

Original Research Article

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Effect of Different land Configurations and Sowing Techniques on Yield, Yield Attributes, Quality and Economics of Soybean

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ABSTRACT

Keywords

Soybean, Land configuration, Sowing technique, Yield attributes, Economics

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A field experiment entitled “Standardization of optimum seed rate and yield maximization in soybean under different land configurations and sowing techniques” was undertaken during *kharif*, 2018 at Post Graduate Instructional Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (Maharashtra). The experiment consists of eight treatments involving Preparation of ridges and furrows at 45cm distance and sowing at one side (45cm x 10cm), Preparation of ridges and furrows at 45cm distance and sowing at both side (22.5cm x 10cm), Preparation of ridges and furrows at 60cm distance and sowing at one side (60cm x 10cm), Preparation of ridges and furrows at 60cm distance and sowing at both side (30cm x 10cm), Preparation of ridges and furrows at 90cm distance and sowing at both side (45cm x 10cm), Preparation of BBF [90 cm top and 120cm base] and sowing at 22.5 cm distance (22.5cm x 10cm). Preparation of BBF [90 cm top and 120 cm base] and sowing at 30 cm distance (30cm x 10cm), Flat bed (45cm x 10 cm). The experiment was laid out in randomized block design with three replications. The result revealed that the yield contributing characters recorded at harvest *viz.* number of pod plant⁻¹ (56), pod weight plant⁻¹ (16.80 g). Weight of seeds pod⁻¹ (15.36 g), 100 grain (12 g) weight was obtained highest on 60 cm ridges and furrows sowing at one side (60 cm x 10cm) with seed rate 28.1 kg ha⁻¹. Significantly the highest grain yield (30.60 q ha⁻¹), straw yield (38.86 q ha⁻¹) were recorded on 60 cm ridges and furrows sowing at two side (30 cm x 10cm) with seed rate 51.4 kg ha⁻¹. The quality parameter, protein content (40.23) was recorded highest on 60 cm ridges and furrows sowing at one side (60 cm x 10cm) with seed rate 28.1 kg ha⁻¹. The protein content was significantly influenced by different land configuration and sowing techniques and recorded highest on 60 cm ridges and furrows sowing at one side (60 cm x 10cm) with seed rate 28.1 kg ha⁻¹. The highest gross returns (Rs.117154 ha⁻¹) and net monetary returns (Rs. 65806 ha⁻¹) were recorded on 60 cm ridges and furrows sowing at two side (30 cm x 10cm) with seed rate 51.4 kg ha⁻¹. The similar trend was observed in case of benefit: cost ratio. The highest benefit: cost ratio (2.27) recorded with 60 cm ridges and furrows sowing at two side (30 cm x 10cm) with seed rate 51.4 kg ha⁻¹.

Introduction

Soybean [*Glycine max* (L) Merrill] is an important legume crop belonging to the

family Leguminosae, sub family Papilionaceae and genus *Glycine*. Soybean is diploid species having chromosomes number 2n=40. The origin of soybean is china. It is

annual leguminous herbaceous plant.

Soybean is cheapest and richest source of protein (38 to 42 %) except methionine and cysteine and about 20% oil. It has established its recognition as both pulses and oilseed crop. It supplies most of the nutritional constituents essential for human health. Soybean protein contains all the essential amino acids vital for human diet. Soybean contains less starch and thus good for diabetic patients. Its oil is used as cooking medium and also soybean oil is used for preparation of vanaspati ghee. It is also used in industries for preparation of antibiotics. The protein of meat, fish, eggs and pulses are acid producing while that of soybean are alkalizing in their effects which makes it a desirable constituent of human diet. Soybean is generally processed for its oil, protein and lecithin as a whole bean or particularly/fully defatted cake meal. Soya flour can also be used in making baked products (Chapatis, biscuits, buns and cakes). Moreover, it is widely used in oil production in India out of the total soybean produced about 85 per cent is utilized for oil extraction, 10 per cent for seed and 5 per cent for food purpose.

In India, soybean is grown on an average of 10.96 M ha area with production of 13.46 million metric tonnes having 1228 kg ha⁻¹ average productivity and 1120 kg ha⁻¹ average yield [2018-19]. In state wise contribution Madhya Pradesh contributes 59.17 percent that is 6.73 million metric tonnes from 5.24 M ha followed by Maharashtra 38.35 percent that is 4.39 million metric tonnes from 3.93 M ha then Rajasthan 9.44 percent that is 1.16 million metric tonnes from 0.93 M ha [Anonymous 2018-19].

In Maharashtra estimate of soybean production 38.35 percent i.e. 4.39 million metric tonnes from 3.93 M ha with productivity 925 kg ha⁻¹ [Anonymous, 2018-

19].

