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Influence of moisture conservation practices and planting geomerty on *Rabi* sorghum in vertisols

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ABSTRACT

A study was conducted to know the influence of moisture conservation practices and planting geometry on *Rabi* sorghum. The experiment was laid out in split plot design in the farmer's field of Bijapur and Bagalkot districts. The experiment consist of three moisture conservation practices (including one as control) and three planting geometry. The results indicated that compartment bunding + residue incorporation produced significantly higher yield of 2429 kg /ha. With the net returns of Rs. 14,466/- per hectare compare to the rest of the treatment. Incase of planting geometry the pooled data of two years showed significantly higher yield of 2773 kg/ha with a spacing of 90 cm compared to paired planting (2352 kg/ha) and control 1670 kg/ha. The higher yield with the spacing of 90cm might be due to the better light interception and reduced competition for moisture and nutrients.

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Key words : Moisture, Sorghum, Geometry, Residue, Compartment bunding and tillage

INTRODUCTION

Sorghum [*Sorghum bicolor* (L.) moench] is an important staple food crop of India, Karnataka is the second important sorghum growing state in the country and it is mainly grown in rainfed condition in northern parts. Moisture is the major limiting factor in dryland agriculture. Rainfall in dryland areas is erratic, illdistrubeted and occasionally occurs with high intensity and within a shorter period of time it erodes lots of topsoil through run off. Therefore it is necessary to control the run off and conserve the rainwater through efficient *in situ* moisture conservation practices. These provide more opportunity time for ponded water to infiltrate in to the soil. In recent years increased usage of only chemical fertilizers temporarily affected the soil health, so in order to maintain the soil health, addition of crop residues in to the soil which are left over after the harvest of the crop and also use of green manures become essential. Incorporation of crop residues improves the physical, chemical and biological properties of the soil. Keeping these important constraints in view an experiment was conducted with appropriate treatment combinations in the farmers fields of Bijapur and Bagalkot district to achieve sustainable higher yields.

MATERIALS AND METHODS

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

Experiment was laid out in split-plot design which comprises of nine treatment combinations, each farmer is considered as one replication and the treatment were replicated ten times with a plot size of 500 sqm for each treatment. The treatment under the study were

Mian plot - Mositure 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+greengram residue incorporation (scientific)

Sub plot - Planting geometry:

S_1- *Rabi* sorghum at 35cm

S_2- *Rabi* sorghum at 90cm

S_3- *Rabi* sorghum with paired row planting at 45-90 cm with repeated Intercultivation (scientific)

In main plot with moisture conservation practice (M_3), green gram was sown during the month of June and the residue of green gram were incorporated during first fortnight of August with rotovater and the compartment bunds were formed with the help of bund farmer in M_2 and M_3 treatments.

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Sorghum was sown during first fortnight of October and harvested during February. The observations on growth and yield parameters were taken.

RESULTS AND DISCUSSION

Available soil water in the soil profile was higher with compartment bunding + residue incorporation (29.89cm/m) compared to only compartment bunding (27.75cm/m) and control (26.2cm/m). These compartment bunds with residue incorporation act as check basins for run-off water and facilitate more time of concentration for rainwater to infiltrate in to deeper layers of the soil profile. In case of planting geometry the available soil water was higher with a spacing of 90cm (29.26cm/m) compared to the normal spacing (26.06cm/m). Higher soil moisture availability for longer period of time in wider row spacing may be due to thick soil mulch formed on repeated interculturing operations.

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

Main plot treatment	Plant height (cm)			Ear head weight (g/plant)			Seed yield (kg/ha)		
	01-02	02-03	pooled	01-02	02-03	pooled	01-02	02-03	pooled
M_1	171.85	159.0	168.1	60.37	38.7	51.4	1325	2477	2023
M_2	166.92	168.4	171.1	61.00	42.3	53.2	1667	2704	2344
M_3	163.03	175.1	171.9	61.71	43.7	54.4	1640	2968	2429
S.E. ±	3.42	1.88	2.47	2.54	0.88	1.75	43	109	59
CD (P=0.05)	NS	5.92	NS	NS	2.77	NS	131	342	173
Sub plot treatment									
S_1	162.83	160.3	164.9	49.17	33.6	42.8	1218	1879	1670
S_2	169.79	175.3	175.4	71.83	48.6	61.7	1780	3481	2773
S_3	169.17	166.9	170.9	62.00	42.5	54.5	1634	2790	2352
S.E. ±	3.37	0.99	2.26	1.60	1.04	1.13	48	131	73
CD (P=0.05)	NS	2.86	6.25	4.55	2.99	3.12	136	377	201

M_1.Off season tillage+repeated harrowing NS=Non-significant
M_2.Off season tillage+repeated harrowing+compartment bunding
M_3. T_2+green gram residue incorporation
S_1.*Rabi* sorghum at 35cm
S_2 *Rabi* sorghum at 90cm
S_3-*Rabi* sorghum with paired row planting at45-90cm with repeated Intercultivation (scientific)

