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RESEARCH ARTICLE

Effect of seed coating on seed quality and yield of soybean [*Glycine max* (L.) Merrill]

H.V. Kalpande, P.S. Chavan, S.B. Borgaonkar and A. B. Bagade

SUMMARY

An investigation on effect of seed coating on seed quality and yield of 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. The experiment was conducted to study effect of different seed coating treatments such as seed on quality and yield of soybean. From the present investigation it was observed that T_4 (T_3+GA_3) 100ppm followed by T_6-(T_3+ NAA50ppm) and T_7 - (T_3+IAA) 50ppm, recorded higher seed quality and yield contributing traits. Mean days for 50 per cent flowering and mean days to harvest found non-significant. Treatment T_4- (T_3+GA_3 100ppm) found superior in increasing plant height over treatment T_5- (T_3+CCC100ppm).In treatment T_4-(T_3+GA_3) 100ppm was found superior for number of branches, leaf area content, chlorophyll content, number of pods per plant, number of seed per pod. Yield per plot and per ha., test weight, harvest index followed by treatments T_6- (T_3+NAA50ppm) and T_7-(T_3+IAA 50ppm than all other seed coating treatments over the control. Biochemical studies found that, oil content and protein content higher in T_7-(T_3+IAA50ppm) followed by treatments T_6-(T_3+ NAA50ppm) and T_5-(T_3+CCC100ppm) than all other coating treatments over the control. Seed germination (%), seed moisture (%), plant total dry weight, was significantly in treatment T_4- (T_3 + $GA_3$100ppm) followed by treatments T_6-(T_3+ NAA50ppm) and T_7-(T_3+IAA50ppm) than all other seed coating treatments over the untreated seed.

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 upto 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. Under field conditions seeds are known to harbor several fungi, which affect their health seriously causing germination failures, partial to complete death of seedlings. Seed borne pathogens declines seed viability and vigour both in storage and field conditions and causes yield losses subsequently in the field (Gupta and Aneja, 2000). Therefore, disease free seed production of soybean is utmost important to sustain the productivity and maintain the quality of the crop. As seed coating is very essential to reduce the losses due to these 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 (Mucke, 1987). 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.

MATERIAL AND METHODS

The sowing was done in *Kharif* season 2018 at experimental farm of Department of Agril. Botany, VNMKV, Parbhani. The sowing was done on 05 July 2018 in *Kharif* season. The sowing was done by dibbling the seed with spacing of 45x5cm with plot size 4.5 x 2.5M 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 signifiacne of treatments.

RESULTS AND DISCUSSION

Plant height is an important morphological parameter and is a major component of the yield. Plant height at different crop growth stages is presented in the Table 1 which recorded that all the coating treatments have significant effect on plant height over treatments T_5-(T_3+CCC).The treatment T_4- (T_3+ GA_3) was significantly superior over other treatments to increase plant height at all other stages of observation followed by treatment T_6- (T_3+NAA) and treatment T_7- (T_3+IAA).

Number of branches is an important yield contributing parameter. Number of branches at different crop growth stages is presented in the Table 1 which shows that all the coating treatments have significant effect on number of branches per plant over control at all stages of crop growth. The treatment T_4-(T_3+ GA_3) increased the number of branches per plant followed by treatment T_6- (T_3+ NAA) and treatment T_7-(T_3+IAA).

Leaf area is an important morphological parameter and is a major component of the yield. Leaf area at different crop growth stages is presented in the Table 1 which shows that all the coating treatments have significant effect leaf area over control. Leaf area increased upto 75 DAS, there after it decreased due to profuse leaf shedding. The data for yield and quality characters is presented in Table 1. The treatment T_4-(T_3+GA_3) was found significantly superior over all the treatment to increase mean leaf area per plant at 45 and 75 DAS followed by treatment T_6- (T_3+NAA) and treatment T_7-(T_3+IAA) increasing mean leaf area per plant as compared to rest of the treatment. The data on mean chlorophyll content in leaf was presented in Table 1. It indicated that the difference among treatments were significant. The treatment T_4-(T_3+GA_3) was found significantly superior over all the treatments followed by treatment T_6- (T_3+NAA) and treatment T_7-(T_3+IAA). Number of pods per plant recorded at harvest was presented in the Table 1 and found to be significant. Data ranges from 31.17 (T_1) to 38.47 (T_4) per plant. Treatment T_4– (T_3+GA_3) recorded highest number of pods per plant (38.47 pods) followed by T_6- (T_3+NAA) (37.40 pods) and T_7-(T_3+IAA) (36.77pods). All the seed