Land configuration decides the effectiveness of the crop management practices regarding application of nutrient, irrigation, weed management, etc. Major land configuration practices includes raised bed preparation, ridges and furrows, broad bed furrows, etc. The general farmer's practice sowing over flat bed without any proper land configuration, leading to less significant growth and development of crops and in turn lesser yields (Deshmukh *et al.*, 2016). Therefore, it is necessary to know about the suitable land configuration for proper growth and development of crops especially cereals.

Materials and Methods

A field experiment entitled "Standardization of optimum seed rate and yield maximization in soybean under different land configurations and sowing techniques" was undertaken during *kharif*, 2018 at Post Graduate Instructional Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (Maharashtra). The experiment consists of eight treatments involving Preparation of ridges and furrows at 45cm distance and sowing at one side (45cm x 10cm), Preparation of ridges and furrows at 45cm distance and sowing at both side (22.5cm x 10cm), Preparation of ridges and furrows at 60cm distance and sowing at one side (60cm x 10cm), Preparation of ridges and furrows at 60cm distance and sowing at both side (30cm x 10cm), Preparation of ridges and furrows at 90cm distance and sowing at both side (45cm x 10cm), Preparation of BBF [90cm top and 120cm base] and sowing at 22.5 cm distance(22.5cm x 10cm). Preparation of BBF [90 cm top and 120 cm base] and sowing at 30 cm distance (30cm x10cm), Flat bed (45cm x 10 cm). The experiment was laid out in randomized block design with three replications. The soil was loamy in texture,

low in available nitrogen (197.5 kg ha⁻¹), medium in available phosphorous (18.4 kg ha⁻¹) and very high in potassium (480 kg ha⁻¹). The soil was moderately alkaline in reaction (pH 8.26).

Results and Discussion

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads.

Yield and yield contributing characters

Data in table 1 reveals that the yield contributing characters recorded at harvest viz. number of pod plant⁻¹ (56), pod weight plant⁻¹(16.80 g), weight of seeds pod⁻¹(15.36 g), 100 grain (12 g) weight were obtained

highest on 60 cm ridges and furrows sowing at one side (60 cm x 10cm) with seed rate 28.1 kg ha⁻¹. Ridges and furrow planting favours optimum availability of soil moisture with uniform flow of water. Also the loose and porous soil under ridges and furrow was found to provide better aeration, microbial activity and drainage which give increased yield contributing characters reported by Jadhav *et al.*, (2011) and Lakpale and Tripathi (2012).

Data in table 2 reveals that Significantly the highest grain yield (30.60 q ha⁻¹), straw yield (38.86 q ha⁻¹) were recorded on 60 cm ridges and furrows sowing at two side (30 cm x 10cm) with seed rate 51.4 kg ha⁻¹. Similar results were also reported by Rajput *et al.*, (1999) and Abbas *et al.*, (1994)

Table.1 Yield contributing characters of soybean influenced by different treatment

Treatment	No. of pods plant ⁻¹	Pods weight plant ⁻¹ (g)	Weight of seeds plant ⁻¹ (g)	100 grain weight(g)
T ₁ -Preparation of ridges and furrows at 45cm distance and sowing at one side (45 cm x 10cm).	51.00	15.30	13.46	11.51
T ₂ -Preparation of ridges and furrows at 45cm distance and sowing at both side (22.5cm x 10cm).	34.00	10.20	6.74	9.92
T ₃ -Preparation of ridges and furrows at 60cm distance and sowing at one side (60cm x 10cm).	56.00	16.80	15.36	12.00
T ₄ -Preparation of ridges and furrows at 60cm distance and sowing at both side (30cm x 10cm).	40.00	12.00	9.82	10.67
T ₅ -Preparation of ridges and furrows at 90cm distance and sowing at both side (45cm x 10cm).	53.00	16.57	13.50	11.53
T ₆ -Preparation of BBF [90 cm top and 120cm base] and sowing at 22.5 cm distance (22.5cm x 10cm).	33.60	10.08	6.65	9.90
T ₇ -Preparation of BBF[90 cm top and 120 cm base]and sowing at 30 cm distance (30cm x10cm).	39.20	11.76	9.50	10.59
T ₈ -Flat bed(45cm x10 cm)	49.00	14.70	11.00	10.20
S.E. m (±)	1.01	0.44	0.26	0.49
C.D at 5%	3.07	1.36	0.81	NS
General Mean	44.48	13.43	10.75	10.79

Table.2 Effect of different land configurations and sowing techniques on yield and economics of soybean

