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Research Notes

Influence of film coating with polykote on seed quality characteristics of cluster bean *(Cyamopsis tetragonoloba* (L.) Taub.)

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Cluster bean *[Cyamopsis tetragonoloba* (L.) Taub.] popularly known as *guar* is a drought hardy, deep-rooted, summer annual legume, grown as feed, fodder and green manure. This crop is susceptible to water stagnation and as well as severe drought condition and hence the seed germination, emergence and establishment are very difficult under these conditions. In general, the germination of seed is highly influenced by moisture status of the substrate (Datta and Dayal, 1988). In order to get better establishment under very low and very high moisture status, film coating technology with polykote alone and in combination with fungicides and halogens will be highly useful. Seed coating technology

Table 1. Influence of polykote film coating and accelerated ageing on germination (%) of cluster bean

Film coating treatments (T)	Days after accelerated ageing (D)						
	0	2	4	6	8	10	Mean
Control	89(70.63)	87(68.87)	75(60.00)	60 (50.77)	49 (44.43)	32 (34.45)	65(53.73)
Dry coating (3g kg^{-1})	92(73.57)	92 (73.57)	80 (63.43)	65(53.73)	57 (49.02)	50 (45.00)	73 (58.69)
Slurry coating (3g kg^{-1} + 5ml of water)	95 (77.08)	93 (74.66)	83 (65.65)	66(54.33)	61(51.35)	52 (36.20)	75 (60.00)
Slurry coating + halogen mixture (3gkg^{-1})	95 (77.08)	94 (75.82)	85 (67.21)	67 (54.94)	61 (51.35)	54 (47.29)	77 (61.34)
Slurry coating + bavistin (2gkg^{-1})	97 (80.03)	95 (77.08)	90(71.57)	73 (58.69)	65(53.73)	58 (49.60)	80 (63.43)
Mean	94(75.82)	92(73.57)	83 (65.65)	69 (56.17)	59 (50.18)	49 (44.43)	74 (5934)
	T	D	TxD				
SEd	0.758	0.830	1.856				
CD (P=0.05)	1.547	1.695	NS				

(Figures in parentheses indicate arc sine transformed values)

Table 2. Influence of polykote film coating and accelerated ageing on vigour index of cluster bean

Film coating treatments (T)	Days after accelerated ageing (D)						
	0	2	4	6	8	10	Mean
Control	2737	2571	2014	1323	863	391	1650
Dry coating (3g kg^{-1})	2900	2804	2244	1605	1318	880	1959
Slurry coating (3g kg^{-1} + 5ml of water)	3036	2932	2391	1713	1274	944	2048
Slurry coating + halogen mixture (3gkg^{-1})	3117	2958	2577	1848	1479	1093	2179
Slurry coating + bavistin (2gkg^{-1})	3187	3024	2763	2059	1619	1206	2310
Mean	2995	2858	2398	1710	1310	903	2029

	T	D	TxD
SEd	116	128	244
CD (P=0.05)	238	261	NS

has developed rapidly during the past two decades and provides an economical approach to seed enhancement. An advantage of seed coating is that the seed enhancement material (fungicide, insecticide, or micronutrient) is placed directly on the seed without obscuring the seed shape. Film coating is the process of applying a colored polymer film material on the seed surface that completely covers the seed and it has been applied to commercial seeds as an effective delivery system for agrochemicals. In addition to that, the polymers are hydrophilic in nature and they are considered to be prolonging the moisture supply under stress condition. These polymers are having the capacity to absorb water about 100 to 1000 times of their weight from the surrounding rhizosphere. Hence, the use of film coating with polykote for the improvement in the germinability of the seeds as a stress management practice was studied along with the methods to preserve the polycoated seeds with high vigour and viability for longer periods through accelerated ageing.

Cleaned and graded seeds of cluster bean cv. Pusji Navbhagar were film coated with green colour polymer obtained from M/S. Little's Oriental Balm and Pharmaceuticals Ltd., Chennai. The different coating formulations imposed were dry coating (3 g kg^{-1}), slurry coating (3 g kg^{-1} of polykote dissolved in

Table 3. Influence of polykote film coating and accelerated ageing on α-amylase activity (cm) of cluster bean

Film coating treatments (T)	Days after accelerated ageing (D)						
	0	2	4	6	8	10	Mean
Control	0.80	0.60	0.30	0.10	0.04	0.01	0.31
Dry coating (3g kg^{-1})	1.10	0.90	0.60	0.20	0.05	0.02	0.48
Slurry coating (3g kg^{-1} + 5ml of water)	1.20	1.10	0.80	0.40	0.20	0.07	0.63
Slurry coating + halogen mixture (3gkg^{-1})	1.20	1.00	0.70	0.50	0.20	0.09	0.62
Slurry coating + bavistin (2gkg^{-1})	1.40	1.30	1.10	0.70	0.40	0.20	0.85
Mean	1.14	0.98	0.70	0.38	0.18	0.08	0.58

