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Effect of Land Configurations and Weed Management Practices on Growth and Yield of Soybean

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Abstract

A field experiment was conducted during the kharif season of 2015 and 2016 to evaluate the effect of different land configurations and weed management practices on growth and yield of soybean at Instructional Farm, Krishi Vigyan Kendra, Aron, Guna (M.P.). The results revealed that the significantly higher plant height was recorded with raised bed furrow sowing land configuration over flat bed but, it was statistically at par with ridge furrow sowing. The similar trend was observed in dry matter production/plant and yield. Among the weed management treatments weed free treatment was recorded significantly higher plant height, dry matter production/ plant and yield/ha over control plot but statistically at par with Aceloflorfen + Clodinafop applied as post emergence at all the stage of observations.

Key words: *Soybean, Weed management, land Configuration, Growth, and Yield.*

Introduction

Weed infestation is considered as a complex constraint in soybean production. Several herbicides, *viz*. pendimethalin, alachlor, chlorimuron, imazethapyr, *etc.* are presently being used for controlling the weeds in soybean but these herbicides were not found much effective to control many broad-leaved weeds[2]. Satisfactory crop establishment through suitable land configuration method is important as alluvial soil of the region is prone to temporary water logging after heavy rainfall due to low infiltration rate. Water logging even for a short period proves detrimental to the crop of soybean particularly during germination and early growth phase. Suitable land configuration becomes important for successful cultivation of soybean in changing climatic situations. Therefore, the present investigation was undertaken.

Material and Methods

The experiment was conducted during two consecutive *kharif* seasons of 2015 and 2016 at Instructional Farm, Krishi Vigyan Kendra, Aron, Guna. The soil of the experimental field having pH 7.8-7.9, EC 0.40 to 0.41 dS/m, OC 0.60 to 0.62%, available N 202.4 to 207.6 kg/ha, available P_2O_5 45 to 48 kg/ha, available K_2O 130.5 to 142.5 kg/ha and available S 16 to 17 kg/ha. The total rainfall received during June to November was 875.6 and 555.6mm in 2015 and 2016, respectively. The treatment comprises four land configurations (flat bed, ridge furrow, broad bed furrow and raised bed furrow sowing) as the main plot treatments and six weed management practices (control, Aceloflorfen + Clodinafop, Imezathapyr + Imezamox, Imezathapyr + Pendimethilin, Imezathapyr and weed free having HW twice) as the sub plot treatments. The experiment was laid out in split plot design with three replications. The soybean variety JS 95-60 was sown in last week of June and first week of July having seed rate 80 kg/ha in rows 45 cm apart. The uniform fertilizer dose of 20 kg N, 60 kg P_2O_5, 20 kg K_2O and 40 kg S/ha was applied in all the treatments. The herbicides were applied as per treatments. The crop was harvested on last week of September.

Results and Discussion

Growth characters

The plant height, in general, enhanced very fast up to 50 DAS therefore the rise was very slow till harvest stage of observation. In fact, the trend and limit of vegetative growth before the first start reproductive phase is mainly govern by the genetic behavior inherited in the height yielding, plant type as well as by the crop management practices and by the existing agro climatic conditions of the region(Table 1). The height was significantly affected by the land configurations at all stages of crop growth during both years and pooled basis. At 25 DAS the crop sown with raised bed furrow (S_4) land configuration produced significantly taller plants (22.74 cm) over crop planted with flat bed (S_1) and broad bed furrow (S_3) and statistically at par with ridge furrow sowing (S_2). The similar trend was observed at 50 DAS and harvest stage. Flat bed sowing recorded the minimum height at all the stages of observation. The increased plant height in ridge furrow and raised bed furrow sowing land configuration treatments may be owing to the increased availability of soil moisture to the actively growing plants. The similar results have been reported earlier [4,6].

Table 1 Plant height and dry matter production of soybean as influenced by land configurations and weed management treatments at successive stages of crop growth (Pooled)

Treatment	Symbol	Plant height (cm)			Dry matter production (g/plant)			Seed yield (q/ha)	Straw yield (q/ha)	Biological yield (q/ha)
		25 DAS	50 DAS	Harvest	25 DAS	50 DAS	Harvest			
Land configurations										
Flat bed sowing	S_1	22.01	38.58	44.30	2.31	6.62	10.60	8.62	10.22	18.84
Ridge furrow sowing	S_2	22.60	39.33	44.86	2.38	6.85	10.80	12.14	14.92	27.06
Broad bed furrow sowing	S_3	22.42	39.13	44.71	2.37	6.80	10.77	11.40	13.96	25.37
Raised bed furrow sowing	S_4	22.74	39.53	45.01	2.39	6.95	10.83	13.04	15.62	28.66
SE (m)±		**0.09**	**0.10**	**0.08**	**0.01**	**0.03**	**0.02**	**0.57**	**1.12**	**1.65**
CD (P=0.05)		**0.27**	**0.32**	**0.26**	**0.03**	**0.10**	**0.05**	**1.77**	**3.44**	**5.08**
Weed management treatments										
Control	W_1	21.32	38.01	43.61	2.25	5.93	9.85	6.85	8.53	15.38
Aceloflorfen + Clodinafop	W_2	22.98	39.77	45.26	2.34	7.03	11.09	15.37	18.31	33.68
Imezathapyr + Imezamox	W_3	22.32	38.98	44.59	2.32	6.91	10.85	10.47	12.84	23.31
Imezathapyr + Pendimethilin	W_4	22.36	38.99	44.64	2.45	6.86	10.77	8.28	10.13	18.41
Imezathapyr	W_5	22.37	38.93	44.61	2.31	6.85	10.81	11.05	13.33	24.37
Weed Free	W_6	23.31	40.17	45.63	2.49	7.25	11.13	15.78	18.94	34.73
SE (m)±		**0.15**	**0.20**	**0.15**	**0.01**	**0.04**	**0.03**	**0.68**	**1.01**	**1.64**
CD (P=0.05)		**0.43**	**0.57**	**0.42**	**0.04**	**0.13**	**0.07**	**1.92**	**2.84**	**4.61**
Interaction (S*W)		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