Table 1: Mean values of seed quality and quantitative characters in soybean

Trait / Treatments	Days to 50 % flowering	Plant height	Number of branches / plant	Chlorophyll Content	Leaf area	Number of pods per plant	Number of seeds per pods
T_1 (Untreated seeds)	39.60	48.27	6.20	38.43	36.13	31.17	2.25
T_2 (Polymer coating polycot 3ml/kg)	39.50	48.50	6.90	40.40	40.40	35.07	2.29
T_3 (T_2+Vitavax 3g/kg)	39.40	49.17	6.93	41.53	41.53	35.13	2.35
T_4 (T_3+$GA_3$100ppm)	37.57	50.13	7.23	47.57	47.57	38.47	2.70
T_5 (T_3+CCC 100ppm)	38.83	43.07	6.97	45.73	45.73	35.17	2.45
T_6 (T_3+NAA50ppm)	37.73	49.87	7.20	46.73	46.73	37.40	2.63
T_7 (T_3+IAA50 PPM)	37.97	49.47	7.13	46.57	46.57	36.77	2.57
S.E.±	0.60	0.26	0.14	0.51	0.51	0.83	0.08
C.D. (P=0.05)	NS	0.79	0.45	1.57	1.56	2.55	0.24
Trait / Treatments	Seed moisture (%)	Seed germination (%)	Protein content of seed (%)	oil content of seed (%)	Biological yield (q/ha)	Harvest index (%)	Grain yield (q/ha)
T_1. (Untreated seeds)	8.50	83.33	38.30	19.07	46.93	40.72	19.10
T_2. (Polymer coating polycot 3ml/kg)	8.53	85.57	38.57	19.10	47.37	41.65	19.69
T_3.(T_2+Vitavax 3g/kg)	8.57	88.80	39.20	19.23	47.82	44.60	21.33
T_4 (T_3+$GA_3$100ppm)	9.07	95.23	39.37	19.40	51.64	46.80	24.14
T_5 (T_3+CCC 100ppm)	8.67	93.63	39.60	19.50	49.51	44.69	22.12
T_6 (T_3+NAA50ppm)	9.03	94.43	39.63	19.67	50.10	46.16	23.73
T_7 (T_3+IAA50 PPM)	8.97	94.10	41.53	19.80	50.04	44.92	22.45
S.E.±	0.12	0.18	0.10	0.07	7.02	6.45	9.36
C.D. (P=0.05)	0.38	0.56	0.32	0.23	21.6	17.85	28.8

coating treatments produced more number of pods per plants than control (31.17 pods). Number of seeds per pods recorded at harvest was presented in the Table 1 and found to be significant. Data ranges from 2.25 seeds (T_1) to 2.70 (T_4) per pod. Treatment T_4- (T_3+GA_3) recorded highest number of seeds per pods (2.70 seeds) followed by T_6-(T_3+NAA) (2.63 seeds) and T_7-(T_3+IAA) (2.57 seeds).

Test weight in gram was presented in the Table 1 which was found to be significant. All the different seed coating treatments have the significant difference in terms of test weight. Data ranges from 11.37 g (T_1) to 11.97 g (T_4) for test weight. Highest test weight was recorded by treatment T_4-(T_3+GA_3) (11.97 g), followed by treatment T_6-(T_3+NAA) (11.63 g) and treatment T_7–(T_3+IAA) (11.37g). Lowest seed yield per ha was recorded by control (10.37g). Similar results were reported by Tagade *et al*. (1998); John *et al*. (2005); Islam *et al*. (2009) and Bony *et al.* (2017).

