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Growth Performance of Sorghum to Different Methods of Cultivation

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Abstract: ***Sorghum [Sorghum bicolour (L.) Moench] is belongs to family graminae which is one of the important forage crop in Marathwada. Effect of different methods of cultivation on growth performance of forage crop Sorghum was studied during present piece of work. Four cultivation methods viz. mulching, raised seed beds, shed nets and ridges and furrows along with control were carried out in three replicates along with control. Growth pattern of the crop along with chlorophyll content was studied. During the investigations it was observed that, cultivation method mulching produced the tallest plants, along with highest chlorophyll content. These plants were emerged out early with 100% seed germination. Raised bed showed poor performance compare to mulching. Thus it could be concluded that, mulching method is best for the production of forage crop Sorghum in rain feed area like Marathwada.***

Keywords: Sorghum, Mulching, Shed net, Raised bed, Furrow and Ridge.

1. Introduction

Sorghum [*Sorghum bicolour* (L.) Moench] is considered to be originated in Northern Africa or at the Egyptian-Sudanese border 5,000-8,000 years ago. Sorghum belongs to the tribe Andropogonae of the grass family *Poaceae* (FAO,1991). Indian sub-continent is its secondary centre of origin, where it is cultivated since 4,500 years. Grain sorghum is the fifth world leading cereal after Sorghum, wheat, rice and barley. The crop can yield reasonably well under adverse conditions of low soil water and high temperature. Sorghum may well offer the best opportunity to satisfy the doubling demand in the developing world by 2020, as a food for the poor and an alternative feed and food to Sorghum (Hunt, E. R. and B. N. Rock. 1989).

Sorghum ranks third in the major food grain crops in India, whereas it is the fourth food grains of the world. Millions of people in Africa and Asia depend on sorghum as the staple food. In addition, the fodder and Stover is fed to millions of animals providing milk and meat for man. It has potential to compete effectively with crops like Sorghum under good environmental and management conditions. Sorghum grain contains about 10-12% proteins, 3% fat and 70% carbohydrates (Hiscox, J. D., and G. F. Isrealstam. 1979). Therefore, it can satisfactorily replace other grains in feeding programme for dairy cattle, poultry and swine. Over 55% of grain produced globally is used for human consumption in the form of flat breads and porridges (thick or thin) and about 33% of grain used in feeding livestock, especially in the Americas.

Climatic Requirements

Sorghum requires warm climate but it could be grown under a wide range of climatic conditions. The plant can tolerate high temperatures throughout their life-cycle better than any other cereal crop. The minimum temperature for germination of sorghum seed is 7-10°C. It needs 26-30°C temperature for its optimum growth. Though it can withstand temperatures up to 45°C, but the lower temperatures (<8°C) limit its cultivation owing to impaired flowering and pollination [Vanderlip (1993) has described grain sorghum growth and development and has assigned numbers from zero to nine similar to the numbering system used in corn. Sorghum is moderately tolerant to short periods of water logging and salinity (Carter et al., 1989; Maas et al., 1986). In Marathwada, Sorghum is produced for consumption both for human and livestock. The green leaves and stalks are used to feed domestic animals.

One of the problems experienced by the farmers is lodging. In dense population most plants remain barren; ear and ear size remains smaller, crop become susceptible to lodging, disease and pest, while plant population at sub-optimum level resulted lower yield per unit area (ICAR, 2006). High plant population leads to lodging of Sorghum plants (Aikinss, H. M; & Joseph, 2006). Present study was under taken to determine the effect of cultivation practices on growth performance of Sorghum.

Sorghum is more tolerant to high temperature (> 38 oC) and drought than most major agronomic crops. Grain sorghum requires less water than corn, under low to modest yield conditions and is an alternative to corn in production environments with frequent severe water deficits (Bennett et al., 1990; Maman et al., 2004; Carter et al. 1989; AFRIS-FAO, 2006; Wikipidia, 2006). Aurangabad features a semiarid climate (Alessi, J. and J.F.Power, 1771**).** Annual mean temperatures in Aurangabad range from 17 to 33 °C, with the most comfortable time to visit in the winter – October to February Most of the rainfall occurs in the monsoon season from June to September. Average annual rainfall is 710 mm. The city is often cloudy during the monsoon season and the cloud cover may remain together for days. Hence conditions are suitable for the growth of sorghum.

The present experiments were conducted to investigate effect of different planting methods on growth of forage crop Sorghum. Keeping in a view above facts a study has been designed with following objectives:

1) To determine percentage of germination and time taken for germinate by Sorghum seeds during different cultivation practices.
2) To investigate impact of different cultivation method on performance of yield.

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3) To determine chlorophyll content of the crop.

2. Material and Methods

It comprises of following there parts.

2.1 Experimental site

The experiments were conducted in Botanical garden in the Botany Department of Marathwada University Aurangabad and at the village Revgaon of District Jalna.

2.2 Experimental Design and treatment

The experiment was carried out in a Randomized complete block design (RCBD) with three replicates. The size of each individual plot was 1.5x2.1 M^2=3.15M^2. The distance between plots, plant, rows, and blocks would be 70cm, 30cm, 70cm, and 1m respectively. Treatments were assigned randomly to each plot and each treatment appeared only once in each block. The experiments were conducted using different cultivation methods viz. Mulching, Shed net, Raised bed, Furrow and Ridge along with triplicates.

