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The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(1): 844-847

www.thepharmajournal.com
Received: 06-10-2022
Accepted: 16-12-2022

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Study of Soybean genotypes to examine the genotypic Variation in physiological growth parameters

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Abstract
The experiment was conducted at the experimental site of Botany Department, Vasantrao Naik Marathwada Agricultural University (VNMKV), Parbhani during the period from June to October 2017 to evaluate seven selected soybean genotypes in respect of growth, dry matter production and yield. Genotypic variations in plant height, leaf area, leaf area index, leaf area duration, dry matter and seed yield were observed. The leaf area ranged from 1296.70 to 1421 (cm2) at 45 DAS and 1416.7 to 1538 (cm2) at 60 DAS, leaf area index varied from 5.57 to 6.30 at 45 DAS and 6.12 to 6.74 at 60 DAS, total dry matter ranged from 17.11 to 18.28 g per plant at 65 DAS and 31.28 to 34.30 at 85 DAS. The seed yield ranged from 717.54 to 1125.00 kg per hectare. Seed yield of soybean was positively related to total dry matter. The filled pods per plant had good relationship with seed yield than other components.

Keywords: Soybean, genotypic variation, growth, seed yield, dry matter

Introduction
Soybean (*Glycine max* (L.) Merrill] one of nature's most versatile crops, is increasingly becoming an important food and cash crop in the tropics due to its high nutrient quality and adaptability to various growing environments (M. C. Kevit, 2005).
It is the most important *kharif* oilseed crop of Maharashtra. Area under soybean during 2017-18 was 101.56 lakh ha with production of 83.50 lakh MT besides productivity of 822 kg per ha in India. While in Maharashtra area under soybean was 34.84 lakh ha with production of 29 lakh MT besides productivity of 841 kg per ha. (SOPA 2017-18).
Being a rich source of protein and oil, it is also referred to as vegetarian meat and can substitute egg, meat or cod-liver oil. The soybean is widely used in the preparation of various food products which ranged from milk to biscuits, cakes, sweets and other confectionery production. The soya milk prepared form soybean is equally nutritious as that of cow and sheep and oil cakes are very nourishing feed for the livestock and poultry. Soybean oil is used for manufacturing vanaspati ghee and several other industrial products. It is widely used in the industrial production of different antibiotics. Soybean, being the richest, cheapest and easiest source of the best multiplicity of uses as food and industrial products the future demand for soybean will increase and the soybean yield must be improved to meet this demand and hence called a "wonder crop".

Material and Methods
The present investigation on "study of Soybean genotypes to examine the dynamics of dry matter accumulation during the seed filling period." was conducted at experimental farm of Dept. of Agril. Botany, VNMKV, Parbhani during *kharif* 2017. The experiment material for the present investigation consisted of seven genotypes. These selected seven genotypes possess good amount of variation for field emergence count, plant height, no. of branches per plant, no. of nodes per plant, leaf area, leaf area duration, leaf area index and dry matter. The seven genotypes used in the present study were MAUS-158, MAUS-162, MAUS-81, MAUS-71, MAUS-612, JS-335 and JS-93-05. The experiment was laid in randomized block design with three replications. Each genotype was randomized in each block and sown in rows of 5m length at 45x15 cm spacing.

Result and Discussion
1) Field emergence count: Data on germination count of soybean at 7 DAS is presented in Table. The data presented in Table indicated that the emergence count was not influenced significantly by different Genotypes.

2) Plant height (cm)
The data on the plant height recorded at harvest are presented in Table. The soybean genotypes differed significantly for plant height at harvest. At harvest, the mean plant height ranged from 58.55 cm to cm 72.05 cm with a mean 62.517 cm. The genotype G1 (72.05 cm) recorded significantly the highest mean plant height than rest of the genotypes and at par with G4 (67.28) and G7 (70.10). The genotype G5 (58.55) recorded significantly lowest mean plant height.

3) Number of branches per plant
In the present study the number of branches per plant ranged from 3.64 to 5.56. Genotype G2 (5.56) had significantly higher number of nodes per plant over remaining genotypes except G7 (5.17) which was at par. However, genotype G3 (3.64) noted minimum branches/plant.
These results are consistent with the study of Adasul D.L., (2013) [1], Devendra Vasht., (2016) [2], Kargar *et al*., (2015) [5], Barskar *et al*., (2014), Ratan Bahale., (2012), Mane A.M., (2013) [6] showed that the genotype G5 (4.66) had significantly higher number of branches over remaining genotypes.

4) Number of nodes per plant
In the present study the number of branches per plant ranged from 10.92 to 13.98. Genotype G2 (13.98) had significantly higher number of branches over remaining genotypes except G7 (13.76), G1 (12.77) and G4 (12.07) which were at par with each other. However, genotype G3 (10.92) recorded minimum nodes per plant.
These results are consistent with the study of Kargar *et al*., (2015) [5] A study was conducted on 170 soybean genotypes under Soil salinity in nine morpho-physiological characters on 30-days-old seedlings plants. Barskar *et al*., (2014). The perusal of the data revealed that higher PCV and GCV were recorded for number of clusters per plant.