The pooled data indicated that at 25 DAS, the maximum plant height (23.31 cm) was recorded under weed free condition weed free (W_6), followed by Aceloflorfen + Clodinafop (W_2) which were at par with each other. The minimum plant height (21.32 cm) was noted with control plot (W_1). At 50 DAS and harvest stages, the weed free (W_6) attained the significantly higher plant height (40.17 and 45.63 cm) over all other treatments except Aceloflorfen + Clodinafop (W_2). The lower values (38.01 and 43.61 cm) were recorded with the control (W_1) treatment during the 50 DAS and harvest stages. The increased plant height might be as a result of increased diminution of existing weeds, reduced crop weed competition there by increased availability of growth promoting conditions viz. sufficient space, light, nutrients and moisture necessary for plant growth. These findings are in close agreement with those of many others[1,5,9].

Dry matter Production

The DMP ranged from 2.25 to 2.49 g /plant in different treatments. Whereas, it was ranged from 9.85 to 11.13 g/plant at harvest stage. Among the land configurations, ridge furrow and raised bed furrow sowing encouraged this parameter upto equal extent and proved significantly superior to flat bed sowing (S_1). This trend was noticed at every stage. At harvest stage, ridge furrow sowing (S_2) and raised bed furrow sowing (S_4) recorded equally higher DMP (10.80 to 10,83 g/plant), whereas significantly lowest DMP (10.60 g/plant) was noted from S_1. The treatment ridge furrow sowing (S_2) and broad bed furrow sowing (S_3) proved equally effective in raising this parameter. The significant enhancement of DMP/plant under ridge furrow sowing (S_2) and raised bed furrow sowing (S_4) land configuration treatments may be ascribed to sufficient availability of soil moisture essential for the activity growing plants through increased production and accumulation of photosynthates in the vegetative parts of the plants. The results are in consonance with the findings of many investigators of [4,7,10].

In case of weed management treatments, all the treatments proved significantly superior to control (W_1). Weed free (W_6) produced the maximum dry matter at every stage. This was closely followed by Aceloflorfen + Clodinafop (W_2). At harvest stage, weed free treatment recorded maximum DMP (11.13 g/plant) closely followed by Aceloflorfen + Clodinafop (11.09g/plant), Imezathapyr + Imezamox (10.85) g/plant) and Imezathapyr (10.81 g/plant), whereas the lowest value (9.85 g/plant) was noted from control. The increased DMP/plant under Aceloflorfen + Clodinafop (W_2) and weed free (W_6) treatments might be as a result of drastic reduction of existing weeds, reduced weed competition thereby increased availability of growth promoting conditions for the activity growing plants, consequently increased production and accumulation of photosynthates in vegetative parts of the plants[3,5].

Productivity Parameters

In the present investigation the best land configuration method was raised bed furrow (S_4) which recorded significantly higher seed up to 13.04 q/ha as compared to the remaining land configurations except ridge furrow sowing (S_2) yielding 12,14 q/ha(Table 1). The broad bed furrow sowing (S_3) produced 11.40 q/ha seed. The significantly lowest seed yield (8.62 q/ha) was secured from flat bed sowing (S_1). The yield of any crop depends on its capacity to accumulate photosynthates per unit area and its ability to remobilize the photosynthates towards the sink. In this respect ridge furrow sowing (S_2) and raised bed furrow sowing (S_4) took a lead over S_1 and S_3 land configuration treatments. The present results are in conformity with those of several workers[4,7].

The weed free condition recorded significantly higher seed yield (15.78 q/ha) as compared to the remaining treatments except Aceloflorfen + Clodinafop (W_2) which

produced 15.36 q/ha seed. Thus, W_2 proved the best substitute of W_6 comprising tedious, time consuming and costly manual practice to keep weed free condition. In, the other herbicidal combinations, as in case of W_3, W_4 and W_5, their effect was not up to that extent, where the seed yields were in the lower range (8.82 to 11.05 q/ha). The significantly lowest seed yield was obtained from the control (W_1) treatment. The performance of weed management treatments on seed yield was exactly in accordance with the yield attributing characters responsible for yield contribution. The best performance of dual herbicides as in W_2 on soybean yield has also been reported in the past[11,12,13].

The treatment pertaining to land configurations, indicated that the S_2, S_3 and S_4 resulted in equally highest straw yield (13.96 to 15.62 q/ha) and proved significantly superior to S_1 (flat bed sowing) where the straw yield being only 10.22 q/ha. This was due to maximum increase in the vegetative growth under S_2, S_3 and S_4 treatments over S_1 as a result of increased plant growth factors particularly enhanced soil moisture. The weed free treatment resulted in significantly higher straw yield (18.94 q/ha) over rest of the treatments except Aceloflorfen + Clodinafop (W_2) where the straw yield was equal (18.31 q/ha).Therefore the straw yield was lowered down significantly under W_3, W_4 and W_5 treatments (10.13 to 13.33 q/ha). The significantly lowest straw yield (8.53 q/ha) was noted from the control (W_1) treatment. The maximum increase in straw yield under W_2 and W_6 treatments was as a result of maximum control of weeds, reduced crop weed competition to ensure maximum vegetative growth of plants.

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