The Pharma Innovation Journal 2021; 10(12): 404-408

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(12): 404-408

www.thepharmajournal.com
Received: 02-10-2021
Accepted: 06-11-2021

Poonam Gunjal
Agronomy Section, R.C.S.M. College of Agriculture, Kolhapur, Maharashtra, India

Shivaji Suryavanshi
Agronomy Section, Dr. D.Y. Patil College of Agriculture, Talsande, Kolhapur, Maharashtra, India

Sudarshan Shende
Ph.D., Scholar, Department of Agronomy, M.P.K.V., Rahuri, A. Nagar, Maharashtra, India

Vikas Patil
Agronomy Section, R.C.S.M. College of Agriculture, Kolhapur, Maharashtra, India

Corresponding Author:
Poonam Gunjal
Agronomy Section, R.C.S.M. College of Agriculture, Kolhapur, Maharashtra, India

Effect of land configuration methods and sulphur levels on growth attributing characters during different growth stages of soybean (*Glycine max* L. Merrill)

Poonam Gunjal, Shivaji Suryavanshi, Sudarshan Shende and Vikas Patil

Abstract
A field experiment entitled, "Effect of land configuration methods and sulphur levels on growth and yield of soybean (*Glycine max* L. Merrill)" was conducted during *kharif*, 2019 at Post Graduate Research Farm, Agronomy Section, RCSM College of Agriculture, Kolhapur. The objectives of experiment is to find out the suitable soybean land configuration methods for Western Maharashtra region and optimum sulphur level for soybean with its economics. The plant population at the initial stages and at harvest did not differ significantly due to different sulphur levels under growth study. The growth attributing characters i.e plant height, plant spread, number of branches and leaf area plant^{-1} observed during different growth stages *viz.*, 30, 45, 60, 75 DAS and at harvest were maximum with the application of were maximum and influenced significantly with the application of 30 Kg S ha^{-1}, however but comparable with the application of sulphur @ 20 Kg ha^{-1}.

Keywords: Soybean, sulphur, plant height, plant spread, number of branches, leaf area

1. Introduction
Soybean (*Glycine max* L. Merrill) is known as Chinese pea and Manchurian bean belong to family Leguminosae, subfamily Papilionaceae and genus Glycine. Soybean is an important oilseed crop in the world & gaining importance in India and is considered as golden bean. Soybean plays major role in the global oilseed economy having 59% share of total oilseed production. It is equally important for India, contributing to around 35% of our oilseed production. India rank fifth in area and production of soybean after USA, Brazil, Argentina and China (SOPA,2019) [13]. In India, soybean is predominantly grown as a rainfed crop covering the states of Madhya Pradesh, Maharashtra and Rajasthan; on vertisols and associated soils. Madhya Pradesh, Maharashtra and Rajasthan together contribute to about 92-93% of area and production of soybean in India. (Anonymous, 2017) [3].
Soybean has spread to different countries in the world and became an established component of world agriculture. Soybean has not only gained a vital importance in Indian Agriculture, but also plays a decisive role in oil economy of India. Soybean crop is rich source of quality protein (40-42%), oil (18-20%) and other nutrients *viz*. calcium, magnesium and iron and glycine. It is a good source of isoflavones and therefore, it helps in preventing heart diseases, cancer and HIVs. Soybean is also rich in unsaturated fatty acids and low in saturated fatty acids. Soybean isoflavones have beneficial effects on human health due to these antiatherosclerosis, antioxidative, antitumoral and antiestrogenic activities (Davis *et al*., 1999) [7]. Trypsin inhibitor also present in soybean and main function is to act as a defense mechanism. Trypsin inhibitor can also be essential for biological processes within the plant.
Soybean being the richest, cheapest and easiest source of quality proteins, fats and a vast multiplicity of used has gained the pivotal role in industries, therefore called as a wonder crop. (Balasubramaniyan & Palaniappan, 2012) [4]. Soybean having a very good nutritive value is capable of fixing atmospheric nitrogen at the rate of 65-115 kg ha^{-1} year^{-1} (Alexander, 1977) [2] with symbiosis of Rhizobium japonicum microorganism. It builds up the soil fertility and productivity by fixing large amount of nitrogen through the root nodules.

