EFFECT OF LAND CONFIGURATIONS AND MULCHES ON GROWTH, YIELD AND SOIL MOISTURE CONSERVATION IN KHARIF SORGHUM [*SORGHUM BICOLOR* (L.) MOENCH]

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Abstract :A field experiment during *Kharif* season 2008-09 at College of Agriculture All India Coordinated Sorghum Improvement Project, College of Agriculture, Indore on medium black soil. A total of 15 treatment combinations consisted with three land configuration systems i.e. flat system, ridge and furrow system and flat system followed by earthing at 30 DAS and five treatments of mulches i.e. No mulch, wheat straw, FYM, green weed biomass and glyricidia leaves, replicated 3 times, were arranged in split plot design. Among land configuration systems, ridge and furrow system showed promising effect on growth parameters, yields, returns, B: C ratio and soil moisture conservation, followed by flat system earthing at 30 DAS over flat system. Among the mulches, application of glyricidia leaves followed by green weed biomass @ 6 t/ha applied at 35 DAS was significantly increased the growth, yields, returns, B:C ratio and soil moisture conservation.

Keywords: Mulches, Land configuration systems, Sorghum

INTRODUCTION

Sorghum (S*orghum bicolor* L Moench) is a major staple food and fodder crop of rainfed agriculture in India. It is at fourth position among the leading cereals of India. Generally flat-land cultivation system is more popular in cultivation of *Kharif*crop like sorghum, which faces the problem of water logging and poor aeration thereby affecting crop productivity adversely under such situations the small changes through land configuration in flat field conditions may help in improving the productivity specially in *Vertisols*. Vertisols with good moisture holding capacity can be used to grow short-duration sorghum by adopting sound land management practices such as Ridge and furrow system may help to increase the income to the farmers besides preventing land degradation due to runoff erosion. There are several factors responsible for low productivity, among them inadequate crop stand due to faulty methods of sowing, erratic weather situation, uneven and low distribution of rainfall at critical stage of crop.

To enhance the productivity, the major constraint is non availability of water during critical stages of crop. Moisture conservation in soil along with prevention of soil erosion can be achieved by use of organic mulches including (FYM, wheat straw, glyricidia leaves, and weed biomass) show remarkable effectiveness in sorghum growing black saline soil. In this context to improve land productivity by adopting suitable land configuration system and suitable moisture conservation measures which help to overcome all above hurdles which decline land productivity and help to grow crop successfully. Moisture stress, particularly at flowering and grain filling stages are the main cause of the low yield of rainfed sorghum. One of the ways to increase the productivity of sorghum is to conserve more soil moisture. Moisture conservation practices increase infiltration rate, porosity, and improve root growth and grain yield of sorghum (Gupta, 2007).Hence keeping above points in view, an experiment has been conducted on sorghum to find out suitable land configuration system for proper growth and yield of *kharif*sorghum and to find out the suitable mulch for proper growth and yield.

MATERIAL AND METHOD

A field experiment was conducted at Jawaharlal Nehru KrishiVishwaVidyalaya Research Farm, College of Agriculture, Indore during *kharif* season of 2008-09, to study "Effect of land configurations and mulches on growth, yield and soil moisture conservation in kharif sorghum (*sorghum bicolor)*". The experiment was carried out on research farm under the All India Coordinated Sorghum Improvement Project (AICSIP), College of Agriculture, Indore (M.P.) during *Kharif* season of 2008-09. The topography of the field was uniform with gentle slope and has adequate drainage. In this season southwest monsoon is responsible for major parts of annual precipitation with occasional showers in winter with an average rainfall of 954 mm. It has subtropical climate having a temperature range of 21^{o}C to 45^{o}C and 6^{o}C to 31^{o}C in summer and winter season, respectively. The relative humidity, wind velocity and evaporation ranges in between 82.8 to 95.5 %, 0.3 to 2.5 km/hr and 1.7 to 4.6 mm respectively. The soil of the experimental field has been grouped under medium black (*Vertisols*) belonging to fine montmorillonite hypothermic family of typical chromosterts predominantly clay in texture.

The field experiment was carried out in split plot design with three replications and 15 treatment combinations. Main plot treatments consisted of three land configuration systems *viz*., Flat system (S_1) , Ridge and furrow system (S_2) and Flat system followed by earthing at 30 DAS (S_3). The sub plot treatments consisted of application of mulches applied at 35 DAS i.e. No mulch (M_1), Wheat straw @ 6t/ha (M_2), FYM @ 6t/ha (M_3), Green weed biomass @6t/ha (M_4), Glyricidia leaves @ 6t/ha (M_5).The sowing of the experiment was done on last week ofJune, 2008. The spacing between two rows and plant to plant was 45 cm X 10 cm.