2.3 Data Collection

Data were collected after 30 days on the following parameters:

1) Height of plant
2) Number of leaves of plants
3) Fresh weight of plant
4) Dry weight of plant
5) Chlorophyll content of plant.

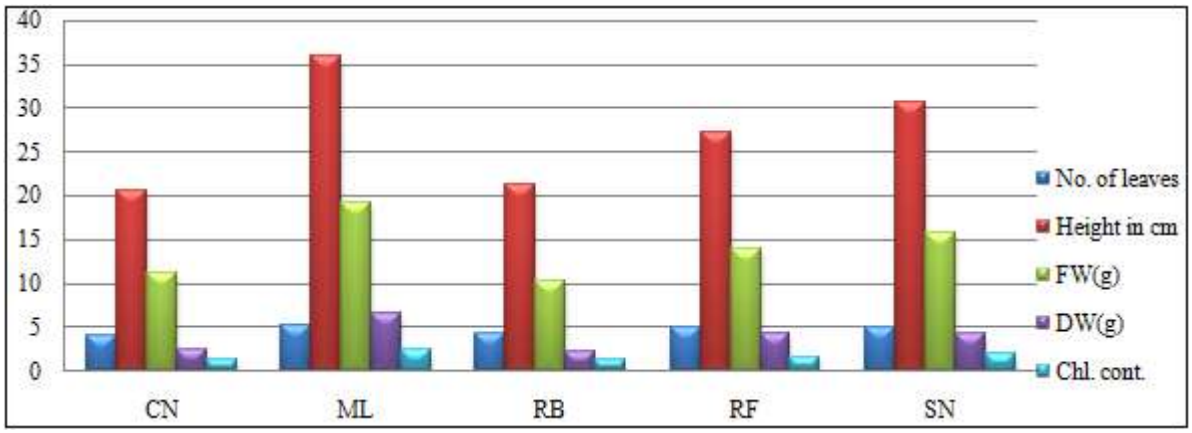
3. Result and Discussion

Plant growth refers to irreversible increase in organ or whole plant size (length, area, volume and weight), while plant development refers to processes related to cell differentiation, organ initiation, member appearance, and extends to plant senescence (Streck et al., 2003). During the present investigation various cultivation methods were employed for growth of Sorghum viz. Mulching, Raised bed, Shed nets, Ridges and furrows along with control.

a) **Number of leaves:** Number of leaves recorded was highest in mulching (5.3) and lowest in Raised bed (4.3) as compared to control. The number of leaves recorded in control was (4.0). The size of the leaves recorded was large in mulching compare to control.
b) **Height of the plant:** It was recorded that, using mulching method heights of the plants recorded were 35.8cm. Lowest height recorded in case of control (20.6cm) and in raised bed it was (21.3cm).
c) **Chlorophyll content:** Chlorophyll content of the leaves of Jowar was estimated which were growing at various methods of cultivation. In case of plants chlorophyll content recorded was (2.58) using mulching method, reading recorded was (1.29) with raised seed beds and (2.10) with shed net and 1.71 with ridge and furrow. The value of control recorded was 1.28.
d) **Fresh and dry weight :** In case of mulching method of cultivation, fresh weight of three plants recorded was 19.1 gms whereas dry weight it was 6.7gms while in case of raised bed fresh weight recorded was 10.3gms and dry weight recorded was 2.3gms (Table.1)

Table 1: Effect of different cultivation methods on growth performance of Sorghum

Days after sowing	Cultivation methods	No. of leaves	Height in cm	FW(g)	DW(g)	Chl. cont.
30 Days	CN	4.0	20.6	11.3	2.56	1.28
	ML	5.3	35.8	19.1	6.7	2.58
	RB	4.3	21.3	10.3	2.3	1.29
	RF	5.1	27.2	13.9	4.43	1.71
	SN	5.0	30.7	15.7	4.3.	2.10



Graph 1: Effect of growth performance on fodder crop sorghum

In nutshell, it could be stated that, mulching is best method for the growth of crop sorghum compare to other methods like raised seed beds, shed nets and ridge and furrow. Due to application of this method, moisture could be held up in the soil which has been covered with plastic sheet. Secondly temperature is the governing factor which is sufficient for germination. This favours the growth of roots. Roots are the main organs for the absorption of the nutrients from the soil. Hence healthy growth of seedlings and crop takes place. Sorghum seeding development is primarily favored by

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ambient temperature (Cutforth and Shaykewich, 1990). Muchow (1990) showed that seed growth may be directly influenced by air temperature. Different sowing dates might cause favorable environmental conditions from emergence to seed filling. Fischer (1985) recorded that the thermal time requirement needed by a specific growth stage is more or less constant. Marathwada is rain feed area where only kharif crops could be grown. Hence there is severe deficit of forage crops. Unless and until you don't have green forage for cattle's there maintenance is obscure. One could have to adopt such novel techniques in scarcity of water.

4. Conclusions

The growth performance of Sorghum is greatly affected by the different cultivation practices. From the recorded result it could be concluded that, mulching method for plantation of forage crop is better than other methods. This method is viable as requirement of water is less and productivity is more. Thus, for similar agro ecologies of Marathwada, this mulching method recommended for higher yield of forage crop.

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