2. Material and Methods
The field experiment was laid out during kharif, 2019 in Survey No. 4A at the Post Graduate Research Farm, Agronomy Section, RCSM College of Agriculture, Kolhapur. the soil of the experimental plot was clayey in texture, slightly alkaline in reaction (pH 7.70), having

electrical conductivity 0.30 dS m^{-1} and organic carbon content was very low (0.18%), low in available nitrogen (207.10 kg ha^{-1}) medium in available phosphorus (28.80 kg ha^{-1}) and high in available potassium (287.10 kg ha^{-1}) and deficient in available sulphur (16.84 kg ha^{-1}). The treatments comprising of sixteen treatment combinations of four Land Configuration [I_1: Flat Bed, I_2: Broad Bed Furrow, I_3: Ridge and Furrow (2 ft), I_4: Ridge and Furrow (3 ft)] and four sulphur levels (S_1- 00 kg S ha^{-1}, S_2- 10 kg S ha^{-1}, S_3- 20 kg S ha^{-1}, S_4- 40 kg S ha^{-1}) and these treatments were replicated three times in Split Plot Design. Application of organic manure through farmyard manure was done well before 15 days of dibbling. The Phule Sangam (KDS-726) variety was used for sowing. The soybean crop was fertilized with 25 kg N and 50 kg P_2O_5 ha^{-1}. The application of N through urea, P_2O_5 through Diammonium phosphate, K_2O through Muriate of Potash and S through Gypsum was done as per the treatments. The plant samples were analyzed to estimate the NPKS content in the plant for estimation of total uptake. The soil samples were analyzed to estimate the NPKS content in soil. The available N by Alkaline KMnO4 method (Subbiah and Asija, 1956), P determination by Olsen method (Olsen, 1954) [10] and K content by flame photometer method (Jackson, 1973) [8] in kg ha^{-1} by adopting the standard procedures. The data obtained from various characters under study were analyzed by the method of analysis of variance as described by Panse, V.G. and Sukhamate, P.V. 1967. Fertilizers were applied uniformly at the rate of 25 kg N and 50 kg P_2O_5 ha^{-1} and K_2O- as per treatments.

3. Result and Discussion

3.1 Effect on plant height

The data on plant height recorded during various growth stages are presented in Table 1. Plant height was increased during every growth stages of soybean till maturity. The mean plant height was increased progressively with an advancement of crop age and reached maximum at harvest. The rate of increase in height was rapid up to 75 days. The mean plant height $plant^{-1}$ recorded at 30, 45, 60, 75 DAS and at harvest was 28.71, 45.84, 52.71, 6.53 and 63.27 cm respectively.

3.1.1 Effect of Land configurations

The treatment 3 ft ridge and furrow recorded the highest plant height at all days of observations and it was comparable with the treatment broad bed furrow at all growth stages. However it was found significantly superior over other land configurations *viz*., 2 ft ridge and furrow & flat bed. Similar result reported by Basendiya *et al.*, (2018) [5] and Dhale (2017) as regards to the height of plant.

3.1.2 Effect of Sulphur Levels

Among the sulphur levels the application of 30 kg S ha^{-1} recorded the highest plant height during all growth stages and it was significantly superior over rest of the treatments during all growth stages, however on par with treatment 20 kg S ha^{-1}. The increase in plant height as observed in the experiment may be due to the favorable effects of sulphur – metabolism and consequently on the vegetative growth of soybean plant (Akter *et al.*, 2013) [1]. Similar findings were also reported by Sarker (2002) [12] on mustard, Umbarkar *et al.*, (2010) on rainfed soybean.

3.1.3 Effect of Interaction

Effect of interaction different land configurations and sulphur levels were non-significant in respect of mean plant height of soybean during all the crop growth stages.

3.2 Effect on plant spread

The data on mean plant spreads $plant^{-1}$ was recorded at various crop growth stages are presented in Table 2. The plant spreads was found to be increased during every crop growth stage till maturity. The increase in plant spread was till maturity. The plant spreads recorded at 30, 45, 60, 75 DAS and at harvest was 19.73, 20.56, 34.68, 45.52 and 41.29 cm respectively.