RESULT AND DISCUSSION

Growth:

Study of the data revealed that the number of leaves, leaf area index, plant height and dry matter progressively increased up to the maturity. Among the land configuration systems, ridge and furrow system produced significantly more number of leaves, leaf area index dry matter than flat system however in dry matter accumulation ridge and furrow system was at par with flat system followed by earthing at 30 days after sowing. Among the mulches the application of glyricidia leaves and green weed biomass @ 6 t/ha at 35 DAS being at par recorded significantly more number of leaves, leaf area index, plant height and dry matter accumulation per plant as compared to other applications of mulching material.The probable reason for this trend of increasing growth in sorghum by adopting ridge and furrow system and application of green weed biomass or glyricidia leaves as a mulch @ 6 t/ha may be the availability of moisture for longer period during crop season. These observations are supported by the findings of Aghave*et al* (2006), Gupta and SurajBhan (1997).

Table 1. Number of leaves, Leaf area index, Plant height and Dry matter accumulation of sorghum as influenced by land configuration systems and mulches at 60 days after sowing

S.N.	Treatments	Number of leaves/ plant	Leaf area index	Plant height	Dry matter accumulation/plant
A. Land configuration systems					
1	Flat system	7.80	6.17	169.99	98.25
2	Ridge and furrow system	9.31	6.29	172.00	126.14
3	Flat system followed by earthing at 30 DAS	9.04	6.21	171.79	123.38
	SE(m) ±	0.04	0.01	0.67	1.53
	C.D.(5%)	0.17	0.06	NS	6.04
B. Application of mulches @ 6 t/ha at 35 DAS					
1	No mulch	7.92	6.08	168.10	109.66
2	Wheat straw	8.30	6.18	170.06	113.50
3	FYM	7.78	6.19	169.95	113.99
4	Green weed biomass	9.70	6.34	174.30	121.06
5	Glyricidia leaves	9.89	6.32	173.91	121.39
	SE(m) ±	0.14	0.02	0.78	2.31
	C.D. (5%)	0.40	0.07	2.28	6.76

Soil moisture conservation:

It is reveled from the Table.2 that there is a wide variation in the soil moisture content of sorghum. Among land configuration systems, ridge and furrow system recorded higher soil moisture content than other systems. Among application of mulches, glyricidia leaves and green weed biomass being at par and gave significantly higher soil moisture content than other mulching materials.

Table 2. Effect of land configuration systems and application of mulches on soil moisture content (%) in different depth at 60 DAS

S.N.	Treatments	Moisture content (in %) in soil at 60DAS		
		0-15 cm	15-30cm	30-45cm
A. Land configuration systems				
1	Flat system	27.6	26.2	24.1
2	Ridge and furrow system	31.8	29.2	28.1
3	Flat system followed by earthing at	30.3	28.3	27.1

	30 DAS			
	SE(m) ±	0.39	0.40	0.17
	C.D. (5%)	1.53	1.60	0.68
B. Application of mulches @ 6 t/ha at 35 DAS				
1	No mulch	29.1	26.6	24.6
2	Wheat straw	28.6	27.1	26.2
3	FYM	28.5	26.1	24.7
4	Green weed biomass	31.1	28.9	28.3
5	Glyricidia leaves	32.1	29.8	28.4
	SE(m) ±	0.45	0.39	0.38
	C.D. (5%)	1.31	1.16	1.12

Post harvest studies

It is revealed from the findings of the present investigation that grain yield and stover yields in sorghum were affected significantly by different land configuration systems. Ridge and furrow system and flat system followed by earthing at 30 DAS were at par with each other and produced the significantly grain and stover yield than flat system. This may be due to proper drainage of rain water and availability of moisture to the plant. Among mulches the application of green weed biomass and glyricidia leaves @ 6 t/ha at 35 DAS were at par with each other and produced significantly higher grain and stover yield in sorghum as compared to other application of mulches. Similar result are reported by Patil and Sheelavantar (2006), Shivkumar and Mishra (2001) and Chiroma*et al.* (2006)

Economics

Net returns and B: C ratio were affected significantly due land configuration systems and mulching material. Ridge and furrow system and flat system followed by earthing at 30 DAS recorded significantly higher net returns and B:C ratio as compared to flat system. Among the mulching material, application of green weed biomass and glyricidia leaves @ 6 t/ha applied at 35 DAS, received significantly higher, net returns and B:C ratio. This may be due to increases in yields of sorghum crop by ridge and furrow system and application of green weed biomass and glyricidia leaves @ 6 t/ha at 35 DAS. Similar results were reported by Chiroma*et. al.* (2006), Patil and Sheelavantar (2006) and RatanLal (2004).

