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Effect of seed coating polymer on seed quality in groundnut (*Arachis hypogeae* L.)

The cultivated groundnut (*Arachis hypogaea* L.) is an important oilseed crop of the world and is believed to be native of Brazil. It belongs to family *Leguminoceae* and introduced into India during early sixteenth century by portugues traders. Groundnut is a primary source of edible oil and has a high oil (44 - 52%) and protein content (25-28%). In India it is grown over an area of 5.52 million hectares with a total production of 9.62 million tonnes with a productivity of 1750 kg per hectare (Anon., 2014a). Karnataka ranks fifth in the country with annual production of 0.65 million tonnes from an area of 0.73 million hectares and an average yield of 907 kg per hectare (Anon, 2014b). In Indian agriculture, different seed treatments are being imposed on crop seeds for a variety of purposes namely for an improvement of field stand and productivity. Among seed treatments, seed polymerization is a physiological method of seed invigoration that enriches the endogenous level of newly bioactive substances (Vijayakumar *et al.*, 2007 and Shakuntala *et al.*, 2010). The polymer film coating may act as physical barrier which has been reported to reduce the leaching of inhibitors from the seed coverings and may restrict oxygen diffusion to the embryo. Thereby, it provides protection from the stress imposed by accelerated ageing, improves plant stand and emergence of seeds. Hence, objective of the present investigation was carried out to standardize the polymer coating dosage and also study the effect of seed coating with polymer on seed quality in groundnut.

The experiment was conducted at the department of Seed Science and Technology, College of Agriculture, University of Agricultural Science, Raichur during 2014-15. The experiment was laid out in Completely Randomize Design with four replications and six treatments *viz.*, P_1- Control, P_2- Polymer @ 2 g per kg of seed, P_3- Polymer @ 4 g per kg of seed, P_4- Polymer @ 6 g per kg of seed, P_5-Polymer @ 8 g per kg of seed, P_6- Polymer @ 10 g per kg of seed. The seeds of groundnut variety Kadari-9 were obtained from ARS, Kadiri, ANGRAU. The liquid polymer Disco Agro DC Red L-603 used in the present study was procured from Incotec Pvt. Ltd. Ahmedabad, Gujarat. The cleaned and graded seeds were coated with different dosages of polymer after diluting with 30 ml distilled water in a rotary seed coating machine available in Department of Seed Science and Technology. Subsequently, seeds were air dried under shade to its original moisture content and tested for seed quality parameters such as germination percentage, shoot length, root length, seedling dry weight, seedling vigour index and speed of germination. The germination test was conducted as per ISTA procedure (Anon., 2014b) using between paper method. The fifty seeds of four replications each counted and placed at equidistance in the wet germination paper. The rolled paper towels were placed at slanting position in cabinet seed germinator at constant temperature of 25± 1^{0}C and 95±1 per cent relative humidity. The number of normal seedlings counted at the end of tenth day as count of germination and expressed in percentage. The ten normal seedlings were selected at random at tenth day of germination test and root and shoot lengths were measured for these ten seedlings and mean was calculated and expressed in centimeters. The same ten seedlings were dried in hot air oven at 80 -^{0}C for 24 hours and cooled in desiccators for 30 minutes and the weight of the dry seedlings were recorded using electronic balance and was expressed in gram (g) per 10 seedlings. (Evans and Bhatt, 1977). Vigour index (VI) was calculated by adopting the method suggested by Abdul-Baki and Anderson (1973) and expressed as whole number. Seeds which were germinated on paper medium with four replications of 50 seeds each and the daily germination counts were taken up to final count. The speed of germination was calculated by using the formula given by Maguire in (1962).

$$\text{Speed of germination} = \frac{G_1}{D_1} + \frac{G_2}{D_2} + \frac{}{} + \frac{G_n}{D_n}$$

Where,

G_1, G_2, ... G_n are the number of seeds germinated on D_1, D_2, ... D_n day. The data were statistically analyzed by using Completely Randomized Design.