3.2.1 Effect of Land configurations

The treatment 3 ft ridge and furrow recorded the highest plant height at all days of observations and it was comparable with the treatment broad bed furrow at all growth stages. Mean plant spreads was influenced significantly during various crop growth stages due to different effect of potassium levels. The 3 ft ridge and furrow and BBF while BBF and 2 ft ridge and furrow were found statistically at par with each other at all growth stages.

3.2.2 Effect of Sulphur Levels

The maximum plant spreads was recorded due to application of 30 kg S ha^{-1}, which was significantly superior over rest of treatments during all growth stages, however comparable with treatment 20 kg S ha^{-1} and 10 kg S ha^{-1} at all growth stages.

3.2.3 Effect of Interaction

Effect of interaction different land configurations and sulphur levels were non-significant in respect of mean plant spreads of soybean during all growth stages.

3.3 Effect on number of branches $plant^{-1}$

The data on mean number of branches $plant^{-1}$ are recorded and presented in Table 3. The mean number of branches $plant^{-1}$ recorded at 30, 45, 60, 75 DAS and at harvest was 1.63, 3.41, 5.03, 5.51 and 5.53 respectively.

3.3.1 Effect of Land configurations

The number of branches differed significantly due to effect of land configuration at all the stages of crop growth. The land configuration 3 ft ridge and furrow produced maximum number of branches at all the stages of crop growth and found significantly higher than the land configuration 2 ft ridge and furrow & flat bed at all the days of observations, however this treatment is on par with the land configuration broad bed furrow. Nangare (2015) [9] found that mean number of branches significantly increased in ridges and furrow over other layouts under study.

3.3.2 Effect of Sulphur Levels

The application of 30 kg S ha^{-1} recorded maximum number of branches $plant^{-1}$ during all growth stages and it was significantly superior over rest of the treatments during all growth stages, however on par with treatment 20 kg S ha^{-1}. Similar results were recorded by Chowhan (1996) [6]. He reported the successive increase in number of branches with increase in Sulphur level from 0 to 50 kg S ha^{-1}.

3.3.3 Effect of Interaction
Effect of interaction different land configurations and sulphur levels were non-significant in respect of mean number of branches plant^{-1} of soybean during all the crop growth stages.

3.4 Leaf Area Plant^{-1} (dm^2)
The data on mean dry matter accumulation plant^{-1} during various growth stages are presented in Table 4. The mean leaf area of plant^{-1} recorded at 30, 45, 60, 75 DAS and at harvest was 32.73, 93.43, 126.96 and 145.12 dm^2 respectively.

3.4.1 Effect of Land configurations
The mean leaf area plant-1 influenced significantly due to different land configurations at all the stages of crop growth. The land configuration 3 ft ridge and furrow produced maximum leaf area plant-1 at all the stages of crop growth and found significantly superior over land configuration 2 ft ridge and furrow & flatbed but at par with the land configuration broad bed furrow at all the days of observations.

3.4.2 Effect of Sulphur Levels
Application of 30 kg S ha^{-1} recorded significantly the highest mean leaf area plant^{-1} at all growth stages, however on par with the application of 20 kg S ha^{-1} at all growth stages. Mean leaf area plant^{-1} increased with increasing levels of sulphur up to maximum level of sulphur application.

3.4.3 Effect of Interaction
The interaction effects among the land configuration and sulphur levels under study were non-significant in respect of mean leaf area plant-1 of soybean during all the crop growth stages.

Table 1: Mean plant height of soybean as influenced periodically by different treatments

