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RESEARCH ARTICLE

Correlation studies for seed yield and yield attributes in soybean [*Glycine max* (L.) Merrill]

■ **P.S. Chavan, H.V. Kalpande, S.V. Kalyankar and S.B. Borgaonkar**

SUMMARY

An investigation entitled as "Correlation for yield and yield contributing traits in soybean [*Glycine max* (L).Merrill.] was conducted during *Kharif* 2018 at Instructional Farm, Department of Agriculture Botany, Vasantrao Naik Marathwada Agriculture University, Parbhani. The experiment was laid out in Randomized Block Design with three replications and seven treatments *viz.*, T_1-untreated seeds,T_2-Polymer coating, T_3-T_2+Vitavax, T_4-T_3+GA_3 100ppm, T_5-T_3+CCC 100ppm, T_6-T_3+, NAA 50ppm, T_7- T_3+IAA 50ppm. Seed yield is a complex character and is dependent on number of component characters. Therefore, study of relationship of characters with each other and with seed yield become more important in crop improvement programme. Therefore, it is essential to find out relative contribution of each of the component character with yield. In present study yield and yield contributing character of seed yield was positive and significant correlated with field plant height, number of branches per plant, chlorophyll content, leaf area, germination per cent, moisture per cent, total dry weight, 100 seed weight, oil content, protein content, harvest index and no. of seeds per pod. The results also obtained from this study days to 50 per cent flowering and days to harvest are negative significant to other yield and yield parameter.

Key Words : Seed quality, GA_3, Seed Germination, IAA, Protein content

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Soybean [*Glycine max* (L.) Merrill] is known as Golden bean and is commonly referred as 'miracle crop' or 'gold from soil'. It is playing an important role in overcoming the present shortage of edible oil and vegetable proteins in India as it contains 20 per cent oil, 21 per cent starch and 40 per cent high quality protein. Soybean protein is rich in essential amino acids like lysine (5%) in which most of the cereals are deficient. It is also a good source of vitamin-B complex, thiamine and

riboflavin. Globally, it is grown in an area of about 78.6 M ha with a production of 181 Million tonnes. In India, it is grown in an area of about 10.83 M ha with a production of 114.83 Lakh Million tonnes and productivity of 1059 kg ha^{-1} (SOPA Database 2018). In Maharashtra, the crop is grown in an area of 36.390 lakh ha with 38.352 M Mt of production and productivity is 1054 kg per hector (SOPA Database, 2018). In India, major soybean growing states are Madhya Pradesh, Maharashtra, Rajasthan, Karnataka, Uttar Pradesh and Andhra Pradesh. One of the major constraints in the endeavour of increasing productivity in soybean is its susceptibility to a large number of diseases caused by fungi, bacteria, viruses and nematodes. The annual losses due to soybean diseases are estimated to the tune 12 per cent of the total production in which fungal diseases alone can cause up to 6-8 per cent damage. Besides this, the crop also suffers from a number of bacterial and viral diseases of economic significance. One of the major constraints in soybean production is the non- availability of quality seeds at the time of planting. For successful production of any crop, the seed must be sound and free from seed mycroflora which interfere with seed germination, emergence and subsequent performance of the crop in the field. As seed coating is very essential to reduce the losses due to pathogens and to extend the seed longevity of the seeds with polymer, fungicide and insecticide. Seed coating materials were reported to improve the germination and increase the seedling emergence at changing soil moisture especially in the suboptimal range. Seed coating technology provides an economical approach to seed enhancement, especially for larger seeded agronomic and horticultural crops. An advantage of seed coating is that the seed enhancement material is placed directly on the seed without obscuring the seed shape. Seed coatings of natural or synthetic polymers have gained rapid acceptance by the seed industry as a much safer, but reliable method of fungicide or insecticide seed treatment. The polymer coat provides protection from the stress imposed by accelerated ageing, which includes fungal invasion. It improves plant stand and emergence of seeds, accurate application of the chemical reducing chemical wastage, helps to make room for including all required ingredients, protestants, nutrients, plant growth promoters, hydrophobic and hydrophilic substance, oxygen suppliers etc. By encasing the seed with thin film of biodegradable polymer, the adherence of seed treatment to the seed is improves, ensures dust free handling, making treated seed both useful and environment friendly. Seed were coated with polymer in combination with fungicide, GA_3, Cycocel and IAA. A significant increase in the seed protein content was also noticed with the appliances of NAA200ppm by (Ramesh and Ramprasad, 2013). The higher seed yield and better quality seed can be produced by treating the seed with polymers, fungicide and growth regulators. Seed yield is a complex character and is dependent on number of component characters. Therefore, study of relationship of characters with each other and with seed yield become more important in crop improvement programme. Therefore, it is essential to find out relative contribution of each of the component character with yield.