All the seed quality parameters showed significant variation due to seed coating with polymer. Among the different polymer dosages, the seeds coated with polymer at (4 ml polymer kg^{-1} of seed) (P_3) recorded significantly highest seed germination (77.00 %) and it was on par with P_4 (6 ml polymer kg^{-1} of seed) (76.62 %) treatment, whereas, lowest germination was recorded in control (74.00 %) (P_1) (Table 1). The increase in germination percentage might be due to the hydrophilic nature of the polymer that has increased imbibition rate which led to faster activation of cells and resulted in the enhancement of mitochondrial activity leading to the formation of more high energy compounds and vital biomolecules, which were made available during the early phase of germination and reduced imbibitional damage by regulating the water uptake. These findings are in agreement with those of earlier researchers in soybean (Imran Baig, 2005). Similarly, seedling length differed significantly due to polymer coating. Among the polymer coating, the seeds coated with polymer @ 4ml per kg of seed (P_3) recorded significantly higher shoot length (15.99 cm) and root length (6.14 cm) as compared to control (13.54 cm and 4.02 cm) (Table 1). This increase in total seedling length may be due to increase in shoot length and root length. This might be due to the beneficial effect of polymer which enhanced metabolic activities in early phase of germination and thereby better seedling growth was observed. These findings were in accordance with the reports of Suma and Srimathi (2014) in sesamum with polymer @ 4 g per kg of seed and Sherin *et al.* (2005) in maize with polymer @ 3 g per kg of seed. Seedling dry weight differed significantly due to seed coating with polymer. The seedling dry weight which is directly dependent on the total seedling length (shoot and root length) and significantly higher seedling dry weight was noticed with the seeds treated with polymer @ 4 ml per kg of seed (P_3) (1.25 g) and was superior over control (P_1) which recorded minimum seedling dry weight (0.89 g) as indicated in Table 1. The possible reason may be the influence of polymer on seed germination and seedling length. The results are in agreement with the findings of Vijaykumar *et al.* (2007) in cotton. The speed

Table 1. Standardization of seed coating polymer in groundnut

Treatment	Germination (%)	Shoot length (cm)	Root length (cm)	Seedling dry weight (g)	Speed of germination	Seedling vigour index
P_1: control	74.00	13.54	4.02	0.89	17.57	1326
P_2: 2 ml per kg of seed	75.75	13.83	4.53	0.92	18.35	1400
P_3: 4 ml per kg of seed	77.00	15.99	6.14	1.25	22.13	1725
P_4: 6 ml per kg of seed	76.62	15.04	5.26	1.03	20.29	1562
P_5: 8 ml per kg of seed	75.00	13.85	4.68	0.92	18.53	1371
P_6: 10 ml per kg of seed	74.50	13.57	4.64	0.92	18.20	1374
Mean	74.00	13.57	4.88	0.98	18.20	1459
S.Em±	0.40	0.42	0.11	0.04	0.04	39.0
C.D. (p=0.01)	1.18	1.27	0.35	0.13	0.13	117

of germination was also found significantly higher with the seeds coated with polymer at 4 ml per kg of seed (22.13) compared to control (17.57) (Table 1) and 6 ml per kg of seed was found to be on par. The increase in speed of germination of polymer coated seed may be due to its hydrophilic nature and higher water uptake which resulted in quicker radicle emergence. It may also due to increase in the rate of moisture imbibition where the fine particles in the polymer coating act as a 'wick' or moisture attracting material or perhaps improves the seed surface area as opined by Manjunatha *et al.* (2008) in chilli. Seedling vigour index is the most important aspect of seed quality as it decides the vigour level or performance of a seed. Significantly highest seedling vigour index was recorded in P_3 treatment (4 ml polymer kg^{-1} of seed) (1725). While, the lowest seedling vigour index was observed in control (1326) (P_1). The beneficial effect of polymer coating that might be the reason for better seedling growth and vigour. It might be also due to enhanced metabolic activities in early phases of germination. Similar results were also obtained by Geetharani (2006) in chilli, Vinodkumar *et al.* (2013) in pigeon pea, Suma and Srimathi (2014) in sesame and Verma and Verma (2014) in soybean.

The present investigation revealed that the seed coated with polymer @ 4ml per kg seed is found more ideal and effective dosage for getting better germination and vigour index in groundnut.

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