5) Leaf area (cm^2)
The results revealed that leaf area was not significantly (at 5%) influenced by genotypes for LA at 45 DAS and 60 DAS as shown in Table. The results were non significant at both stages of growth.

6) Leaf area index (LAI)
In present investigation the differences among the genotypes leaf area index (LAI) was significant at all growth stages. Differential genotypic performance for LAI and their relation to the DM production, at each growth stage could be associated with the genetic make-up of the genotypes. However, genotypes MAUS-158, JS-335 and MAUS-612 continued to maintain significantly higher values of LAI up to 60 DAS followed by a gradual decrease in subsequent growth period which was attributed to the reduction in magnitude of assimilatory surface area due to drying an senescence of leaves which is a beneficial character for breeding of crops for higher economic productivity. On the other hand the lesser value of LAI was noted in genotype MAUS-162 from beginning of plant growth to the harvesting.
The result were in accordance with the findings of Mottaghian *et al*. (2010) [7]. The LAI ranged from 0 to 5.5 m2/ m2 in soybean (Nguy *et al*., 2012).The variety JS 81335 registered greater LAI (5.9) than other varieties, (Sharma and Sharma, 1993) [10]. Leaf area index ranged from 0.54 to 3.17 (Rajput *et al*., 2004) [9]. Yadav and Singh (2006) [11] noted the highest value of leaf area index (3.28) at transplanting.

7) Leaf area duration (LAD) (m^2. days)
In the present investigation revealed that the Leaf area duration exhibited highly significant differences (at 5%) among various genotypes as shown in Table. Genotype G4 (98.02) exhibited significantly higher LAD and at par with G2 (96.25) and G6 (96.22) and significantly superior over rest of the genotypes. However, genotype G1 (89.15) recorded minimum leaf area duration.
The result was in accordance with the findings of Devendra Vasht., (2016) [2]. Leaf area duration exhibited highly significant differences (at 5%) among various genotypes throughout crop growth period.

8) Dry matter (gm/plant)
At 65 DAS
Genotypes G2 (18.28) showed significantly higher total dry matter production followed by G3 (18.06), G6 (18.07), and G7 (18.24). The minimum was noted in genotype G5 (17.11).

At 75 DAS
Genotypes G2 (34.34) followed by G3 (33.12), G4 (32.12), G5 (31.81), had significantly higher accumulation of TDM over rest of the genotypes. Genotype G1 (28.04) was associated with the lowest magnitude for this trait.

At 85 DAS
Genotypes G2 (34.28) followed by G7 (34.28), G4 (34.08) and G3 (33.20) had significantly more total dry matter production. The minimum was recorded in G6 (31.28).
The result was in accordance with the findings of Bahale R.S 2012 [3].

Table 1: Differences in field emergence in Soybean genotypes.

	Genotype	Field emergence (%)
G1	MAUS-162	96.67 (75.40)
G2	MAUS-158	90.67 (65.07)
G3	JS-93-05	93.00 (68.66)
G4	MAUS-612	95.00 (72.86)
G5	JS-335	93.00 (68.66)
G6	MAUS-81	94.67 (71.54)
G7	MAUS-71	94.00 (70.62)
	G.M.	93.77 (70.42)
	S.E±	2.97
	C.D. at 5%	NS
	C.V. (%)	7.31

Table 2: Differences in plant height in Soybean genotypes.

Genotype		Plant height (cm)
G1	MAUS-162	72.05
G2	MAUS-158	65.29
G3	JS-93-05	60.33
G4	MAUS-612	67.28
G5	JS-335	58.55
G6	MAUS-81	64.13
G7	MAUS-71	70.10
	G.M.	65.39
	S.E±	1.74
	C.D. at 5%	5.76
	C.V. (%)	4.61

Table 3: Differences in no. of branches per plant in Soybean genotypes.

	Genotype	No. of branches per plant
G1	MAUS-162	4.21
G2	MAUS-158	5.56
G3	JS-93-05	3.64
G4	MAUS-612	4.37
G5	JS-335	3.97
G6	MAUS-81	4.00
G7	MAUS-71	5.17
	G.M.	4.42
	S.E±	0.38
	C.D. at 5%	1.19
	C.V. (%)	15.12

Table 4: Differences in no. of nodes per plant in Soybean genotypes.

Genotype		No. of nodes per plant
G1	MAUS-162	12.77
G2	MAUS-158	13.98
G3	JS-93-05	10.92
G4	MAUS-612	12.07
G5	JS-335	11.32
G6	MAUS-81	11.56
G7	MAUS-71	13.76
	G.M.	12.34
	S.E±	0.68
	C.D. at 5%	2.08
	C.V. (%)	9.49

Table 5: Differences in Leaf area in Soybean genotype at different growth stages.