Treatment	Grain yield (q ha ⁻¹)	Straw yield (q ha ⁻¹)	Net monetary returns (ha ⁻¹)	B:C ratio
T1-Preparation of ridges and furrows at 45cm distance and sowing at one side (45 cm x 10cm).	28.50	36.48	60499	2.24
T2-Preparation of ridges and furrows at 45cm distance and sowing at both side (22.5cm x 10cm).	28.30	36.79	57248	2.12
T3-Preparation of ridges and furrows at 60cm distance and sowing at one side (60cm x 10cm).	24.43	31.27	48174	2.06
T4-Preparation of ridges and furrows at 60cm distance and sowing at both side (30cm x 10cm).	30.60	38.86	65806	2.27
T5-Preparation of ridges and furrows at 90cm distance and sowing at both side (45cm x 10cm).	28.70	36.45	60993	2.24
T6-Preparation of BBF [90 cm top and 120cm base] and sowing at 22.5 cm distance (22.5cm x 10cm).	27.93	36.03	56034	2.10
T7-Preparation of BBF[90 cm top and 120 cm base]and sowing at 30 cm distance (30cm x10cm).	29.64	38.53	63077	2.25
T8-Flat bed(45cm x10 cm)	23.12	29.36	43431	1.96
S.E. m (±)	0.31	0.40	1223.32	
C.D at 5%	0.96	1.24	3710.57	
General Mean	27.65	35.47	56883	2.15

Table.3 Protein content in soybean as influenced by different treatment

Treatment	Protein (%)
T ₁ -Preparation of ridges and furrows at 45cm distance and sowing at one side (45 cm x 10cm).	40.07
T ₂ -Preparation of ridges and furrows at 45cm distance and sowing at both side (22.5cm x 10cm).	39.80
T ₃ -Preparation of ridges and furrows at 60cm distance and sowing at one side (60cm x 10cm).	40.23
T ₄ -Preparation of ridges and furrows at 60cm distance and sowing at both side (30cm x 10cm).	39.57
T ₅ -Preparation of ridges and furrows at 90cm distance and sowing at both side (45cm x 10cm).	40.10
T ₆ -Preparation of BBF [90 cm top and 120cm base] and sowing at 22.5 cm distance (22.5cm x 10cm).	39.60
T ₇ -Preparation of BBF[90 cm top and 120 cm base]and sowing at 30 cm distance (30cm x10cm).	39.87
T ₈ -Flat bed(45cm x10 cm)	39.23
S.E. m (±)	0.27
C.D at 5%	NS
General Mean	39.81

Quality parameters

Protein content

The data in respect of protein content of soybean are presented in table 3. The mean protein content in grain was 39.81 per cent. Numerically maximum protein content was recorded 40.23(%) by treatment preparation of ridges and furrows at 60 cm distance sowing at one side (60cm x 10cm). which is followed by preparation of ridges and furrows at 90cm distance sowing at both side (45cm x 10cm) i.e. 40.10(%). Whereas numerically minimum protein content was recorded by flat bed treatment 39.23(%). The protein content in grain was statistically non significant due to different land configurations and sowing techniques.

Economics

Data in table 2 reveals that the highest gross returns (Rs. 117154 ha⁻¹) and net monetary returns (Rs. 65806 ha⁻¹) were recorded on 60 cm ridges and furrows sowing at two side (30 cm x 10cm) with seed rate 51.4 kg ha⁻¹. The similar trend was observed in case of benefit: cost ratio. The highest benefit: cost ratio (2.27) recorded with 60 cm ridges and furrows sowing at two side (30 cm x 10cm) with seed rate 51.4 kg ha⁻¹. Similar results obtained by Hariram *et al.*, (2011), Dhakad *et al.*, (2014) and Prajapati *et al.*, (2018).

In conclusion the yield contributing characters recorded at harvest viz. number of pod plant⁻¹ (56), pod weight plant⁻¹ (16.80 g). Weight of seeds pod⁻¹ (15.36 g), 100 grain (12 g) weight was obtained highest on 60 cm ridges and furrows sowing at one side (60 cm x 10cm) with seed rate 28.1 kg ha⁻¹. Significantly the highest grain yield (30.60 q ha⁻¹), straw yield (38.86 q ha⁻¹) were recorded on 60 cm ridges and furrows sowing at two side (30 cm x 10cm) with seed rate 51.4 kg ha⁻¹. Sowing of

soybean on 60cm ridges and furrows at one side (60cm x10cm) with seed rate 28.1 kg ha⁻¹ increases protein content. The highest gross returns (Rs.117154 ha⁻¹) and net monetary returns (Rs. 65806 ha⁻¹) were recorded on 60 cm ridges and furrows sowing at two side (30 cm x 10cm) with seed rate 51.4 kg ha⁻¹. The similar trend was observed in case of benefit: cost ratio. The highest benefit: cost ratio (2.27) recorded with 60 cm ridges and furrows sowing at two side (30 cm x 10cm) with seed rate 51.4 kg ha⁻¹.

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