Treatments	Mean plant height (cm)				
	30 DAS	**45 DAS**	**60 DAS**	**75 DAS**	**At harvest**
Main Plot: Land configurations					
I_1- Flat Bed	25.73	39.81	48.22	55.72	58.73
I_2- Broad Bed Furrow	30.19	48.19	54.05	64.30	64.84
I_3- Ridge and Furrow (2 ft)	28.40	44.50	51.50	56.97	60.79
I_4- Ridge and Furrow (3 ft)	30.52	50.87	57.04	65.15	68.70
S. Em±	0.80	1.19	1.22	1.23	1.55
C. D. at 5%	2.78	4.13	3.56	3.59	5.37
C. V.%	9.68	9.01	9.72	9.18	8.49
Sub Plot: Sulphur levels					
S_1 - 00 Kg S ha^{-1}	26.66	42.31	49.12	57.03	60.24
S_2 - 10 Kg S ha^{-1}	28.72	45.65	51.64	58.69	61.25
S_3 - 20 Kg S ha^{-1}	29.65	47.32	53.47	62.37	64.61
S_4 - 30 Kg S ha^{-1}	29.81	48.08	56.60	64.04	66.96
S. Em±	0.71	0.94	1.48	1.23	1.13
C. D. at 5%	2.07	2.75	5.12	5.55	3.29
C. V.%	8.58	7.13	8.01	7.03	6.17
Interaction: I × S					
S. Em±	1.42	1.89	2.44	2.46	2.26
C. D. at 5%	NS	NS	NS	NS	NS
General mean	28.71	45.84	52.71	60.53	63.27

Table 2: Mean plant spread of soybean as influenced periodically by different treatments

Treatments	plant spread (cm)				
	30 DAS	**45 DAS**	**60 DAS**	**75 DAS**	**At harvest**
Main Plot: Land configurations					
I_1- Flat Bed	18.89	18.34	32.50	43.09	39.10
I_2- Broad Bed Furrow	20.38	21.05	35.30	46.30	41.88
I_3- Ridge and Furrow (2 ft)	19.02	20.12	34.54	45.21	40.65
I_4- Ridge and Furrow (3 ft)	20.63	22.72	36.39	47.47	43.55
S. Em±	0.35	0.56	0.72	0.83	0.85
C. D. at 5%	1.22	1.94	2.51	2.87	2.94
C. V.%	6.20	9.45	7.24	6.30	7.12
Sub Plot: Sulphur levels					
S_1 - 00 Kg S ha^{-1}	19.03	19.41	33.00	42.91	39.68
S_2 - 10 Kg S ha^{-1}	19.41	20.44	34.44	45.44	40.80
S_3 - 20 Kg S ha^{-1}	19.81	20.67	34.58	45.67	41.77
S_4 - 30 Kg S ha^{-1}	20.67	21.71	36.71	48.05	42.92
S. Em±	0.37	0.54	0.72	1.01	0.78
C. D. at 5%	1.08	1.58	2.51	2.96	2.27
C. V.%	6.51	9.11	8.71	7.71	6.51
Interaction: I × S					
S. Em±	0.74	1.08	1.64	2.02	1.55
C. D. at 5%	NS	NS	NS	NS	NS
General mean	19.73	20.56	34.68	45.52	41.29

Table 3: Mean number of branches plant^{-1} of soybean as influenced periodically by different treatments

Treatments	Number of Branches				
	30 DAS	45 DAS	60 DAS	75 DAS	At harvest
Main Plot: Land configurations					
I_1- Flat Bed	1.46	3.20	4.53	5.03	5.00
I_2- Broad Bed Furrow	1.73	3.53	5.16	5.66	5.66
I_3- Ridge and Furrow (2 ft)	1.51	3.30	4.92	5.42	5.42
I_4- Ridge and Furrow (3 ft)	1.81	3.60	5.50	6.00	5.98
S. Em±	0.04	0.08	0.13	0.13	0.14
C. D. at 5%	0.12	0.29	0.44	0.47	0.44
C. V.%	9.41	8.43	8.83	8.54	8.03
Sub Plot: Sulphur levels					
S_1 - 00 Kg S ha^{-1}	1.52	3.22	4.77	5.27	5.24
S_2 - 10 Kg S ha^{-1}	1.63	3.30	4.82	5.32	5.31
S_3 - 20 Kg S ha^{-1}	1.68	3.44	5.20	5.70	5.70
S_4 - 30 Kg S ha^{-1}	1.69	3.64	5.32	5.82	5.80
S. Em±	0.04	0.08	0.12	0.12	0.11
C. D. at 5%	0.12	0.24	0.35	0.35	0.33
C. V.%	8.96	8.31	8.20	7.46	7.08
Interaction: I × S					
S. Em±	0.08	0.16	0.24	0.24	0.23
C. D. at 5%	NS	NS	NS	NS	NS
General mean	1.63	3.41	5.03	5.53	5.51