Genotype		Leaf area (cm^2)	
		45 DAS	60 DAS
G1	MAUS-162	1298	1426.7
G2	MAUS-158	1399.3	1488.3
G3	JS-93-05	1368	1468.3
G4	MAUS-162	1421	1519.7
G5	JS-335	1291.7	1425.3
G6	MAUS-81	1305.3	1538
G7	MAUS-71	1296.7	1416.7
	G.M.	1340	1469
	S.E.±	70.92	83.55
	C.D.at 5%	NS	NS
	C.V. (%)	9.17	9.85

Table 6: Differences in Leaf area index in Soybean genotype at different growth stages.

Genotype		Leaf area index	
		45 DAS	60 DAS
G1	MAUS-162	5.57	6.12
G2	MAUS-158	6.30	6.74
G3	JS-93-05	5.94	6.37
G4	MAUS-162	6.00	6.45
G5	JS-335	5.97	6.60
G6	MAUS-81	6.28	6.38
G7	MAUS-71	5.85	6.40
	G.M.	5.99	6.44
	S.E.±	0.16	0.19
	C.D.at 5%	NS	NS
	C.V. (%)	4.67	5.04

Table 7: Differences in Leaf area duration in Soybean genotype.

	Genotype	Leaf area duration (m^2. Days)
G1	MAUS-162	89.15
G2	MAUS-158	96.25
G3	JS-93-05	94.54
G4	MAUS-612	98.02
G5	JS-335	94.23
G6	MAUS-81	96.22
G7	MAUS-71	90.44
	G.M.	94.12
	S.E±	0.91
	C.D. at 5%	2.81
	C.V. (%)	1.67

Table 8: Dry matter (gm/plant) in Soybean genotypes.

Genotype		Dry matter gm/plant		
		65 DAS	75 DAS	85 DAS
G1	MAUS-162	17.95	28.04	32.65
G2	MAUS-158	18.28	34.34	34.3
G3	JS-93-05	18.06	33.12	33.20
G4	MAUS-612	17.70	32.12	34.08
G5	JS-335	17.11	31.81	33.14
G6	MAUS-81	18.07	28.32	31.28
G7	MAUS-71	18.24	28.33	34.28
	G.M.	17.92	30.87	33.27
	S.E. ±	1.28	1.17	1.02
	C.D. at 5%	1.32	1.04	0.91
	C.V. (%)	1.84	1.90	1.54

Conclusion

It may concluded from this research work that the soybean genotype differed significantly in relation to their physiological growth parameters and structural yield attributing traits with biological and economic yield. The genotypes MAUS-158 and MAUS-71 accumulated physiological growth determinants *viz*; LA, LAI, LAD. The improvement in morphophysiological parameters resulted in maximum realisation of yield potential of MAUS-158 which finally resulted in physiological growth parameters.

References

1. Adasul DL. Morpho-physiological studies of soybean genotypes for yield differences. (Msc.thesis at MPKV Rahuri; c2013.
2. Devendra Vasht. Evaluation of physiological efficiency, growth and productivity of soybean (*Glycine max* (L.) Merrill) genotypes; c2016
3. Bahale RS. Screening of soybean (*Glycine max* (L.) Merrill) genotypes for morpho- physiological traits of productivity. Msc thesis Jabalpur; c2012.
4. Baraskar VV, Kachhadia VH, VachhanI JH, Barad HR, Patel MB, Darwankar MS. Genetic variability, heritability and genetic advance in soybean [*Glycine max* (L.) Merrill] Electronic Journal of Plant Breeding. 2014;5(4):802-806 (Sep 2014) ISSN 0975-928X.
5. Kargar *et al*. Study on genetic variation of 14 soybean cultivars using cluster and factor analysis under water stress and non strss conditions. J Bio. & Env. Sci., 2015.
6. Mane AM. Morphophysiological intervention in soybean genotypes. Msc. thesis at MPKV Rahuri; c2013
7. Mottaghian A, Pirdashti H, Bahmanyar MA. Dry matter accumulation and physiological indices of two soybean cultivars in response to enriched sewage sludge compost. World Applied Sciences Journal. 2010;8(5):578-588.

8. Molla Malede, Berhanu Abate, Asmamaw Amogne. The effect of soil acidity on some growth-related traits of soybean genotypes. Int. J Res. Agron. 2020;3(2):35-41.
9. Rajput BS, Mathur CM, Sonakiya VK. Studies on phenological attributes and their association with structural attributes in chickpea (*Cicer arietinum* L.). Advances in Plant Sciences. 2004;17(2):479-483.
10. Sharma JP, Sharma SP. Influence of genotype and plant densities on physiological parameters, grain yield and quality of soybean. Indian J Agron. 1993;38(2):311-314.
11. Yadav Vivek, Singh Bhagwan. Effect of crop establishment method and weed management practice on rice and association weeds. Indian Journal Agronomy. 2006;51(4):301-303.
12. Ning Liu Guo, Chun Wu Yang, KeZhang Xu, Zhian Zhang, DaYong Li, ZhiHai Wu, *et al*. Development of yield and some photosynthetic characteristics during 82 years of genetic improvement of soybean genotypes in northeast China. Australian Journal of Crop Science. 2012;6(10):1416-1422.