International Journal of Tropical Agriculture
Volume 41, Numbers (1-2) • 2023 : pp. 153-156
ISSN: 0254-8755

Growth, Productivity and Profitability Enhancement in Delayed Planting of Soybean through Integrated Nutrient Management

Ajay Singh[1], Nisha Singh[2], K. S. Yadav[3], Balkrishan Singh[4] and Janmejay Sharma[5]

Rajmata Vijayaraje Scindia Krishi Vishwa Vidhyalaya, Gwalior, Madhya Pradesh 474 002, India
**E-mail: bhadauria.snisha2011@gmail.com*

Abstract: A two years experiment was conducted to assess the performance integrated nutrients on soybean sown on different dates. Late sowing of soybean [*Glycine max (L.)* Merrill] due to various reasons affects the growth and yield negatively due to less duration of vegetative and reproductive growth. Among various factors responsible for low productivity Soybean, in discriminate fertilizer use is a major factor. The result revealed that sowing of soybean on 1st July with 75% RDF + FYM @ 2.5t/ha was observed significantly superior over the rest of the treatments or their combinations with respect to growth, productivity and profitability (Table-2). Economically, this combination of date of sowing and fertility level also find remunerative over the other treatment combinations. Under delayed sowing, 75 % recommended doses of fertilizers along with 5t FYM per ha is more productive and profitable under prevailing situations of Gwalior region.

Keywords: Soybean, sowing dates, fertility levels, FYM

INTRODUCTION

India is among the largest vegetable oil economy in the world after USA, China, Brazil and Argentina. In india, it is grown on an area of 11.8 million hectare with the production of 13.5 million tonnes and the productivity is 1144 kg/ha. In Madhya Pradesh the area occupied under soybean is 5.11 mha with the annual production 5.85 mt and average productivity of 1075 kg/ha (DAC&FW, 2019-2020). In present scenario, appropriate planting date has to determine its very important due to climate change. Planting date is the most important non monetary input influencing crop yield. Suitable sowing time causes optimal utilization of the climatic resources such as temperature, humidity, day length and also anthesis time adaptation with proper temperature (Hashemi, 2001).The delayed planting due to high sensitivity of soybean to photoperiod and prevailing temperature affect yield negatively by curtailing the duration of vegetative and reproductive growth and drop in yield components (Kazemi *et al*., 2005). Sowing the crop at optimum time increases yield owing to suitable environment at all growth stages of the crop. Flowering is induced after sufficient vegetative growth. Moisture stress or dry spell may be avoided during critical growth stages. Therefore optimum planting date plays an important role in production of soyabean crop. Integration of fertilizers, organic manures and biological sources and their efficient management has shown promise in not only sustaining the productivity and soil health but also in meeting part of crops nutrient requirement.

METHODOLOGY

The experiment was conducted in prevailed weather conditions of Gwalior region during *kharif* 2013 and 2014 at College of Agriculture

Article History: Received: 05 May 2023; Revised: 22 May 2023; Accepted: 02 June 2023; Published: 20 June 2023

farm, Gwalior. The four sowing dates *viz*. July 1, July 10, July 20 and July 30 with five levels of fertility i.e. 100% RDF, 50% RDF + FYM @ 5.0 t/ha, 75% RDF + FYM @ 2.5 t/ha, 125% RDF and 100% RDF + Bio-fertilizer (*Rhizobium* + PSB) were tested in split plot design. The recommended dose of fertilizers applied was 30 N : 60 P_2O_5 : 40 K_2O : 30 S kg/ha through urea, diammonium phosphate(DAP), murate of potash(MOP) and single super phosphate(SSP) respectively; the bio-fertilizers were applied at the rate of 10g per kg of seed. Entire N, P_2O_5, K_2O and S were applied basal and covered with soil. In FYM (farmyard manure), available nutrient were N 0.65-0.72%, P_2O_5 0.46-0.48% and K_2O 1.04-1.07%. Uniform plant density is an important requisite for obtaining higher precision when it is not a variable factor as the treatments. Soybean variety JS-93-05 with the seed rate of 80 kg/ha was grown using standard package of practices. Other management practices were adopted as per recommendations of the crop under irrigated conditions. The economics was calculated on the basis of prevailing market rates of agriculture produced and cost of cultivation treatments wise.

RESULT AND DISCUSSION

Growth parameters

Plant height

Pooled mean both year with respect to sowing date, significantly greater plant height was recorded with 1st July followed by 10th July and 20th July. Among the integrated nutrient management, the pooled data revealed that as plant height of soybean significantly increased as plant growth advanced owing to 75% RDF + FYM @ 2.5t/ha, 125% RDF and 100% RDF + *Rhizobium* & PSB treatments at harvest stage.

Dry matter production

Data pertaining to significantly maximum dry matter production were observed when soybean crop sown on 1st July over another date of planting, while the minimum when the crop sown on 30 July. Among the integrated nutrient management, treatment 75% RDF + FYM @ 2.5t/ha was found significantly to be superior to other treatments regarding drymatter production. Dry matter accumulation is the result of higher metabolic activity of plants and solar energy harvesting efficiency of plants due to optimum sowing time like 1st July i.e 1st July coupled with favourable climate conditions which produce higher drymatter as the plant growth advanced at harvesting. FYM supplied nutrients in balanced proportion and improved physical characters of soil , which might have increased the availability of nutrients.

