Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-7: 4582-4586

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-7 pp. 4582-4586**
Journal homepage: http://www.ijcmas.com

Original Research Article

Effect of Planting and Moisture Conservation Techniques in Chilli (*Capsicum annuum* L.)

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Keywords

Chilli, moisture, conservation, farm yard manure

A B S T R A C T

The effect of eight different methods of planting and moisture conservation was assessed on growth and yield parameters of chilli cultivar Pusa Jwala at Agricultural Research Farm, Institute of Agricultural Sciences, Bundelkhand University, Jhansi. Adoption of moisture conservation practices had significant effect on plant height (49.5cm) as compared to control (42.50cm). Different moisture conservation practices adopted in the chilli field revealed significant effect on growth, yield and yield attributing characters viz., number of fruits/plant, fruit length, fruit diameter and green fruit yield (q/ha) at different growth stages. The highest yield of green chilli (50.40 q/ha) was obtained with application of FYM as mulch of moisture conservation technique, followed by grass mulch (47.50 q/ha) and Planting in 20 cm deep Furrow + Black Polythene Mulching (46.60 q/ha) with lowest (34.20 q/ha) of its control (Planting on flat beds). To reduce the cost of mulching material, dry grass mulching may be taken as option for higher yield with conservation of the soil moisture.

Introduction

India is a major producer, consumer and exporter of chilli (*Capsicum annuum* L.) in the world and Andhra Pradesh, Karnataka, Maharashtra, Odisha, Tamil Nadu, Bihar, Uttar Pradesh and Rajasthan are major Chilli producing states. In India chilli is cultivated in the area of 775 thousand hectares with production, productivity of 1492 thousand matric tones and 1.90 matric ton/ha, respectively. Chilli share 25.26 % total spice production among all spices in India (NHB Database, 2014). There are more than 400 different varieties of chilli's found all over the world. It is also called as hot pepper, sweet pepper, bell pepper, etc. Chilli is one of the most important commercial crops of India. It is grown almost throughout the country and available in all the kitchens for preparation of each and every culinary item and to enhance the taste of tongue.

Sustainable crop production depends on maintaining an appropriate balance between use of soil nutrients and water resources for crop and environmental protection in rainfed condition in any crop. It is a common perception that vegetables cannot be grown under rainfed situation in arid and semiarid regions; which are otherwise dominated by cereals, pulses and other field crops. Seeing

the importance of the crop and to limit to use day by day scaring water on the globe, a successful attempt was made to grow chilli exclusively under dry area of Bundelkhand with of Uttar Pradesh with the objectives to study the effect of moisture conservation practices on growth, development yield of chilli.

Materials and Methods

The field experiment was conducted during Rabi season 2009-2010 at the Agricultural Research Farm, Institute of Agriculture Sciences, Bundelkhand University, Jhansi. Geographically it is located at 25^0.27" N latitude and 78^0.35 E longitude at an altitude of 271 meters above the mean sea level in semi-arid tract of central India. Jhansi has sub-tropical climate with hot days during summer and cold in winter. The mean maximum temperature of 45^0C to 49^0 C is not uncommon during summer while very low temperature (3^0C) accompanied in January. The experimental soil was sandy loam in texture with P^H 7.4

The investigation was consisting of eight treatments/planting systems viz., Planting on Flatbed (control, T_1), Planting on flat beds (T_2) + Black Polythene Mulching (T_3), Planting on Ridges (20 cm high above ground level) (T_3), Planting on Ridges (20 cm high above ground level) + Black Polythene Mulching (T_4), Planting in Furrows (20 cm deep) (T_5), Planting in Furrows (20 cm deep) + Black Polythene Mulching (T_6), Grass mulching (T_7) and FYM mulching (T_8) with Randomized Block Design and three replications. For the above experiment Seedlings of Chilli variety Pusa jwala were grown in nursery and planted at the spacing of 45 x 30 cm on well prepared field as per the treatments. Just after transplanting plot were irrigated. Mulches were applied 15 days after planting. Other cultural and fertilization practices were followed as per recommended for cultivation of Chilli. All the recorded growth and yield parameters were subjected to analysis as per Randomized Block Design for interpretation of result.

Results and Discussion

Plant growth characters

Data analyzed and present in Table 1 revealed significant effect of various soil moisture conservation techniques on the field performance of chilli in terms of growth and yield attributes. All the treatments showed significant superiority over the treatment T_1 (Planting on flat beds/control).

Among the various eight techniques applied including control, application of FYM and grass mulch recorded significantly higher values of growth parameter like plant height, plant diameter and no. of secondary branches.

With respect to plant height, non-significant difference was noticed with increasing plant height from treatment T_2 (Planting on Flat bed + Black Polythene Mulching) to T_8 (Mulching with FYM), however maximum plant height 49.50 cm recorded in with FYM mulching (T_8) closely followed by grass mulch (49.20 cm) and 48.70 cm both in treatment T_5 (Planting in 20 cm deep Furrows) and T_6 (Planting in 20 cm deep Furrow + Black Polythene Mulching). Similarly to this highest plant diameter (3.8 cm) and no. of secondary branches were also noticed in T_8 (Mulching with FYM). Planting in deep furrows in combination with application of Black polythene mulching also exerted growth promotion effects (Table 1).