Data on grain yield (q/ha), biological yield (q/ha) and harvest index were record and presented in Table 1. The data indicate that the difference among the treatments were significant over control. Among the treatments highest yield was recorded by treatment T_4-(T_3+GA_3) followed by treatment T_6-(T_3+NAA) and treatment T_7–(T_3+IAA) Lowest seed yield per hector was recorded by control. Among the treatments highest biological yield was recorded by treatment T_4-(T_3+GA_3) followed by treatment T_6-(T_3+NAA) and treatment T_7–(T_3+IAA) lowest biological yield per hecter was recorded by control. Among the treatments, treatment T_4-(T_3+GA_3) found significantly superior over all treatments to increase mean harvest index followed by treatment T_6-(T_3+NAA) 50ppm and treatment T_7–(T_3+IAA50 ppm). Seed protein content in percentage was presented in the Table 1 which was found to be significant. Data ranges from 38.30 (T_1) to 41.53 % (T_5) for protein content. Higher protein content was recorded by treatment T_7-T_3+IAA (41.53%), followed by treatment T_6-(T_3+NAA) (39.63%) and treatment T_5- (T_3+CCC) (39.60%). Lowest protein content was recorded by untreated seed (38.30).

Seed yield per plot in kg was presented in the Table 1 which was found to be significant. All the different seed coating treatments have the significant difference in terms of seed yield per plot. Data ranges from 2.15 to 2.72 kg for seed yield per plot. Higher seed yield per plot was recorded by treatment T_4-T_3+GA_3 (2.72 kg), followed by treatment T_6-T_3+NAA (2.67kg) and treatment T_7-T_3+IAA (2.53 kg) Lowest seed yield per plot was recorded by control (2.15kg). Seed yield per ha in quintal was presented in the Table 1 which was found to be significant. All the different seed coating treatments have the significant difference in terms of seed yield per ha. Data ranges from 19.11 quintal (T_1) to 24.17 qt (T_4) for seed yield per hector. Higher seed yield per plant was recorded by treatment T_4-(T_3+GA_3) (24.17qt), followed by treatment T_6-(T_3+NAA) (23.73qt) and treatment T_7-(T_3+IAA) (22.48 qt). Lowest seed yield per hector was recorded by control (19.11quintel). Similar result were reported by Salunkhe *et al.* (2008) in soybean, Kalyankar *et al.* (2007) in soybean and Dhage *et al.* (2011).

REFERENCES

Bony, R.K., Rajeswari, B., Jhansi, K. and Keshavulu, K. (2017). Effect of seed coating on field performance in soybean. *Int.J. Curr. Microbial. App.Sci.,* **6** (11): 4304-4311.

Dhage, A.A., Nagre, P.K., Bhangare, K.K. and Papu, Anandkumar (2011). Effect of plant growth regulators on growth and yield parameter of okra. *Asian J. Hort.,* **6** (1) : 170.

Gupta, Anuja and Aneja, K.R. (2000). Effect of seed treating chemicals on seed yield and quality in soybean seed *Res.,* **28** : 54-58.

Islam, M.R., Prodhan, A.K.M., Islam, M.O., Kohinar, H. and Uddin, M.K. (2009). Effect of a plant growth regulator on growth characters and yield of blackgram. *Bull. Inst. Trop. Agr, Kyshu Univ.,* **32** :1-8.

John, S. S., Bharathi, A., Natesan, P. and Raja, K. (2005). Effect of polymer coating on germination and seedling vigour in maize cv. Co 1. *Karnataka J. Agric. Sci.,* **18** (2) : 343-348.

Kalyankar, S.V., Kadam, G.R., Borgaonkar, S.B., Deshmukh, D.D. and Kadam, B.P. (2007). Effect of foliar application of growth regulators on seed yield and yield copmontents of soybean. *Asian J. Bio Sci.,***3** (1): 229-230.

Mucke, J.D. (1987). The regulation of water transport in pelleted sugar beet seed. *J. Agron. & Crop Sci.,* **161**: 79-83.

Panse V.G. and Sukhatme, P.V. (1985). *Statistical methods for Agricutural workers.* ICAR Publ. New Delhi, India.

Ramesh, R. and Ramprasad, E. (2013). Effect of plant growth regulators on morphological physiological and biochemical parameters of soybean. *Helix.*, **6** : 441-447.

Solanke, A.P., Pawar, G.S., Dhadge, S.R. and Kamble, B.G. (2018). Effect of plant growth regulators on growth and yield of soybean [*Glycine max* (L.) Merrill.] applied at different stages. *Internat. J. Chemical Studies*, **6**(5): 2962-2966.

Tagade, R., Deotale, R.D. Sable, S. and Chore, C.N. (1998). Effect of growth regulators on biochemical aspects and yield of soybean. *J. Soils Crops*, **8** (2) : 172-175.