Grain yield

On the basis of pooled, (Table 1) crop sown on 1st July recorded maximum seed yield as well as straw followed by the crop sown on 10th July and 20th July (Table 1). Among the various integrated nutrient management , 75% RDF + FYM @ 2.5t/ha resulted in higher seed yield other integrated nutrient nutrient management. Interaction effects of sowing dates and fertility levels in term of seed yields were found statistically significant and the delay in sowing date from 1st July to 30th July decreased the seed yield under each fertility level. Significantly higher yields were recorded under 1st July with each fertility level compared to other sowing dates. However, fertility treatment 75% RDF + FYM @2.5 t/ha, 125% RDF and 100% RDF + bio-fertilizers were equally effective under the crop sown on 1st July and 10th July date of sowing. Similarly in case of fertility levels, 75% RDF + FYM @2.5 t/ha was found superior to rest of the fertility levels under each sowing date except 125% RDF, 100% RDF + bio-fertilizers in 1st July and 10th July sowing. Balanced supply of nutrients through inorganic fertilizer in coupled with organic manures resulting better development of source in the form of drymatter accumulation which contributed to yield attributing characters. Optimum utilization of solar radiation, temperature, higher assimilates production and its conversion to starch result in higher biomass and seed yield. Billore and Shrivastava (2013) also reported that the early planting of soybean increase the seed yield. Shegro e*t al.* (2010) also revealed that the flowering was generally delayed and maturity hastened due to delay in planting dates

ECONOMICS

Analysis of pooled mean data (table-1) showed that higher gross return , net return and benefit cost ratio were recorded with 1st July followed by 10th,20th and 30th July. Across the 4 fertility levels, 75% RDF + FYM @2.5 t/ha resulted in higher gross return , net return and benefit cost ratio than other fertility levels. It was concluded that the soybean crop sown on 1st July may produce higher seed yield and net return with application of 75% RDF + FYM @2.5 t/ha.

Table 1 : Growth, yield and economics of soybean under different sowing dates and fertility levels (pooled data of two years)

Treatment	*Growth parameters*		*Seed yield (kg/ha)*	*Economics*	
	Plant height at harvest (cm)	*Dry matter per plant at harvest (g)*		*Net return (Rs/ha)*	*B: C ratio*
Sowing dates					
1st July	54.38	6.99	2215.37	51388	3.318
10th July	48.83	6.82	1975.18	43658	2.969
20th July	42.90	6.42	1603.86	31503	2.421
30th July	40.40	6.10	1315.99	21988	1.990
SE (m)±	0.40	0.03	21.90	-	-
CD (P=0.05)	1.23	0.08	67.50	-	-
Fertility levels					
100% RDF	45.75	6.40	1501.98	29206	2.380
50% RDF + FYM @ 5t/ha	43.11	6.33	1493.89	26680	2.139
75% RDF + FYM @ 2.5t/ha	48.68	6.90	2142.65	48909	3.194
125% RDF	48.38	6.66	1879.87	40208	2.783
100% RDF + *Rhizobium* & PSB	47.23	6.63	1869.62	40669	2.877
SE (m)±	0.53	0.03	27.96	-	-
CD (P=0.05)	1.50	0.08	79.08	-	-

Table 2 : Interactive effect of sowing dates and fertility levels on seed and straw yield (pooled data of two years)

Treatments	*Sowing dates*			
	1st July	*10th July*	*20th July*	*30th July*
Fertility levels	Seed yield (t/ha)			
100% RDF	1882.04	1659.03	1458.69	1008.16
50% RDF + FYM @5 t/ha	1819.45	1611.81	1415.34	1128.95
75% RDF + FYM @2.5 t/ha	2573.97	2368.23	1892.02	1736.37
125% RDF	2421.19	2118.06	1631.72	1348.50
100% RDF + bio-fertilizers	2380.21	2118.76	1621.54	1357.99
	Between any two fertility levels at same sowing date		Between any two sowing date at same or different levels of fertility	
SE (m)±	55.92		54.60	
CD (P=0.05)	158.16		156.66	

RDF- Recommended dose of fertilizer FYM- Farm yard manure B:C Ratio- Benefit Cost ratio

CONCLUSIONS

It may be concluded from the present investigation, sowing of soybean on 1st July with 75% RDF + FYM @ 2.5t/ha was observed significantly superior over the rest of the treatments or their combinations with respect to growth, productivity and profitability (Table 2). Economically, this combination of date of sowing and fertility level also find remunerative over the other treatment combinations. Under delayed sowing, 75 % recommended doses of fertilizers along with 5t FYM per ha is more productive and profitable under prevailing situations of Gwalior region

REFERENCE

Agriculture Statistics at a Glance 2020. Department of Agriculture, Cooperation & Farmers Welfare, *GOI*.

Arbad, B.K. and Ismail, Syed (2011). Effect of integrated nutrient management on soybean (*Glycine max*)-safflower (*Carthamus tinetorius*) cropping system. *Indian Journal of Agronomy*, **56**(4): 340-345.

Billore, S.D. and Shrivastava, S.K. (2013). Sustainability and stability of yield of soybean varieties under various planting time in different agro climatic regions of India. *Soybean Research,* **11**(2): 8-16.

Hashemi, J.M. (2001). Sowing date on the developmental stages and some agronomic and physiological characteristics of five soybean cultivars grown in the second planting. *Crop Science Journal*, **3**(4): 49-59.

Kazemi, S.H., Ghaloshi, S., Ghanbari, A. and Kianoosh, G.H. (2005). Effects of planting date and seed inoculated with bacteria on yield components of two soybean cultivars. *Journal of agricultural sciences and Natural Resources*, Twelfth year (In Persian).

Shegro, A., Atilaw, A., Pal, U.R. and Geleta, N. (2010). Influence of Varieties and planting dates on growth development of soybean (*Glycine max* L. Merril). *Indian J. of Agron.*, **9**(3): 146-156.