Table 4: Leaf Area plant^{-1} of soybean as influenced periodically by different treatments

Treatments	Leaf Area (dm^2)			
	30 DAS	45 DAS	60 DAS	75 DAS
Main Plot: Land configurations				
I_1- Flat Bed	26.98	79.65	102.52	129.55
I_2- Broad Bed Furrow	37.48	101.89	146.83	155.46
I_3- Ridge and Furrow (2 ft)	28.24	86.64	111.17	136.94
I_4- Ridge and Furrow (3 ft)	38.21	105.55	148.32	158.55
S. Em±	0.87	2.31	2.92	3.84
C. D. at 5%	3.01	8.00	10.11	13.30
C. V.%	9.21	8.57	7.97	9.17
Sub Plot: Sulphur levels				
S_1 - 00 Kg S ha^{-1}	28.51	89.67	111.16	138.15
S_2 - 10 Kg S ha^{-1}	32.18	91.79	117.00	140.90
S_3 - 20 Kg S ha^{-1}	34.20	94.91	135.06	147.72
S_4 - 30 Kg S ha^{-1}	36.02	97.36	144.63	153.73
S. Em±	0.80	1.86	3.59	4.00
C. D. at 5%	2.35	5.44	10.47	9.38
C. V.%	8.54	6.91	9.79	9.55
Interaction: I × S				
S. Em±	1.61	3.72	7.17	7.99
C. D. at 5%	NS	NS	NS	NS
General mean	32.73	93.43	126.96	145.12

4. Conclusions

Among the land configuration methods 3 feet ridge and furrow is suitable for western Maharashtra region. Among the sulphur levels application of 20 kg S ha^{-1} recorded the higher growth attributes during different growth stages of summer soybean.

5. Acknowledgments

The authors are thankful to Agronomy Section, RCSM College of Agriculture, Kolhapur– 416004, Maharashtra, India for providing necessary facilities to undertake the field experiment.

6. References

1. Akter F, Islam NM, Shamsuddoha ATM, Bhuiyan MSI, Shelpi S. Effect of phosphorus and sulphur on growth and yield of soybean (*Glycine max* L.). International Journal of Bioresource and Stress Management 2013;4:555- 560.
2. Alexander M. Pulse crop, Oxford and IBH Publishing Co. Pvt. Ltd. 1977, 55.
3. Anonymous. Report on sowing position of soyabean in India. ICAR- Indian Institute of Soybean Research, Indore 2017.
4. Balasubramaniyan P, Palaniappan SP. Principles and Practices of Agronomy 2012.
5. Basendiya AL, Mishra S, Gupta R, Kumar P, Basediya SS. Performance of Ridge and Furrow system on the Growth and Yield Attribution of soybean in Barwari District of M. P. in India. International Journal of Currrent Microbiology and Applied Sciences 2018;7(8):499-505.
6. Chowhan DR, Paroda S, Ram M. Response of Indian mustard (*Brassica juncea*) to biofertilizers, S and N fertilizer. Indian Journal of Agronomy 1996;41(4):620-630.

7. Davis SR, Palais FS, Simpson ER, Murkies AL. I photo estrogens in health and disease. Recent Progress Hormone Res 1999;54:185-210.
8. Jackson ML. Soil Chemical Analysis. Prentice Hall of India Pvt. Ltd., New Delhi 1973, 256-260.
9. Nangare MV. Performance of soybean varieties under different layouts. *M.Sc. (Agri) Thesis*, Mahatma Phule Krishi Vidyapeeth, Rahuri (M.H.), India 2015.
10. Olsen SR, Cole CW, Wathode FS, Peun LA. Estimation of available phosphorus in soil by extraction with Co3. U.S.D.A. Cir. 1954, 939.
11. Panse VG, Sukhamate PV. Statistical methods for agricultural workers ICAR, New Delhi 1967 361.
12. Sarkar MAR, Sarker AV, Das PK, Chowdhury AKMSH. Effect of sulphur fertilization on the yield components of mustard varieties. Bangladesh Journal of Agriculture Science 2002;20(2):351-358.
13. SOPA Soybean Processors Association of India 2019.