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Short Communication

Effect of seed coating with synthetic polymer and additives on growth parameters and seed yield of soybean [*Glycine max* (L.) Merrill.]

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Abstract

A field experiment was conducted at Experimental Farm of Seed Science and Technology, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur during *Kharif* 2014 to study the effect of seed coating with synthetic polymer and additives on growth parameters and seed yield of soybean [*Glycine max* (L.) Merrill.] cv. Hara soya. The seeds were coated with 7 different treatments of polymer, fungicides, insecticide, polymer-fungicides and polymer-insecticide combinations. Seed coating exhibited significant effect on plant height (cm), branches per plant, pods per plant, empty pods per plant, pod length (cm), seeds per pod, 100-seed weight, seeds per plant and seed yield (q/ha). Amongst various coating treatments, seed coated with polymer @ 3.0 ml per kg of seed and flowable thiram @ 2.4 ml per kg of seed (T_3) recorded highest pods per plant (71), pod length (4.30 cm), seeds per plant (162), 100-seed weight (18.40) and seed yield (25 q/ha) as compared to untreated control (T_0).

Key words: Soybean, synthetic polymer, additives, growth parameters and seed yield.

Soybean [*Glycine max* (L.) Merrill] is an important leguminous oilseed crop in India. It has become a miracle crop of the twentieth century. It is one of the most important protein and oil seed crop and occupies third place both in seed and oil production in the world. It contains about 40 per cent protein and 20 per cent oil content (Singh and Chung 2007). Its protein is rich in lysine and oil in essential fatty acids like Omega-3 and Omega-6. In addition it is good source of dietary fibres, vitamins and minerals, hence termed as "miracle crop". It also contains various phytochemicals such as isoflavones (genistein, daidzein and glycitein) that protect human body from chronic diseases such as prostate cancer, diabetes, osteoporosis, blood pressure, postmenopausal syndromes, coronary heart diseases etc. A number of protein rich products like soy- milk, soy-paneer (TOFU), soy-sauce, soy flour etc. are produced from soybean seeds. In India, soybean has come up as the main oilseed crop in a short span of time. Starting from just 0.03 million ha in 1970, the area under soybean crop has increased to 10.69 million hectares with a production of 14.14 million tonnes and productivity of 12.24 quintals per hectare during 2013-14 (Anonymous 2014). In Himachal Pradesh, it occupies an area of 601 ha with a production of 837 tonnes and productivity of 13.93 quintal per hectare (Anonymous 2013) and has a lot of scope for further expansion in terms of area and production in places like Kangra, Mandi and Kullu districts.

The use of high physiological quality seeds is among the best practices for obtaining maximum seed yield. These seeds are more likely to achieve a high performance when exposed to different environmental conditions, expressed in a high percentage and speed of emergence, good stand establishment, good initial seedling development and increased final production (Tillmann and Miranda, 2006). During seed production several strategies are adopted to ensure a high seed yield. Among these, seed coating technology has developed rapidly during the past two decades and provides an economical approach to seed enhancement. It reduces chemical wastage and protects seed from fungal invasion and insects attack. It also improves plant stand, field emergence of seeds and thus increases the seed yield. Therefore, the present study was undertaken to determine the effect of seed coating with synthetic polymer and additives on seed yield and related growth parameters in soybean.

The present study was conducted during *Kharif* 2014 at Experimental Farm of Department of Seed Science and Technology, CSKHPKV, Palampur. Freshly harvested seeds of soybean cv. Hara soya

were dried to about 10 % moisture content, graded to uniform size and used for conducting the present study. Eight treatments viz., T_0 - untreated control, T_1 - polymer coating (polykote 3.0 ml per kg of seed diluted with 5 ml of water), T_2 - flowable thiram (Royal flow 40 SC) @ 2.4 ml per kg of seed, T_3 - polymer + flowable thiram (Royal flow 40 SC) @ 2.4 ml per kg of seed, T_4 - vitavax 200 (containing thiram 37.5% and carboxyl 37.5%) @ 2 g per kg of seed, T_5 - polymer + vitavax 200 (containing thiram 37.5% and carboxil 37.5%) @ 2 g per kg of seed, T_6 - imidacloprid (17.8 % SL) @ 6 ml per kg of seed and T_7 - polymer + imidacloprid (17.8 % SL) @ 6 ml per kg of seed were evaluated in randomized block design (RBD) with four replications. After coating, the seeds of different treatments were dried to original moisture content by keeping the seeds in shade for 72 hours and thereafter the coated seeds of various treatments were used for sowing in field. Ten plants from each plot were selected randomly to records the data on plant height (cm), branches per plant, pods per plant, empty pods per plant, pod length (cm), seeds per pod and 100-seed weight, while days to 50 % flowering, days to 75 % maturity and seed yield (q/ha) were recorded on plot basis. Data were subjected to standard statistical analysis (Panse and Sukhatme 1984).

