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SEED QUALITY ENHANCEMENT IN BHENDI (ABELMOSCHUS ESCULENTUS L) CV. ARKA ANAMIKA BY POLYMER SEED COATING

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Abstract:

An experiment was conducted to evaluate the influence of polymer and polymer in combination with thiram and imidacloprid for seed quality enhancement in bhendi. Seeds of bhendi cv. *Arka anamika* was used for coating purpose with 4 coating treatments *viz*, T_1 (control), T_2 (polymer @ 6 ml kg^{-1}), T_3 (polymer @ 6 ml kg^{-1} + thiram @ 2 g kg^{-1}), T_4 (polymer @ 6 ml kg^{-1} + imidacloprid @ 1 ml kg^{-1}) of seeds and stored in cloth bag. The results showed that polymer coating in general have deteriorated at slower rate compared to control and polymer coating @ 6 ml kg^{-1} + Imidacloprid @ 1 ml kg^{-1} of seeds was effective in maintaining quality of seeds for 5 months of storage followed by seeds coating with polymer @ 6 ml kg^{-1} + thiram @ 2 g kg^{-1} of seeds.

Key Words: Polymer Seed Coating, Bhendi & Germination

Introduction:

Bhendi (*Abelmoschus esculentus* L.) is a fruit vegetable grown in tropical and subtropical parts of the world (Swarup, 2012) and native of tropical Africa. It is cultivated for its tender green fruit which is largely used as fresh vegetable (Choudhary, 1979). It is considered as power house of nutrients. The fruit consists of 2.4 g of protein, 7.6 gm carbohydrate, 92 mg of calcium, 51 mg of phosphorus, 0.6 mg of iron and 249 mg of potassium per 100 g of fresh weight. It contains calcium, magnesium, potassium, iron and vitamins A, B & C. India is the second largest cultivator of bhendi with an area of 5.18 lakh hectares with the production of 62.5 lakh tones (NHB, 2011). In India, bhendi is cultivated in Uttar Pradesh, Bihar, Gujarat, Orissa, West Bengal, Andhra Pradesh, Karnataka and Assam.

The root and stem of bhendi are used for clarification of sugarcane juice. Matured fruit and stem are used in the paper industry. The greenish yellow edible oil has a pleasant taste and odour and is high in unsaturated fats such as oleic acid & linoleic acid.

Seed is the basic and crucial input in agriculture. Germination and emergence of bhendi seed under field condition is poor due to inadequate or excess soil moisture and low soil temperature. Bhendi is sensitive to low temperature and grows poorly below 15°C (Marsh, 1992). The adverse effects of biotic and abiotic stresses can be overcome by various physical and chemical treatments known as seed enhancement treatments. Seed enhancement is post harvest treatments that improves germination and facilitates the delivery of seed and other material required at the time of sowing. Seed enhancement treatments are used to achieve rapid and uniform germination (Pandita and Nagarajan, 2010; Bharwaj *et al.*, 2012). Various seed quality enhancement treatments are seed pelleting, seed colouring, seed hardening and seed coating. Among the various seed treatments, seed coating improves the performance of the seed.

Seed coating is a process in which the chemical ingredients are coated on the seed for direct delivery at the time of emergence and improving imbibition of seeds. Chachalis and Smith (2001) reported that polymer coating @ 24 mg per kg of seed regulated the rate of water uptake, reduced imbibitional damage and improved germination and seedling emergence in soybean.

Polymer is a film coating chemical applied over the seeds without significantly increase the size, shape and weight of the seed. This kind of plasticizer polymer form flexible film that prevents dusting off and loss of fungicides during handling and is readily soluble in water without affecting normal germination (Sherin Susan John, 2003). The application of polymer to seed serves as an outer shell to give the desired seed characters *viz.*, quick water uptake and enhanced germination that would be beneficial for better emergence and establishment (Taylor *et al.*, 1998).

Film coating provides protection from the stress imposed by accelerated ageing including fungal invasion. It improves plant stand and emergence of seeds. Though there are number of published results indicating varied affect of polymer coating, it has been imperative to explore the effect of polymer coating on seed quality in bhendi.

Materials and Methods:

The freshly harvested bulk seeds of bhendi cv. *Arka anamika* was collected from Vegetable Research Station, Palur, Tamil Nadu. The seeds were cleaned and dried to moisture content of less than 10 per cent and used for study. The experiment consisted of various treatments *viz.*,

T_1 - Control

T_2 – Polymer @ 6 ml kg^{-1}

T_3 – Polymer @ 6 ml kg^{-1} + Thiram @ 2 gm kg^{-1}

T_4 – Polymer @ 6 ml kg^{-1} + Imidacloprid @ 1 ml kg^{-1}

The treated seeds were dried under shade to bring back its original moisture content and stored in cloth bag for 5 months, under ambient conditions of Annamalainagar, Tamil Nadu.

The laboratory experiments were conducted in the Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai Univeristy with FCRD in three replications.

Details of Various Lab Experiments are:

- ✓ Germination Percent
- ✓ Root Length
- ✓ Shoot Length
- ✓ Vigour Index
- ✓ Seedling Dry Weight
- ✓ Electrical Conductivity
- ✓ Speed of Germination
- ✓ Moisture Content

The statistical analysis was done as per the procedures described by Panse and Sukhatme *et al.* (1985).

