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Response of sunflower to moisture conservation practices and planting geometry

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ABSTRACT

A field experiment was conducted on farmers' field of Bijapur and Bagalkot districts to study the response of sunflower to moisture conservation practices and planting geometry under rain fed situations. The experiment was laid out in split plot design with moisture conservation practice as main plot and planting geometry as sub-plot. The main plot includes 1.off season tillage + repeated harrowing (ITK) 2. off season tillage + repeated harrowing + compartment bunding (IITK) 3.T_2+residue incorporation (scientific)and the sub plot includes three plant spacing a. sunflower at 35 cm row spacing (ITK) b. sunflower at 135cm with frequent inter cultivation (IITK) c. sunflower with paired roe planting at 45-135 cm with repeated intercultivation. Among the moisture conservation practices M3 *i.e.* compartment bunding + residue incorporation has given significantly higher yield of 1496 kg/ha over only compartment bunding (1414 kg/ha) and control (1157 kg/ha).the increased yield might be due to increased available soil moisture with M3 (30.8 cm/m). in case of planting geometry the pooled data showed significantly higher yield of 1689 kg/ha with a spacing of 135cm as compared to paired row planting (1498 kg/ha) and control (870 kg/ha).

Key words : Moisture, Sunflower, Geometry, Residue and tillage

INTRODUCTION

Vertisols and Vertic inceptisols of northern dryzone of Karnataka are facing many problems like, insufficient, undistributed rainfall (CV 30%) associated with higher PET values, which exceed normal rainfall during *Kharif* season. Consequently the length of growing period is hardly 85-90 days. Unevenly distributed *Kharif* rains are of shorter duration but of torrential. Vertisols overload with 8-10cm loose soil on the surface and endowed with low infiltrationrate because of high clay content and low organic matter are highly erodable. Hence these soils are not only hungry but are also equally thirsty. Identification of in-situ moisture conservation practice and sustainable soil management practice, which enhance further the effect of in-situ moisture conservation, is urgent need of the hour. With this view in mind an experiment was conducted in different locations of Bagalkot and Bijapur districts to find out suitable integrated practice for improving the productivity of sunflower on sustainable basis.

MATERIALS AND METHODS

The study was conducted in the farmer's fields of Bagalkot and Bijapur districts during *Rabi* season of 2001-02 and 2002-03. Two farmers were selected from each village *i.e.* Madabhavi and Kavalagi of Bijapur district and Benakatti, Bhagawati and Mannikatti of Bagalkot district for the study. The soil type was medium to deep black soil in its character

Experiment was laid out in split-plot design with nine treatment combinations and was replicated 10 times with a plot size was 500 sqm for each treatment, the treatments under the study were, Main plot – Moisture conservation practices:M_1.Off season tillage +repeated harrowing (ITK- Indigenous technical knowledge)M_2.Off season tillage + repeated harrowing +compartment bunding (IITK-improved Indigenous technical knowledge)M_3. T_2 + green gram residue incorporation (scientific) Sub plot - Planting geometry : S_1.Sunflower at 35cm row spacing (ITK)

S_2 Sunflower at 135cm with frequent intercultivation (IITK) S_3.Sunflower with paired row planting at 45-135cm with repeated Intercultivation (scientific).

In main plot treatment of M_3, green gram was sown during the month of June and the green gram residue was incorporated with the help of rotavator during August first fortnight after the harvest of pods and the compartment bunds were formed with the help of bund farmer in M_3 and M_2 treatments.

Sunflower was sown during September second fortnight and harvested during January month. The observations on growth and yield parameters were taken.

RESULTS AND DISCUSSION

The results indicated that over years significantly higher seed yield of 1496 kg/ha of sunflower was recorded with compartment bunding + residue incorporation in comparison with control (1157 kg/ha) and it was at par with the comportment bunding alone (1414 kg/ha). This higher yield might have been influenced by higher growth and yield attributing characters and in-situ moisture conservation practice. Significantly higher plant height of 152cm was recorded with the treatment of greengram residue incorporation +compartment bunding over control

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Table 1 : Growth, yield components and yield of sunflower as influenced by moisture conservation practices and planting geometry

Main plot treatment	Plant height (cm)			Head diameter (cm)			Seed yield (kg/ha)		
	01-02	02-03	Pooled	01-02	02-03	Pooled	01-02	02-03	Pooled
M_1	136.0	148.0	143.0	10.6	9.6	10.1	922	1345	1157
M_2	145.0	154.0	151.0	11.6	10.6	11.12	1290	1457	1414
M_3	146.0	157.0	152.0	11.8	11.4	11.6	1462	1467	1496
S.E. ±	1.0	0.7	0.8	0.2	0.29	0.2	78	32	58
C.D. (P=0.05)	4.0	2.0	2.3	0.5	0.91	0.5	233	98	178
Sub plot treatment									
S_1	136.0	149.0	144.0	9.8	9.5	9.7	777	932	870
S_2	147.0	157.0	153.0	12.6	11.6	12.2	1603	1667	1689
S_3	145.0	153.0	150.0	11.5	10.5	11.0	1294	1670	1508
S.E. ±	1.0	0.5	0.5	0.2	0.17	0.13	74	78	58
C.D. (P=0.05)	3.0	1.6	1.6	0.5	0.5	0.36	210	223	122

M_1-Off season tillage +repeated harrowing, M_2-Off season tillage +repeated harrowing + compartment bunding
M_3-T_2+green gram residue incorporation, S_1-sunflower at 35cm row spacing (ITK), S_2-sunflower at 135cm with frequent Intercultivation
S_3-sunflower with paired row planting at 45-135cm with repeated intercultivation

(143cm) but it was at par with compartment bunding alone.