Polymer coating act as temperature switch and protective coating by regulating the seed coating, intake of water until the soil has warmed to a predetermined temperature. Seed coating provides resistance against mechanical damage in seed drill and thus, improves the seed quality as well as seed appearance (Vanagamudi *et al.* 2003). Modern seed production systems require a high degree of precision in crop establishment. The need for high plant population densities and uniform plant stand requires seeds of high quality that will consistently produce rapid and uniform seedling emergence from each seed sown.

Seed coating treatments recorded significant superiority over control (untreated seeds) for crop growth parameters and yield *viz.,* plant height (cm), primary branches per plant, pods per plant, pods length (cm), 100-seed weight (g) and seed yield (Table 1). However, seed coating treatments showed non-significant effect on days to 50 per cent flowering and days to 75 per cent maturity (Table 1).

Plant height varied significantly for all the treatments. The seed coated with T_3- polymer + flowable thiram @ 2.4 ml/kg of seed recorded significantly higher plant height (65.30 cm) followed by T_5 - polymer + vitavax 200 @ 2 g/kg of seed (64.80 cm) as compared to T_0 -untreated control (62.00 cm). Similar results were recorded by Chaudhry *et al.* (1995) in maize and Kumar *et al.* (2013) in pigeon pea. Significantly higher number of branches (5) was observed for the treatment T_3- polymer + flowable thiram @ 2.4 ml/kg of seed which was at par with T_5 - polymer + vitavax 200 @ 2 g/kg of seed (5) as compared to T_0 - untreated control (3). These results are in agreement with the finding of Shakuntala *et al.* (2010) in sunflower, where seed coated with polymer @ 5 ml/kg of seeds + vitavax (carboxil 37.50% + thiram 37.50%) @ 2 g/kg of seeds + imidacloprid @ 5 g/kg of seeds recorded higher number of branches per plant. The number of pods was significantly influenced by seed coating treatments with polymer and additives. Significantly higher number of pods (71) was observed for the treatment T_3 - polymer + flowable thiram @ 2.4 ml/kg of seed and T_5 - polymer + vitavax 200 @ 2 g/kg of seed (70) as compared to T_0 - untreated control (65). Higher number of pods per plant in seeds coated with polymer and thiram might be due to the higher number of primary branches per plant which in turn increased the number of pods per plant. Similar results were reported by Chikkanna *et al.* (2000) in groundnut, where seeds coated with polymer @ 20.00 g per kg of seeds recorded higher number of pods.

Significantly lesser number of empty pods (3) was recorded for treatment T_3 - polymer + flowable thiram @ 2.4 ml/kg of seed and T_5- polymer + vitavax 200 @ 2 g/kg of seed (3) over T_0-untreated control (5). The pod length varied significantly for all the treatments. Significantly higher pod length (4.30 cm) was observed for the treatment T_3- polymer + flowable thiram @ 2.4 ml/kg of seed which was at par with T_5 - polymer + vitavax 200 @ 2 g/kg of seed (4.28 cm) as compared to T_0- untreated control (4.17 cm). Days to 75 per cent maturity were not significantly influenced by seed treatment with synthetic polymer and additives. Seed coated with polymer + flowable thiram @ 2.4 ml/kg (T_3) of seed recorded significantly higher number of seeds per pod (3) as compared to T_0- untreated control (2). Significantly higher number of seeds per plant (162) was obtained for seeds coated with polymer + flowable thiram @ 2.4 ml/kg of seed which was at par with treatment T_5- polymer + vitavax 200 @ 2 g/kg of seed (158) as compared toT_0- untreated control (151). Seed coated with polymer + flowable thiram @ 2.4 ml/kg of seed (T_3) exhibited significantly highest 100-seed weight (18.40 g) followed by T_5- polymer + vitavax 200 @ 2 g/kg of seed (18.20 g) as compared to T_0- untreated control (17.70). These results are in agreement with the findings by Chikkanna *et al.* (2000) in groundnut.

Table 1. Effect of seed coating with synthetic polymer and additives on growth and yield of Hara soya variety of soybean

Treatment	Days to 50% flowering	Plant height (cm)	Branches per plant	Pods per plant	Empty pods per plant	Pod length (cm)	Days to 75% maturity	Seeds per pod	100-seed weight (g)	Seed yield (q/ha)
T_0	62.50	62.0	3	65	5	4.17	122.25	2	17.70	23.4
T_1	62.50	62.4	4	65	4	4.21	121.75	2	18.00	23.9
T_2	62.00	64.1	4	69	3	4.26	121.75	3	18.20	24.2
T_3	61.50	65.3	5	71	3	4.30	121.50	3	18.40	25.3
T_4	62.00	63.1	4	67	4	4.26	121.75	3	18.20	24.6
T_5	61.50	64.8	5	70	3	4.28	121.25	3	18.20	25.0
T_6	61.75	62.9	4	68	4	4.22	122.00	2	18.10	24.0
T_7	61.75	62.4	4	69	4	4.27	121.75	3	18.10	24.6
Mean	61.94	63.5	4.0	68	4	4.29	121.75	3	18.1	24.4
SE(m±)	0.04	0.66	0.20	0.97	0.25	0.01	0.34	0.08	0.07	0.19
CD (P=0.05)	NS	1.93	0.58	2.84	0.74	0.02	NS	0.23	0.21	0.56