MATERIAL AND METHODS

The sowing was done in *Kharif* season 2018 at experimental farm of Department of Agricultural Botany, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The sowing was done on 05 July 2018 in *Kharif* season. The sowing was done by dibbling the seed with spacing of 45 x 5cm with plot size 4.5 x 2.5 M in three replication. Hand weeding, irrigation plant protection measures were carried out from time to time as required. Harvesting of the crop was manually at proper stage of physiological maturity before shattering of seed started. The crop was kept for drying in the field and threshing was done by stick beating the seed were kept for further studies *i.e.* seed quality. The observations were recorded on days to 50 per cent flowering, plant height (cm), leaf area (cm^2) (45 and 75 DAS), chlorophyll content (SPAD Method) (45 and 75 DAS), dry Matter (g), days to maturity, yield per plant (g), number of pods per plants, number of seeds per plant, seed yield (kg per ha), test weight (g), number of branches per plant, harvest index (%), germination per cent, moisture content, protein (%) and oil (%). Protein content was determined by the Kjeldhal method of AOAC (1995). 0.2 g flour sample was digested with 10 g of digestion mixture (potassium sulphate and copper sulphate in the ratio 100:20) and 25 ml of concentrated sulphuric acid. The contents were then digested for 90 minutes till a carbon free liquid was obtained and clean light green colour was obtained. The analysis of oil content in soybean was done by NMR method. The sample of 50g were scanned by NMR. The field data were analyzed statistically as per Randomized Block Design (RBD) and laboratory data were analyzed. Data of all entries in the experiment was subject to analysis of variance (Panse and Sukhatme,

1985) for testing the significance of treatments. Correlation co-efficient value was computed between seed quality and seed yield contributing characters as per procedure illustrated by person method. Correlation is a measure of the degree to which character are associated with yield or among themselves.

RESULTS AND DISCUSSION

The character days to 50 per cent flowering has negative significance association with number of pod per plant (-0.77*) Total dry matter (-0.79*). The character days to harvest has negative association with, 100 seed weight (-0.84*), number of pods (-0.86*) and Total dry matter (-0.77*). The data is presented in Table 1. The character test weight (g) has positive significance association with number of pods per plant (0.79*), plant height (0.76*) number of seeds per pod (0.76*) and plant total dry matter (-0,81*). The character moisture (%) has positive and significance association with, number of pods per plant, (0.84*), number of branches (0.10**) and leaf area (o.75*). The character germination (%) has positive and significant association with number of pod per plant (0.86*) leaf area (0.99**) chlorophyll content (0.99**) and grain yield per plot. The character Number of pod per plant has positive and significance association with, no seeds per pod (0.77*), harvest index (0.84*). Similar results are reported by Ramesh and Ramprasad (2013); Joshi *et al*. (2014) and Bony *et al.* (2017). Chlorophyll content (0.87**), leaf area (0.91) and dry weight (0.97**). The character number of branches per plant (90 DAS) has positive and significance association with leaf area (0.75), plant height harvest index (0.49). The results are in accordance with the reports of Chachalis and Smith (2001); Kalyankar *et al.* (2007) and Bony *et al.* (2017).