Table.1 Effect of different moisture conservation techniques on growth and yield characters of Chilli cv. Pusa Jwala

TREATMENT/Planting Systems	Growth & Yield attributing characters							
	Plant Height (cm)	Number of branches/ plant	Plant diameter (cm)	Number of fruits/ plant	Fruit length (cm)	Fruit Diameter (cm)	Fruit Yield/ Plant (g.)	Green Fruit Yield (q/ha)
T1 Planting on Flat bed (control)	42.5	82	3.1	20.8	12.8	2.1	250.3	34.2
T2 Planting on Flat bed + Black Polythene Mulching	47.8	86	3.3	24.5	14.6	2.8	290.2	42.4
T3 Planting on 20 cm high Ridges	47.9	87	3.3	25.8	14.8	2.8	290.4	43.2
T4 Planting on 20 cm high Ridges + Black Polythene Mulching	48.5	85	3.4	26.2	14.7	3.1	290.6	43.4
T5 Planting in 20 cm deep Furrows	48.7	87	3.5	28.4	14.8	3.2	290.8	46.3
T6 Planting in 20 cm deep Furrow + Black Polythene Mulching	48.7	86	3.5	29.4	14.8	3.2	290.5	46.6
T7 Mulching with Grass	49.2	88	3.6	30.2	14.9	3.3	300.4	47.5
T8 Mulching with FYM	49.5	92	3.8	31.5	14.9	3.3	320.4	50.4
SEm ±	**0.9**	**1.7**	**0.1**	**1.8**	**0.5**	**0.3**	**6.7**	**2.3**
C.D. at 5% level of Probability	**2.8**	**5.1**	**0.3**	**5.4**	**1.5**	**0.9**	**20.5**	**7.0**

The growth promotion effects in FYM mulching might be due to important role of FYM for sustaining the productivity and FYM also contains almost essential nutrients and enhance root growth of the plant (Bhardwaj 2013). The beneficial effects of moisture conservation on different field crops have been reported by various workers. In agreement to results of the present investigation, Pendke *et al.,* (2000) also revealed the advantage of adoption of moisture conservation practices like deep tillage with broad bed and furrow before sowing; in enhancing seed cotton yield over deep tillage with one directional hoeing. Additionally, Hulihalli and Patil (2006) reported that compartment bunding, tied ridges and furrows, broad bed and furrow gave significantly higher seed cotton yield compared to flatbed sowing.

Yield and yield attributing characters

Data presented in Table 1 also revealed significant superiority of moisture conservation techniques of yield and yield attributing traits of chilli over the control. Data for number of fruits/plant varied from 20.08 (control) to 31.50 (T_8 Mulching with FYM). Treatment T_7 i.e. application grass as mulch also registered higher no. of fruits/plant (30.20). Treatment T_8 (Mulching with FYM) also showed superiority over the control for Fruit length (14.90 cm) and fruit diameter (3.3 cm), respectively. Application of grass mulch as moisture conservation practice gave fruit yield of 300.40 g/plant which was non-significant to the highest fruit yield/plant of 320.40g/plant in treatment $T_{8.}$ Narayan *et al.,* (2017) concluded that double coated plastic polythene mulch could retain maximum moisture lowest weed density maximum number of fruits, fruit weight and ultimately fruit yield while being costly than our results.

Unlike the aforesaid yield attributing characters, highest yield of green chilli (50.40 q/ha) was obtained highest with application of FYM as mulch and moisture conservation technique, followed by grass mulch (47.50 q/ha) and T_6 (Planting in 20 cm deep Furrow + Black Polythene Mulching) 46.60 q/ha with lowest (34.20 q/ha) of it control (Planting on flat beds). Favorable weather condition and moisture of the soil are the important parameters affecting the crop production. Higher values for yield and yield and yield attributes might be due to enhanced water holding of soil due to application of FYM as mulch and moisture conservation practice. FYM is also a sustainable source to improve soil texture, supply of nutrients to the soil and also add favorable micro-organism in the soil, making soil more congenial for growth of the plant. Reddy *et al.,* (2016) register that fertigation with plastic mulching performed maximum for yield attributing traits, carotenoid content and pungency level. Our results are in close conformity to those of Ashrafuzzaman *et al.,* (2011) who mentioned that Plants on black plastic mulch had the maximum number of fruits and highest yield. Thus mulching appears to be a viable tool to increase the chilli production under tropical conditions. Likewise, Prajapati *et al.,* (2017) concluded that maximum net profit was obtained by hand weeding at 15 days interval.

On the basis of the findings of present investigation it can be concluded to adopt FYM mulching in the Chilli field as moisture conservation practice for higher green fruit yield under Bundlekhand region of U.P. In addition, by looking in cost effectiveness of FYM optional mulching with dry grass can also taken in practice for conservation of moisture in chilli fields which will give almost similar results with respect to growth and yield characters.

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