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Growth and Yield of Soybean Varieties as Influenced by Dates of Sowing

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Abstract: *The present field investigation was conducted during kharif 2013 at Department of Agronomy, Vasantrao Naik Marathwada Krishi Vidhyapeeth, Parbhani. The experiment was laid down in Factorial RBD with 10 treatment combinations, which comprised of two varieties i.e. MAUS-71 (V_1), MAUS-81 (V_2) and five dates of sowing i.e. D_1 (MW 25), D_2 (MW 26),D_3 (MW 27), D_4 (MW 28) and D_5 (MW 29). Each experimental unit was replicated thrice. The gross and net plot size of each experimental unit was 5.4 x 4.5 m2 and 4.5 x 4.3 m2, respectively. Sowing was done according to meteorological week by dibbling method as per treatments. Variety MAUS-71 (V1) recorded significantly higher growth attributing characters* viz. *plant height, number of functional leaves, number of branches, leaf area, total dry matter plant-1,, seed and straw yield, over the rest of the variety i.e., MAUS-81. Among all the dates of sowing, D_1 (MW 25) recorded significant higher growth attributing characters* viz. *, plant height (cm), number of functional leaves, number of branches, leaf area, total dry matter plant^{-1}, seed and straw yield over the rest of the sowing dates.*

Key words: *Sowing dates, Soybean, Varieties, Yield.*

INTRODUCTION

Soybean being a leguminous crop fixes atmospheric nitrogen. It sheds about 32-35% of crop residue at the time of harvest, which helps in increasing the soil fertility and soil physical condition. Hence soybean crop also called as miracle crop. Soybean has occupied third place in oilseed crops of India, which is rich source of protein (40-42%) and quality oil (20-22%).

Apart from its high nutritive value, it has manifold use in agriculture, i.e. soybean adds large amount of organic matter in soil and thereby improving physical and chemical as well as biological properties of soil and resulting in significant improvement in productivity. Besides this it can very well fit in different cropping systems under rain fed and irrigated farming.

Timely sowing, availability of high yielding genotypes, recommended fertilizer doses, optimum seed rate and need based plant protection are the most important aspects for increasing the productivity of soybean. The work of varietal development has got fast momentum in India and every year new genotypes are being recommended for cultivation. The performance of these new genotype is necessary to be ascertained in comparison with the potential of improving agricultural productivity and hence livelihoods if adopted by farmers.

During past few years, the onset of monsoon is delayed and due to this shifting of monsoon, the sowings are undertaken in the month of July. Under such situation it is necessary to test the different varieties of soybean with the shifting of monsoon.In Maharashtra, soybean crop was grown on an area of 38.704 Lakh ha in 2013-14 with an annual production of 48.565 Lakh metric tons and productivity of 1255 kg ha^{-1} (Anonymous, SOPA, 2013).

MATERIAL AND METHODS

The field investigation was conducted at P.G. student research farm, Department of Agronomy, College of Agriculture, V.N.M.K.V., Parbhani (M.S.) India. The experimental field was leveled and well drained. The soil was clayey in texture, low in available nitrogen, medium in phosphorus, high in potassium and slightly alkaline in reaction. The environmental conditions prevailed during research period was favorable for normal growth and maturity of soybean crop. The present experiment was laid out in Factorial RBD with three replications. The gross plot size was 5.4 m x 4.5 m and net plot size was 4.5 m x 4.3 m. The

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first factor was encompassed of two varieties i.e. MAUS -71(V_1), and MAUS- 81(V_2) and the second factor was comprised of five dates of sowing D_1 (MW 25) 24th June, D_2 (MW 26) 01th July, D_3 (MW 27) 08th July, D_4 (MW 28) 15th July and D_5 (MW 29) 20th July. The ten treatments combinations of two varieties and five dates were randomly allotted in each replication.

RESULTS AND DISCUSSION

Effect on growth attributes

The varieties under study differed significant regarding to plant height except at 30 DAS, where it was found to be non- significant. This may be due to more competition to get sunlight, in case of variety MAUS-81 (V_2). The rate of increase in plant height of the crop was maximum during 30-75 DAS in all the varieties indicating grand growth of the crop. Variety MAUS-71 (V_1) recorded the highest height. The other one variety remained approximately equal in respect of the height. This could be attributed to genetic makeup of variety. In general, the plant height of individual variety was directly proportional to the duration of that variety. Ruhul Amin *et al.* (2009) also reported significant differences in plant height due to different varieties.

The maximum number of functional leaves was produced by variety MAUS-71 (V_1) at 60 DAS. Also variety MAUS-81 (V_2) recorded higher numbers of functional leaves at all growth stages. This might be due to genetic composition of varieties, nutrient, moisture and light. Same trend was seen in case of no. of branches, leaf area (cm^2). Patoliya (1998) also stated significant differences in number of functional leaves due to different varieties.

Increase in total dry matter accumulation $plant^{-1}$ was the cumulative effect of increase in various growth characters like number of branches $plant^{-1}$, number of leaves $plant^{-1}$, leaf area $plant^{-1}$. The mean total dry matter accumulation $plant^{-1}$ was influenced due to different varieties. Significantly highest dry matter $plant^{-1}$ recorded by variety MAUS-71 (V_1) followed by variety MAUS-81 (V_2).This might be due to more photosynthetic activities and more accumulation of carbohydrates and by this means increased dry matter accumulation. Kausale (2000) also stated significant differences in total dry matter to different varieties.

