Effect of bioagent and seed coating on seed quality parameters in soybean (Glycine max (L.) Merrill.)

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Abstract
A field experiment entitled “Effect of bioagent and seed coating on yield and seed quality parameters in soybean (Glycine max L.) Merrill.” was conducted during kharif 2019 at experimental field of Department of Agriculture Botany, Vasantrao Naik Marathwada Agriculture University, Parbhani. Seed of soybean var. MAUS 162 were coated with polymer in combination with different bioagents and maintained untreated seed (control). After seed treatment, the seed were sown in the field with three replication and seven treatment adopting randomized block design in order to find out the effect of seed treatments on various seed quality parameters. Oil content, protein content, Germination percentage, seedling length, vigour index were significantly superior in treatment T1: T2+ Biomix@6ml followed by T4 T2+ Rhizobium japonicum @6ml than all other seed coating treatments over the control in the soybean var MAUS-162.

Keywords: soybean, seed coating, bio-agents, polymer and seed quality

Introduction
Soybean (Glycine max (L.)) is the wonder crop of the 20th Century, which is commonly referred as ‘miracle crop ‘golden bean’ or gold from soil which belonging to family Leguminosae, sub family Papilionaceae and the genus Glycine L. It is supposed to have originated in China and was introduced to India in 1968 (Bragg cv.) from USA (Nagata, 1970). It is basically a pulse crop and gained the importance as an oil seed crop. Soybean has the unique significance on this age of energy crisis and has a vital role in agriculture, enterprise and export change of India. The 30% of global vegetable oil and 60% of vegetable protein is derived from soybean. Due to high protein content, soybean is known as ‘poor man’s meat’. Recently the area under soybean in our country is increasing year after year due to certain advantages like short duration crop, less pest and disease attack but productivity is not considerably increased and has remained almost stagnant for the past several years. There are numerous reasons for low productivity such as low seed germination poor storability, which low vigour and poor seed quality, lack of use of growth regulators, Micronutrients, biofertilizers and bio fungicides.

Seed coating an effective technique to seed enhancement, in particular for large seeded agronomic and horticultural plants and its major benefit is that the seed enhancement material is placed directly on to the seed. Seed coating material is extremely thin, which permits multiple layers on the seed with 1 to 10% increase in seed weight. The film coat enhances, flow ability of the seed, dust free, safe to handle and has bright colour and quality appearance. Seed coating materials were reported to improve the germination and increase the seedling emergence at changing soil moisture regime mainly in the sub-optimal range (Scott., 1989; Sherin and Susan John., 2003). Application of chemical fungicide has been replaced by biocontrol agents because of emergence of fungicide resistant. In view of the above circumstances, the present investigation was undertaken to study the effect of bioagent and seed coating on seed quality parameters in soybean.

Material and Methods
A field experiment entitled “Effect of bioagent and seed coating on yield and seed quality parameters in soybean (Glycine max L.) MIRRIL.” was conducted during kharif 2019 at experimental field of Department of Agriculture Botany, Vasantrao Naik Marathwada Agriculture University, Parbhani. The experiment was laid out in randomized block design with three replication and seven treatments. The seed were coated with polymer in combination with different bioagents and maintained untreated seed (control). The seed treatments are T1: Untreated seed, T2:Polymer coating@ 3ml/kg, T3 : T2+Tricoderma viride @
5 ml, T₄: T₃+ Rhizobium japonicum @6ml, T₅: T₃+ Phosphorus solubilizing bacteria @6ml, T₆: T₃+ Potash Solubilizing bacteria @6ml, T₇: T₃+ Biomix@6ml. Seed of soybean var. MAUS 162 were coated with polymer in combination with different bioagents and maintained untreated seed (control). The data were collected on various characters. Oil content in percentage was determined by soxlet method. Percentage of oil content was analysed in the sample and observations were recorded for each plot in each replication. Protein content in seed was estimated by using KEL PLUS Nitrogen Estimation System. Standard germination test was conducted by rolled towel paper method as described in the ISTA rules of seed testing (ISTA 1993). After harvesting, the seeds were subjected to germination percentage, vigour index test based on seedling length along with control. Seedling length was measured and mean seedling length was expressed in centimeters. Coated seed are compared with uncoated seed for their quality parameters viz., oil content, protein content, germination percentage, seedling length and seedling vigour index. Seedling vigour index was calculated as per formula given by ISTA (1976).

Seedling Vigour Index = Germination percentage (%) x Mean seedling length (cm)

Result and Discussion
Oil content
Seed Oil Content (%)
Oil content in percentage is presented in the table 1 which was found to be significant. Higher oil content was recorded by treatment T₇: T₃+ Biomix@6ml/Kg of seed (19.23%), followed by treatment T₅: T₃+ Rhizobium japonicum@6ml/kg of seed (19.06%) and Lowest oil content was recorded by T₁: Control seed (18.30%). The mean oil content in seed differed significantly due to application of seed coating which could be due to increased accumulation of hexose sugars at the time of synthesis of triacylglycerol.

Seed Protein Content (%)
The protein content in seed shows significant effect due to seed coating treatments. Protein content in percentage is presented in the table 1 which was found to be significant. Higher protein content was recorded by treatment T₇: T₃+ Biomix@6ml/Kg of seed (40.83%) followed by T₅: T₃+ Rhizobium japonicum@6ml/kg of seed (39.70%) and Lowest protein content was recorded by T₁: Control seed (38.73).

| Treatments          | Oil content (%) | Protein content (%) | Germination (%) | Seedling length | Vigour index |
|---------------------|-----------------|---------------------|-----------------|-----------------|--------------|
| T₁ (Untreated seeds) | 18.30           | 38.73               | 88.00           | 25.88           | 2277         |
| T₂: Polycot @ 3ml/Kg of seed | 18.36               | 39.23               | 88.81           | 26.11           | 2263         |
| T₃: T₃+ Trichoderma viride@5ml/Kg of seed | 19.00               | 39.63               | 90.33           | 27.15           | 2452         |
| T₄: T₃+ Rhizobium japonicum@6ml/kg of seed | 19.06               | 39.70               | 91.00           | 28.06           | 2554         |
| T₅: T₃+ Phosphorus solubilizing bacteria @6ml/kg | 18.70               | 39.40               | 89.00           | 27.08           | 2401         |
| T₆: T₃+ Potash solubilizing bacteria @6ml/seed | 18.63               | 39.33               | 90.33           | 26.48           | 2393         |
| T₇: T₃+ Biomix@6ml/Kg of seed | 19.23               | 40.83               | 92.00           | 28.08           | 2583         |
| SE (m) t          | 0.12             | 0.17                | 0.63            | 0.32            | 125.33       |
| CD at 5%         | 0.37             | 0.55                | 1.98            | 1.02            | 40.22        |

Table 1: Effect of seed coating on Oil content (%), Protein content (%), Germination (%), Seedling length and Vigour index

Conclusion
From the above result it is concluded that seed quality parameters viz., oil content, protein content, germination percentage, seedling length and seedling vigour index were significantly increased due to seed coating with T₁: T₃+ Biomix@6ml/Kg of seed and T₇: Rhizobium japonicum@6ml/kg of seed in soybean var MAUS -162.

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