The character chlorophyll has positive and significance association with, leaf area (0.99*), plant height (0.08), total dry matter (0.89*), harvest index (0.90*) yield (0.78). The character leaf area has positive and significance association with total dry matter (0.91*), harvest index (0.87*). The character number of seeds per pod has positive and significance association with harvest index (0.95*) and plant dry matter (0.88). Similar findings were reported by Muthuraj *et al.* (2002); Bhamaraj *et al.* (2014) and Goswami *et al.* (2017).

The character harvest index has positive and significance association with, number of pod per plant (0.84*), number seeds per pod (0.95*) germination (%)

Table 1 : Correlation co-efficient between yield and yield attributes in soybean

Character	50% flowering	Days to harvest	100 seed wt	Seed moisture %	Germination %	No. of pods/Plant	No. of branch /90das	Chlorophyll 75 days	Leaf area 75 days	Plant ht 90das	No. of seeds /Pod	Oil content	Protein content	Harvest Index	Dry weight 90 days	Grain yield/ha
50% flowering	1	0.61	-0.64	-0.59	-0.57	-0.77*	-0.59	-0.62	-0.64	-0.27	-0.70	-0.37	-0.25	-0.60	-0.79*	- 0.70
Days to harvest		1	-0.84*	-0.67	-0.59	-0.86*	-0.67	-0.62	-0.66	-0.52	-0.62	0.14	-0.16	-0.64	-0.77*	- 0.62
100 seed wt			1	0.54	0.51	0.79*	0.54	0.56	0.59	0.76*	0.76*	00	00	0.73	0.81*	0.76*
Seed moisture %				1	0.71	0.84*	0.10**	0.66	0.75*	0.02	0.35	0.35	0.54	0.49	0.75	0.35
Germination %					1	0.86*	0.71	0.99**	0.99**	00	0.71	0.64	0.69	0.85*	0.86*	0.71
No. of pods/plant						1	0.84	0.87**	0.91**	0.34	0.77*	0.36	0.41	0.84*	0.97**	0.71*
No. branch/ plant							1	0.66	0.75*	0.02	0.35	0.35	0.54	0.49*	0.75	0.35
Chlorophyll								1	0.99**	0.08	0.78	0.63	0.51	0.90**	0.89**	0.78*
Leaf area									1	0.08	0.75	0.61	0.64	0.87**	0.91**	0.75
Plant height										1	0.59	-0.31	-0.62	0.46	0.43	0.59
No. of seed/pod											1	0.41	0.07	0.95**	0.88**	0.10*
Oil content												1	0.56	0.51	0.47	0.41
Protein content													1	0.25	0.32	0.07
Harvest index														1	0.92**	0.95**
Dry weight															1	0.88*

(0.85*), leaf area (0.87*), chlorophyll content (0.90*) number of branches (0.49*) and grain yield.(0.95*). The character total dry matter at 90 days has positive and significance association with number of pod/plant (0.97*), number seeds per pod (0.88) germination (%) (0.86), leaf area (0.91), chlorophyll content (0.89). Plant height (90DAS) (0.43), number of branches (0.75), harvest index (0.92*), test weight (0.81), grain yield. (0.88*) Other characters days to harvest (-0.77*) and days to 50 per cent flowering (-0.79*) has negative association. The character grain yield has positive significance association with 100 seed weight (0.76*). Number of pods per plant (0.71*), chlorophyll content (0.78*), number of seeds per pod (1*), harvest index (0.95*) and dry weight (0.88*). The results are in agreements with the reports of Tagade *et al.* (1998); Brooker *et al.* (2007); Jitendra *et al.* (2007); Joshi *et al.* (2014) and Solanke *et al.* (2018).

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