Among the dates of sowing, D_1 (MW 25) recorded comparatively tallest plants over the other dates of sowing at all stages growth of crop, but was found at par with D_2 (MW 26) and D_3 (MW 27) at 45, 60, 90 and at harvest. The lowest plant height was recorded in D_5 (MW 29) at all growth stages of crop. This might be due to less of nutrient and delayed dates of sowing. Similar kind of observations were at recorded in case of no. of functional leaves, no. of branches, leaf area (cm^2). Hari Ram *et al.* (2010) also reported parallel results in respect to growth attributes due to different dates of sowing.

The dates of sowing played a conspicuous role in total dry matter accumulation $plant^{-1}$. The date of sowing D_1 (MW 25) has recorded significantly highest total dry matter $plant^{-1}$ which significantly superior over the dates of sowing D_3 (MW 27), D_4 (MW 28) and D_5 (MW 29) at all growth stages of crop but was found at par with D_2 (MW 26) at all growth stages of soybean crop. This might be due to highest biomass production due to the fact that more availability of plant nutrients, moisture, and light. These results are in the confirmation with the findings of Kausale (2000).

Effect on seed yield

Seed yield is a functional of yield attributes. The variety MAUS-71 (V_1) recorded highest seed yield which was superior over the variety MAUS-81 (V_2). This may be due to of higher seed yield $plant^{-1}$ which occurred from increased pod number and pod weight $plant^{-1}$and number of seed pod^{-1}. These results collaborate to those reported by Rajput *et al.* (1999).

Straw yield is an augmenting effect of increased vegetative growth through plant height, number of branches and number of leaves $plant^{-1}$. Profound effect on straw yield (kg ha^{-1}) was noted due to different varieties. Variety MAUS-71 (V_1) produced higher straw yield than MAUS-81 (V_2) variety. This may be due to profuse branching, more number of leaves, plant height and maximum dry matter as result of this higher straw yield. Singh *et al.* (1993) reported the similar result.

In case of dates of sowing, D_1 (MW 25) recorded highest seed yield ha^{-1} and was significantly superior to the rest of sowing dates. These might be due to higher seed yield $plant^{-1}$ which occurred from increase pod number and pod weight $plant^{-1}$ and number of seed pod^{-1}. The lowest seed yield and biological yield kg ha^{-1} has recorded with the date of sowing D_5 (MW 29).The difference in the seed yield was 37.4 % in among the dates of sowing. The results are in confirmation with Shaikh *et al.* (2005).

Profound effect on straw yield kg ha^{-1} was noted due to different dates of sowing. The date of sowing D_1 (MW 25) produced highest straw yield which significantly superior over the rest of sowing dates

Table 1
Mean Plant height (cm), No. of leaves, Leaf area (cm^2), No. of branches and Dry matter (g) of soybean as influenced by different treatments

Treatments	*Plant height (cm)*	*No. of leaves*	*Leaf area (cm^2)*	*No. of branches*	*Dry matter (g)*
Varieties(V)					
V_1 - MAUS-71	60.43	18.62	1409.3	4.21	34.31
V_2 - MAUS-81	53.53	18.13	1295.0	3.45	33.99
S.E. ±	0.59	0.15	29.27	0.09	0.10
C.D. at 5 %	1.75	0.47	86.83	0.28	0.31
Dates of sowing (D)					
D_1 - (MW 25)	59.38	19.33	1515.0	4.33	35.5
D_2 - (MW 26)	57.66	18.70	1446.7	3.95	34.83
D_3 - (MW 27)	57.32	18.35	1356.0	3.77	34.31
D_4 - (MW 28)	55.66	17.83	1237.5	3.64	33.3
D_5 - (MW 29)	54.88	17.66	1143.2	3.46	32.83
S.E. ±	0.93	0.25	46.28	0.15	0.16
C.D. at 5 %	2.77	0.74	137.30	0.44	0.50
Interaction (V x D)					
S.E. ±	1.32	0.35	65.45	0.21	0.23
C.D. at 5 %	NS	NS	NS	NS	NS

Table 2
Mean Seed yield, straw yield (kg ha^{-1}) of soybean as influenced by different treatments

Treatments	*Seed yield (kg ha^{-1})*	*Straw yield (kg ha^{-1})*
Varieties (V)		
V_1 - MAUS-71	2078.9	3468.0
V_2 - MAUS-81	1991.9	3323.1
S.E. ±	27.59	45.87
C.D. at 5 %	81.87	136.09
Dates of sowing (D)		
D_1 - (MW 25)	2297.4	3730.0
D_2 - (MW 26)	2158.0	3566.7
D_3 - (MW 27)	1963.7	3316.7
D_4 - (MW 28)	1873.7	3243.3
D_5 - (MW 29)	1779.2	3121.2
S.E. ±	43.63	72.53
C.D. at 5 %	129.45	215.18
Interaction (V x D)		
S.E. ±	61.71	102.58
C.D. at 5 %	NS	NS

but was at par with date of sowing D_2 (MW 26). This may be due to more number of leaves, highest plant height and maximum dry matter accumulation as a result of this highest straw yield. The difference in the straw yield was 11.47% in among all the dates of sowing. These results are in conformity with Singh and Arya (1994).

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