Results and Discussion:

Polymer seed coating did not exhibit any significant improvement immediately on germination, root length, shoot length, vigour index and electrical conductivity, however T_4 (polymer @ 6 ml kg^{-1} + Imidacloprid 1 ml kg^{-1}) recorded higher germination after natural ageing (68%) over control (61%). After 5 months of storage period T_4 (polymer coating @ 6 ml kg^{-1} + Imidacloprid 1 ml kg^{-1}) recorded higher root length (6.60 cm) followed by T_3 (polymer seed coating @ 6 ml kg^{-1} + Thiram @ 2 gm kg^{-1}) (6.29 cm) over control (5.23 cm) (Table 1). But seeds coated with polymer @ 6 ml kg^{-1} + Thiram @ 2 g m kg^{-1} was effective in minimizing the deterioration recording higher values (7.96 cm, 6.26 cm) for before and after natural ageing. Similar findings were observed by Sherin Shusan and Bharathi (2006) in maize and Nisar *et al.* (2006) in soybean.

Seeds treated with polymer @ 6 ml kg^{-1} + Imidacloprid @ 1 ml kg^{-1} coating recorded highest shoot length (12.38 cm and 11.00 cm) for before and after natural ageing, while the control seeds recorded the least value (10.46 cm and 9.73 cm). But polymer 6 ml kg^{-1} + Thiram @ 2 gm kg^{-1} coated seeds was effective in minimizing the deterioration recording higher values (11.80 cm and 11.40 cm) for before and after natural ageing (Table 1). Seeds treated with polymer 6 ml kg^{-1} + Imidacloprid @ 1 ml kg^{-1} coating recorded highest vigour index (1414 and 1287 for before and after natural ageing) followed by seeds treated with polymer 6 ml kg^{-1} + Thiram @ 2 gm kg^{-1} 1350 and 1147 before and after natural ageing, while the control seeds recorded the least vigour index (1128 and 912) before and after natural ageing (Table 1).

Seeds treated with polymer @ 6 ml kg^{-1} + Imidacloprid @ 1 ml kg^{-1} coating recorded minimal electrical conductivity of seed leachates (149.5 and 178.9 dSm^{-1}) for before and after natural ageing, while the control recorded the higher electrical conductivity of seed leachates (196.8 and 235.7 dSm^{-1}) for before and after natural ageing (Table 1).

The decline in germination is attributed to ageing leading to depletion of food reserves and decline in synthetic activity of embryo apart from death of seeds, because of fungal invasion, insect damage and storage conditions. Thiram acted as protective agent against fungal invasion and physiological ageing (Savitri *et al.,* 1994). The film formed around the seed act as physical barrier, reducing leaching of inhibitors from the seed covering and may restrict oxygen diffusion to the embryo (Duan and Burris, 1997). The higher germination per cent in polymer coated seed is due to increase in the rate of imbibition where the fine particle in the coating acts as "wick" or moisture attracting material to improve germination. Damage to membrane, is the cause for loss of vigour and viability during ageing (Roberts, 1979) and is the reflection of seed deterioration accompanied by alterations in the membranes of aged seeds (Parish and Leopold, 1979). In the present study, the electrical conductivity was minimum in polymer coated seeds and the highest in control and after ageing which indicates the operation of repair mechanism brought out by treatment with polymer coated seeds.

The present investigation revealed that, polymer coated seeds in general have deteriorated at slower phase when compared to control that has been manifested in higher germination over control. It is due to coated seeds maintained high vigour due to slower deterioration. It is concluded that polymer coating 6 ml kg^{-1} + Imidacloprid @ 1 ml kg^{-1} was found to be very effective in maintaining quality of bhendi seeds.

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Table 1: Polymer coating for seed quality maintenance in bhendi during storage

Treatment	Germination (%)		Root length (cm)		Shoot length (cm)		Vigour Index		Seedling Dry Weight		Electrical Conductivity	
	BA	NA	BA	NA	BA	NA	BA	NA	BA	NA	BA	NA
T_1	70	61	5.66	5.23	10.46	9.73	1128	912	0.17	0.10	196.0	235.7
T_2	71	62	6.58	5.91	11.50	10.83	1283	1037	0.25	0.16	182.0	219.1
T_3	72	65	6.96	6.26	11.80	11.40	1350	1147	0.27	0.19	165.8	197.5
T_4	2	68	7.31	6.60	12.33	11.00	1414	1287	0.30	0.19	149.5	178.9
Mean	66	63	6.62	6.0	11.52	10.89	12.94	1083	0.24	0.16	173.5	207.8
S.Ed.			0.008	0.082	0.072	0.08	18.36	21.02	0.009	0.005	0.955	0.799
CD 5%			0.018	0.018	0.018	0.019	31.54	43.12	0.019	0.012	1.951	0.163

T_1 – Control
T_2 – Polymer @ 6 ml kg^{-1}
T_3 – Polymer @ 6 ml kg^{-1} + Thiram 2 gm kg^{-1}
T_4 – Polymer @ 6 ml kg^{-1} + Imidacloprid @ 1 ml kg^{-1}
BA – Before ageing
NA – Natural ageing