Table 3. Grain, stover yield and harvest index of sorghum a influenced by land configuration systems and mulching materials

S.N.	**Treatments**	**Grain yield (kg /ha)**	**Stover yield (kg/ha)**	**Harvest Index (%)**	**Net returns (Rs/ha)**	**B:C Ratio**
A. Land configuration systems						
1	Flat system	4337	20069	17.76	35046	3.47
2	Ridge and furrow system	5578	23634	19.07	46770	4.14
3	Flat system followed by earthing at 30 DAS	5124	22754	18.62	43756	3.86
	SE(m) ±	154	502	0.14	1341	0.09
	C.D. (5%)	606	1970	0.55	5263	0.35
B. Application mulches @ 6 t/ha at 35 DAS						
1	No mulch	4409	19753	18.62	37676	3.83
2	Wheat straw	4925	21528	18.64	39705	3.51
3	FYM	5050	22184	18.50	40736	3.50
4	Green weed biomass	5328	23727	18.27	45713	4.14
5	Glyricidia leaves	5346	23572	18.41	45457	4.13
	SE(m) ±	98	444	0.22	1139	0.08
	C.D.(5%)	285	1294	NS	3325	0.22

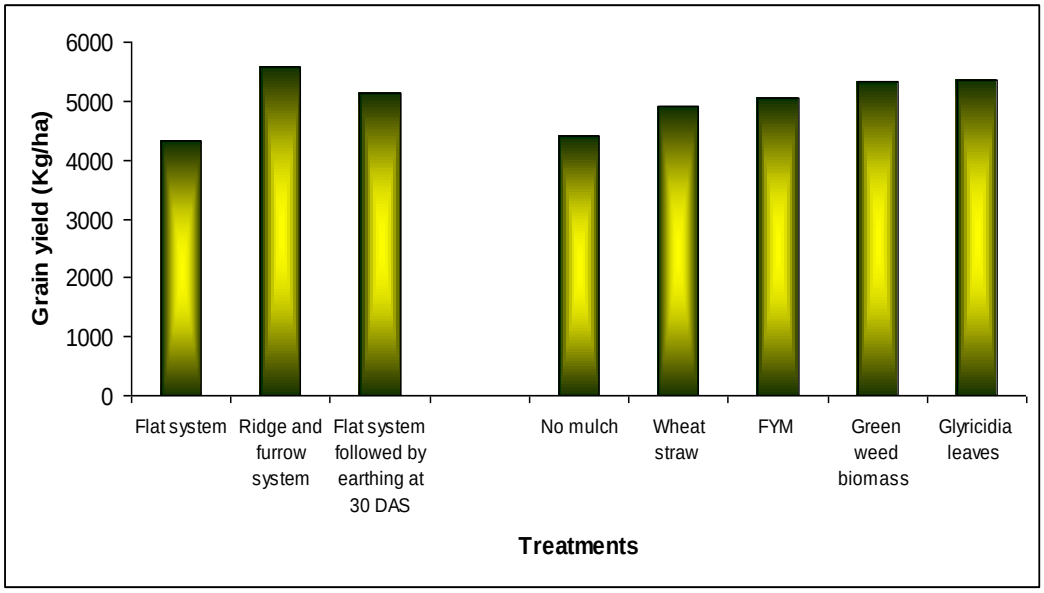

Fig. Grain yield (kg/ha) as influenced by different treatments.

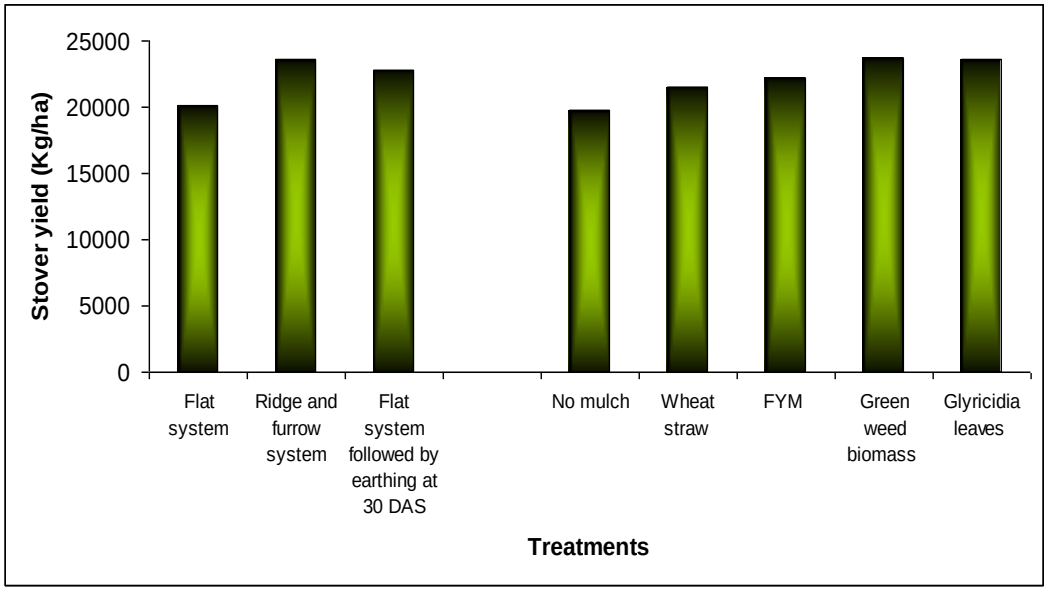

Fig. Stover yield (kg/ha) as influenced by different treatments.

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