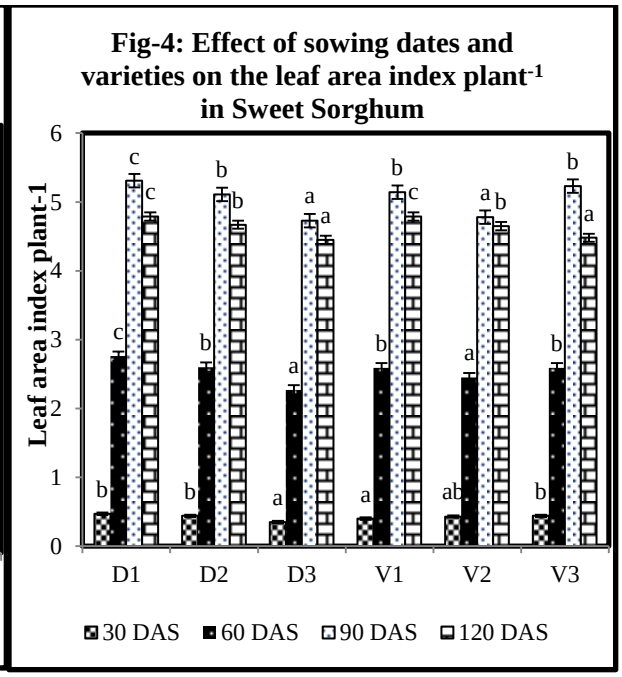

Notes: D_1, D_2 and D_3= Dates of sowing 1st, 2nd and 3rd, V_1, V_2 and V_3= SSV-74, SS-84 and CSV-22-SS, DAS= Days after sowing