In yield attributing characters also higher head diameter of 11.6 cm was recorded with the treatment M_3 which is significantly superior over control (10.1cm) but it was at par with only compartment bunding (M_2). Similar trend was also observed in seed yield/plant and 1000 seed weight.

Among planting geometry, the pooled data showed significantly higher grain yield of 1689 kg/ha with the spacing of 135 cm as compared to the paired row planting (1508 kg/ha) and the control (870 kg/ha). This higher yield might be due to higher growth and yield attributing characters *viz.*, plant height (cm), head diameter (cm), seed yield/plant (g) and 1000 seed weight (g) and also due to moisture conservation and residue incorporation.

Significantly higher plant height of 153 cm was recorded with a spacing of 135 cm than the paired row planting (150cm) and control (144 cm). Similar trend was observed with head diameter, seed yield/plant and 1000 seed weight, Similar results were reported by Patil *et al.* (1992), Kene *et al.* (1994) and Lal *et al.* (1998). The higher yield and yield attributing characters with wider row spacing of 135 cm might be due to repeated Intercultivation which forms the soil mulch and control the weed computation for the moisture and nutrients.

Table 2 : Yield components and yield of sunflower as influenced by moisture conservation practices and planting geometry

Main plot treatment	Seed weight (g/plant)			1000 seed weight (g)			Seed yield (kg/ha)		
	01-02	02-03	Pooled	01-02	02-03	Pooled	01-02	02-03	Pooled
M_1	28.0	34.5	32.08	39.83	38.31	38.91	922	1345	1157
M_2	33.74	43.8	38.79	44.34	42.48	43.08	1290	1457	1414
M_3	33.55	42.4	37.96	44.34	42.52	43.09	1462	1467	1496
S.E. ±	0.75	1.65	1.02	0.62	0.72	0.53	78	32	58
C.D. (P=0.05)	2.25	5.09	2.97	1.85	2.23	1.54	233	98	178
Sub plot treatment									
S_1	23.15	33.0	27.89	41.06	38.6	39.71	777	932	870
S_2	40.85	45.1	44.24	44.43	42.81	43.39	1603	1667	1689
S_3	31.29	42.5	36.7	43.02	41.91	41.96	1294	1670	1508
S.E. ±	0.87	1.05	0.79	0.65	0.56	0.46	74	78	58
C.D. (P=0.05)	2.47	3.02	2.18	1.85	1.6	1.27	210	223	122

M_1-Off season tillage +repeated harrowing, M_2-Off season tillage +repeated harrowing + compartment bunding
M_3-.T_2+green gram residue incorporation, S_1-sunflower at 35cm row spacing (ITK), S_2-sunflower at 135cm with frequent Intercultivation
S_3-sunflower with paired row planting at 45-135cm with repeated intercultivation

Table 3 : Grain yield of sunflower (pooled data) as influenced by moisture Conservation practices and planting geometry sunflower

Treatments	Seed yield (kg/ha)	Net returns (Rs/ha)
M_1S_1	689[e]	7408[b]
M_1S_2	1467[bc]	19337[ab]
M_1S_3	1314[c]	17280[b]
M_2S_1	920[e]	10625[cd]
M_2S_2	1800[a]	22981[a]
M_2S_3	1521[abc]	19896[ab]
M_3S_1	1002[b]	11336[c]
M_3S_2	1799[a]	21931[a]
M_3S_3	1689[ab]	22204[a]
LSD	260	3724

M_1-Off season tillage +repeated harrowing
M_2-Off season tillage +repeated harrowing + compartment bunding
M_3-.T_2+green gram residue incorporation
S_1-sunflower at 35cm row spacing (ITK)
S_2-sunflower at 135cm with frequent Intercultivation
S_3-sunflower with paired row planting at 45-135cm with repeated Intercultivation

Table 4 : Available soil moisture (cm/m) as influenced by Moisture Conservation practices and planting Geometry in sunflower

	S_1	S_2	S_3	Mean
M	26.8	29.0	28.6	28.13
M_2	26.8	32.0	30.9	29.9
M_3	28.9	32.2	31.3	30.8
mean	27.5	31.06	30.26	

M_1-Off season tillage +repeated harrowing
M_2-Off season tillage +repeated harrowing + compartment bunding
M_3-.T_2+green gram residue incorporation
S_1-sunflower at 35cm row spacing (ITK)
S_2-sunflower at 135cm with frequent Intercultivation
S_3-sunflower with paired row planting at 45-135cm with repeated Intercultivation

The available soil moisture was higher (30.8 cm/m) with the treatment M3 (compartment bunding and residue incorporation) compared to only compartment bunding (29.9cm/m) and control (28.13 cm/m). In sub plot treatments of planting geometry crops grown at a wider row spacing of 135 cm had higher available water of 31.06 cm/m compared to the normal spacing of 40-45 cm (27.5 cm/m). Compartment bunds might have reduced the run off there by increased the time of concentration and also incorporation of crop residues might have increased the water holding capacity of the soil by improving the soil aggregation. The results are in conformity with the findings of Hiremath *et al*. (2003) and Radder *et al.* (1991).

DMRT test was conducted to know the significance of interaction effect of moisture conservation practices and the planting geometry on the grain yield and net returns. The pooled data showed that compartment bunding with wider row spacing of 135 cm gave significantly higher grain yield of 1800 kg/ha and it was at par with the treatment receiving compartment bunding + residue incorporation and wider row spacing (1799 kg/ ha). Similar trend was observed with respect to net returns.

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