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

Main plot treatments	Seed weight (g/plant)			1000 seed weight (g)			Fodder yield (kg/ha)		
	01-02	02-03	Pooled	01-02	02-03	Pooled	01-02	02-03	Pooled
M_1	46.87	26.4	37.7	38.7	32.1	35.3	3313	3924	5060
M_2	46.71	30.5	38.6	39.0	33.2	36.2	4167	4926	5844
M_3	47.87	28.9	39.8	39.49	34.0	36.4	4100	4725	6307
S.E. ±	1.97	0.20	1.29	0.56	0.17	0.18	108	115	148
C.D. (P=0.05)	NS	0.64	NS	NS	0.53	0.55	327	361	435
Sub plot treatments									
S_1	36.00	26.9	31.8	38.38	31.1	34.5	3046	3654	4176
S_2	56.83	29.4	44.2	39.63	34.6	37.0	4450	5132	6919
S_3	48.62	29.6	40.1	39.18	33.5	36.2	4085	4789	6116
S.E. ±	1.23	0.31	0.80	0.42	0.33	0.22	119	157	182
C.D. (P=0.05)	3.52	0.90	2.20	NS	0.94	0.60	341	452	502

M_1-Off season tillage+repeated harrowing NS=Non-significant
M_2-Off season tillage+repeated harrowing+compartment bunding
M_3T_2+green gram residue incorporation
S_1-*Rabi* sorghum at 35cm
S_2 -*Rabi* sorghum at 90cm
S_3-*Rabi* sorghum with paired row planting at45-90cm with repeated Intercultivation (scientific)

Table 3: Grain yield and fodder yield of *Rabi* sorghum (pooled data) as influenced by moisture conservation practices and planting geometry

Treatments	Grain yield (kg/ha)	Fodder yield (kg/ha)	Net returns (Rs/ha)
M_1S_1	1478[d]	3996[d]	5795[e]
M_1S_2	2543[b]	6358[b]	12542[ab]
M_1S_3	2049[c]	5124[c]	9423[cd]
M_2S_1	1719[c d]	4297[c d]	6938[de]
M_2S_2	2780[a b]	6902[a b]	12755[ab]
M_2S_3	2533[b]	6334[a]	12090[b]
M_3S_1	1815[c d]	4535[c d]	6896[e]
M_3S_2	2998[a]	7496[a]	14466[a]
M_3S_3	2476[b]	6890[b]	11148b[c]
LSD	356	891	2366

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S_3.*Rabi* sorghum with paired row planting at45-90cm with repeated Intercultivation (scientific)

Significantly higher seed yield of 2429kg/ha was recorded with the treatment M_3 (residue incorporation + compartment bunding) compared to the control 2023 kg/ha, but it was on par with M_2 (2324 kg/ha). Higher yield might have been influenced by higher thousand seed weight and available moisture in the treatment having residue incorporation and compartment bunding Similar trend was also observed in case of fodder yield (kg/ha). These results in conformity with the findings of Hiremath *et al.* (2003) and Radder *et al.* (1991).

In case of planting geometry, significantly higher seed yield of 2773 kg/ha was recorded with a wider row spacing of 90cm compared to paired row planting (2352 kg/ha) and farmers practice (1670 kg/ha). Similar trend was observed in case of fodder yield also. The higher yield with 90cm row spacing may be attributed to higher growth and yield attributing characters. The higher plant height of 175.4 cm was recorded with a spacing of 90cm which was on par with paired row planting (170.9cm) and both were found significantly superior over the control (164.9 cm). In all yield attributing characters earhead weight (g)/plant, seed weight (g)/plant and 1000 seed weight). The wider row spacing of 90 cm was found significantly superior over the paired row and control. Similar findings were also reported by Molini *et al.* (1997), Khafi *et al.* (2000) and Ishwar Singh (1990).

DMRT test was conducted to know the interaction effect of moisture conservation practices and planting geometry on *rabi* sorghum crop. The pooled data indicated

Table 4 : Available soil moisture (cm/m) as influenced by moisture conservation practices and Planting geometry in *Rabi* sorghum

	S_1	S_2	S_3	Mean
M_1	24.18	26.84	27.61	26.21
M_2	26.31	28.09	28.84	27.75
M_3	27.68	30.68	31.32	29.89
Mean	26.06	28.53	29.26	

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that the grain and fodder yield of *Rabi* sorghum were significantly superior with compartment bunding + green gram residue incorporation and wider row spacing of 90 cm with repeated intercultivation (2998 and 7496 kg/ha, respectively) (Table 3) compared to the rest of the treatment combinations. However, it was on par with the compartment bunding and wider row spacing of 90 cm with repeated intercultivation (2780 and 6902 kg/ha, respectively). This may be attributed to higher available moisture (30.68 cm/m).

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