T_0 - control (untreated seeds), T_1 - polymer coating (polykote @ 3 ml/ kg of seed, diluted with 5 ml of water), T_2 - flowable thiram (Royal flow 40 SC) @ 2.4 ml/ kg of seed, T_3 - polymer + flowable thiram (Royal flow 40 SC) @ 2.4 ml/ kg of seed, T_4 - vitavax 200 (containing thiram 37.5% and carboxil 37.5%) @ 2g/ kg of seed, T_5- polymer + vitavax 200 (containing thiram, 37.5% and carboxil, 37.5%) @ 2g/ kg of seed, T_6 - imidacloprid (17.8 % SL) @ 6 ml/ kg of seed, T_7 - polymer + imidacloprid (17.8 % SL) @ 6 ml/ kg seed of seed

Seed yield was significantly higher (25.3 q/ha) in seeds coated with T_3 - polymer + flowable thiram @ 2.4 ml/kg of seed which was at par with T_5- polymer + vitavax 200 @ 2 g/kg of seed(25.0 q/ha) as compared to untreated control (24.2 q/ha). Significant increase in seed yield might be due to increase in yield parameters *viz.*, number of seeds per plant, pod length, number of seeds per pod, seeds per plant and 100-seed weight. Seed coated with polymer and flowable thiram (T_3) recorded superiority for all seed yield related parameters which might be due to slower imbibition rate, lesser seed leakage, lesser fungal invasion and insect attack in seeds coated with polymer and thiram. Similar results were recorded by Shakuntala *et al.* (2010) in sunflower and Zholbolsynova *et al.* (1992) in wheat. During present study, better performance was recorded for the seed treatments with polymer and fungicides. Therefore, seed coating with polymer and fungicides could be used to increase the rate and percentage of seedling emergence. Such seeds can lead to the better germination and uniform stand of well developed seedlings ensuring optimum plant establishment that can further lead to better crop yields.

From the present study it can be concluded that for enhancing seed yield of soybean, seeds can either be treated with polymer + flowable thiram @ 2.4 ml/kg of seed or polymer + vitavax 200 @ 2 g/kg of seed.

References

Anonymous. 2013. Annual Season and Crop Report 2013-14. Directorate of Land Records, Shimla, HP, India.

Anonymous. 2014. All-India area, production and yield of soybean. Proceedings of SOYCON 2014: International Soybean Research Conference, Feb 22-24, Directorate of Soybean Research, Indore, MP, India.

Chaudhry MA, Ahmad T and Khan MFA. 1995. Effect of polymers on germination, plant height and permanent wilting point of maize (*Zea mays* L.) and soybean (*Glycine max* L.). Pakistan Journal of Scientific and Industrial Research **38**: 308-311.

Chikkanna CS, Timmegouda and Ramesh R. 2000. Hydrophilic polymer seed treatment on seed quality and yield in finger millet, cowpea and groundnut. Seeds and Farms **85**: 39-45.

Kumar VSB, Vyakaranahal BS, Dhananjaya P, Yegappa H and Asha AM 2013. Effect of seed polymer coating on field performance and quality of pigeon pea [*Cajanus cajan* (L.) Mill]. Environment and Ecology **31**: 43-46.

Panse VG and Sukhatme PV. 1984. *Statistical Methods for Agriculture Workers*. ICAR, New Delhi, India.

Shakuntala NM, Vyakaranahal BS, Shankergoud I, Deshpande VK, Pujari BT and Nadaf HL. 2010. Effect of seed polymer coating on growth and yield of sunflower hybrid RSFH-130. Karnataka Journal of Agricultural Science **23**: 708-711.

Singh RJ and Chung GH. 2007. Cytogenetics of soybean: Progress and perspectives. The Nucleus **50**: 403-425.

Tillmann MAA and Miranda DM. 2006. Análise de sementes. In: Peske. S.T.; Lucca Filho, O.A.; Barros, ACSA. (Ed.). *Sementes:* fundamentos científicos e tecnológicos, Pelotas: UFPel, p.159-255.

Vanangamudi K, Srimathi P, Natarajan N and Bhaskaran M. 2003. Current scenario of seed coating polymer. *ICAR* - Short Course on Seed Hardening and Pelleting Technologies for Rain Fed or Garden Land Ecosystems, p 80-100.

Zholbolsynova AS, Martin VG and Sushinskaya EE. 1992. Effect of treating wheat and barley grain with polyvinyl alcohol and starch on the quality and productivity of their seed. Izvestiya Timiryazevsoi Selkokhozyaistvennoi Akadomil **6**: 163-166.