Research Note

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Evaluation of Land Configuration and Mulching on Soil Moisture Retention and Yield of Rainfed Cotton

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In-situ rain water harvesting involves the use of methods that increase the amount of water stored in the soil by holding the rain and this can be done by adopting land configuration and crop residue or coir pith mulch. Broad bed furrow system and mulches can increases the soil moisture content. Land configuration practices can also improve soil quality through addition of crop residue and soil organic carbon at the end of the season. Broad bed furrow system with coir pith incorporation was recorded higher growth and seed yield of cotton under dry spell situation.

Introduction

Rainfed area occupies an important place in Indian Agriculture. The productivity levels of the rainfed areas are very low and unstable due to the monsoon rainfall which is erratic, unpredictable and also highly fluctuating over the years. *In-situ* rain water harvesting, also called soil and water conservation, involves the use of methods that increase the amount of water stored in the soil profile by trapping or holding the rain where it falls (Stott *et al.*, 2001). This can be achieved by adopting land configuration and crop residue mulch. These two most important practices have been reported to reduce soil erosion and increase *insitu* moisture storage and improve the productivity of crops (Bhatt *et al.*, 2004).

Materials and Methods

The field experiments were conducted under NICRA scheme on "Water harvesting technology to cope with climate variability in drylands in Tamil Nadu" implemented at Directorate of Crop Management, TNAU, Coimbatore during 2012-13 to evaluate the *in-situ* water harvesting techniques for rainfed cotton. The experiment was laid out in split plot design with three replications. The main plot treatments were M_1-Compartmental bunding; M_2–Broad Bed Furrow; M_3–Ridges and Furrow; subplot treatments were S_1–Crop residue mulch @ 5 t/ha; S_2–Coir-pith incorporation @ 5t/ha and S_3-no mulch (control). Soil moisture measurements were done at 20 days interval. Biometric observation was recorded by taking five plants randomly from each plot at 30 days interval starting from 30 DAS to at harvest stage and data on yield parameters and kapas yield were recorded and analyzed statistically.

Result and Discussion

1. Soil moisture content

Land configuration and crop residue mulching had significant effect on soil moisture, yield attributing characters and kapas yield. Broad Bed Furrow System (BBF) (M_2) recorded the maximum soil moisture percent both at 20 cm and 40 cm depth on 30, 60, 90 and 120 DAS (Table 1). This may be due to broad bed furrow system helps in the safe disposal of excess water

through furrows when there is high intensity rainfall with minimal soil erosion, at the same time it serves as land surface treatment for in-situ moisture conservation. A similar finding was reported by Singh *et al*., 2009. Mulching with crop residue @ 5t/ha (S_2) influenced the soil moisture content both at 20 cm and 40 cm depth which was comparable with coir pith incorporation @ 5t/ha (S_3). Treatment without mulching had no influence on soil moisture content. Mulching can reduce soil evaporation and increases the water use efficiency in crops (Wani *et al.*, 2011).

Table 1: Effect of land configuration and mulching on soil moisture content (%) in rainfed cotton

Treatments	30 DAS		60 DAS		90 DAS		120 DAS	
	20cm	40cm	20cm	40cm	20cm	40cm	20cm	40cm
M_1	23.6	18.3	11.1	22.0	13.1	21.2	10.0	16.7
M_2	23.9	20.2	15.6	25.3	14.2	23.7	11.6	19.9
M_3	23.6	18.7	14.2	24.6	13.3	21.7	10.8	17.6
SED	0.62	0.7	0.49	0.79	0.33	0.57	0.57	0.87
CD (P=0.05)	NS	1.6	1.21	1.95	0.82	1.39	1.41	2.13
S_1	24.7	19.6	15.5	24.8	13.7	22.8	12.1	19.7
S_2	23.6	19.4	13.2	24.0	13.5	21.7	10.8	18.1
S_3	22.7	17.8	12.1	22.6	12.9	21.1	10.3	17.0
SED	0.68	0.89	0.54	0.89	0.37	0.67	0.67	0.98
CD (P=0.05)	1.45	1.57	1.14	1.88	0.78	1.42	1.41	2.07

(Main plots: M_1-Compartmental bunding; M_2–Broad Bed Furrow; M_3–Ridges and Furrow; Subplot: S_1–Crop residue mulch @ 5t/ha; S_2– Coir-pith incorporation @ 5t/ha and S_3- no mulch)

2. Yield parameters and yield

Cotton crop grown in BBF system (M_2) registered higher yield parameters *viz.,* No. of sympodial branches/plant (21.7), number of bolls/plant (43.2) and boll weight (3.96 g) and significantly higher seed cotton yield of 2658 kg/ha. The BBF system increased yield of rainfed crops also observed by Singh *et al.,* 2009.

Table 2: Effect of land configuration and mulching on yield parameters and seed yield of rainfed cotton

Treatments	No. of sympodial branches/plant	No. of bolls /plant	Boll weight (g)	Seed cotton yield (kg/ha)
M_1	20.5	38.1	3.48	2263
M_2	21.7	43.1	3.96	2658
M_3	21.0	40.6	3.60	2415
SEd	0.34	0.49	0.02	63
CD (P= 0.05)	0.84	1.20	0.06	155
S_1	21.3	42.2	3.90	2537
S_2	21.6	42.5	3.98	2568
S_3	19.2	40.8	3.03	2068
SEd	0.39	0.62	0.07	114
CD (P= 0.05)	0.83	1.80	0.20	328

(Main plots: M_1-Compartmental bunding; M_2–Broad Bed Furrow; M_3–Ridges and Furrow; Subplot: S_1–Crop residue mulch @ 5t/ha; S_2– Coir-pith incorporation @ 5 t/ha and S_3- no mulch)

In sub plot treatment, coir pith incorporation recorded higher number of boll bearing branches (21.6), bolls/plant (42.5) and boll weight (3.98 g) and also increased the seed cotton yield of 2568 kg/ha over no mulch. Coir pith recorded higher yield because of higher water retention in the soil profile which may have increased uptake of plant nutrients (Raniperumal *et al.*, 1991).

Conclusion

Broad bed furrow with coir pith incorporation (5 t/ha) was found to be effective in conserving soil water under dryland condition by improving the water holding capacity of the soil. This study shows that broad bed furrow system with coir pith incorporation @ 5.0 t/ha improved the seed yield of cotton under dry spell situation over no mulch.

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