	T	D	TxD
SEd	0.42	0.05	0.10
CD (P=0.05)	0.88	0.11	0.21

5 ml of water) and polykote with inclusion of bavistin (2 g kg^{-1}) and eco-friendly seed protectant, halogen mixture (3 g kg^{-1}). The halogen mixture was prepared by mixing 5:4:1 ratio of calcium oxychloride, calcium carbonate and arappu leaf powder in an air tight glass container and allowed to impregnate for five days and used for treating seeds. These polycoated seeds were subjected to accelerated aging test (Woodstock and Feeley, 1965) at 40°C and 100 per cent RH using desiccators up to ten days at two days interval and were observed for the seed and seedling quality parameters *viz.*, germination (ISTA,1999), speed of germination (Maguirel 1962), root length (cm) (the distance between the collar region to the tip of the primary root), shoot length (cm) (the distance between collar region to the tip of the primary leaf) drymatter production of seedlings (mg) (dried in a hot air oven maintained at 85°C for 48h and cooled in a desiccator for 30 min. and weighed in an electronic digital balance, vigour index(Abdul-Baki and Anderson, 1973) and α-amylase activity (Simpson and Naylor, 1962).The data from various experiments were analysed statistically adopting the procedure described by Gomez and Gomez (1984). Wherever necessary, the percentage values were transformed to angular (arc sine) values, before

carrying out the statistical analysis. The critical difference (CD) was worked out at 5 per cent (P = 0.05) level.

Film coating technology deals with application of precise amount of active ingredients along with a liquid material, directly on to the seed surface without altering the shape of the seed while the seed weight may increase to 1 to 2 percent (Taylor *et al.,* 1998). The film coating formulation consists of a mixture of polymer, plastilizer, colourants and formulation are commercially available that are ready to use liquids or prepared as dry powders (Halmer, 1988; Robani, 1994).

Film-coated seed has the benefit of providing uniform and precise pesticide placement, and is dust free and no loss of fungicide during handling, safe to handle, can be highly visible in the soil, has increased flow ability of the seed, bright color and nice appearance. Thus the use of polymer as a device for seed treatment can control the timing of germination and use of proper coating material favours better conservation of seed quality in storage as well as improve the stand establishment in field (Baxter, 1984). Polymer coating is also used as a protective coating as the fungicide or insecticides are adhered to the surface of the seed over a long period. Polymers are available in various colours, the suitable polymer colour should be selected for a particular seed to improve its physical appearance as well as the aesthetic values of seed. The polymer products can be used as such or can be diluted with 1 to 4 parts of water as they contain excellent surfactants and spreaders and have a very quick drying time. Eckenrode *et al.* (1973) also reported that it is often desirable to coat the seeds with chemicals such as fungicides and insecticides and for which various methods are currently employed such as the use of cellulose derivatives or polymers incorporating the biologically active chemicals as a wet treatment. With this views, in the present study, the cluster bean seeds were treated with polykote, a hydrophilic green colour polymer @ 3 g kg^{-1} of seeds as dry and slurry coating (diluted with 5 ml of water) with inclusion of bavistin (2 g kg^{-1}) and halogen mixture (3 g kg^{-1}) and evaluated for initial quality, and the storability of these seeds were determined through accelerated ageing where seed quality characters were estimated at alternate days upto 10 days.

The results of the study expressed that coating treatments recorded improvement in seed germination where the seeds of both dry and slurry coated recorded 6 per cent improvement in germination over the uncoated seed immediately after the treatment. Inclusion of fungicides in polycoating resulted in 9 per cent improvement in germination, while it was 7 per cent for halogen mixture (Table 1). The totality measured in terms of vigour index for polycoated seed with inclusion of bavistin was 40 per cent higher than the control seed and was followed by halogen mixture, which recorded 32 per cent improvement over control (Table 2). Protective film coating with bavistin, followed by halogen mixture recorded the highest seedling vigour characters compared to uncoated seeds in terms of root length, shoot length, dry matter production and vigour index.

The storability of seeds evaluated through accelerated ageing revealed that at the end of ageing period (10^{th} day),(seeds/film coatecrwith bavistin recorded 58 per cent germination, while the uncoated seed recorded 32 per cent germination which was 81 per cent lower than bavistin coating. The other seedling quality parameters also recorded similar reduction trend with ageing and simple coating without seed protectants, maintained higher vigour than the uncoated seeds, which could be due

to the unknown active chemicals present in polykote. Chachalis and Smith (2001) and Sherin (2003) have also reported the earlier reduction in vigour of uncoated seeds than the polycoated seeds.

Shepherd *et al.* 1995) reported that radicle extension was closely correlated with α-amylase activity and this could be used as a measure of vigour in seeds. In the present findings also, the a-amylase significantly declined steeply during the period of storage and it was more steep in uncoated control seeds than the seeds coated with polykote (Table 3) and this situation was also reported by Sherin (2003) in maize .Thus, the present study implies that, seeds coated with polykote @ 3 g kg^{-1} along with bavistin @ 2 g kg^{-1} maintained the seed germination and seedling vigour both initially and after acceleratedageing.

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