Research Paper

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Pre-Sowing Seed Management Techniques on Initial Seed Quality Parameters in Blackgram Cv.ADT 3

Agriculture

KEYWORDS : Blackgram seeds, ZnSO4, Polymer, Carbendazim, Imdiacloprid

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ABSTRACT

In the present study, seeds were evaluated for their influence at laboratory condition both with existing seed treatment, seed hardening and newer seed management technique, designer seed that focused on integration of seed management techniques, pertaining to invigoration and protection, as the seed is known as the carrier of new technologies. The results of the study revealed that seeds hardened with ZnSO4 100 ppm improved the germination (95 per cent) by three per cent compared to control (92 per cent), while that of designer seed (98 per cent) by six per cent. Likewise seedling vigour characters and field emergence also higher in seeds imposed with invigourative seed treatment.

INTRODUCTION

Blackgram (*Phasiolus mungo* (L.) Hepper)) is a popular pulse crop of India because it is a rich source protein (24-26 %), starch (35 %), fibre (5-6 %), amino acids, vitamins and minerals etc. It has wide adoptability and can be grown around the year in India. The main constraints in raising the productivity levels of pulses in drylands are the inadequacy of soil moisture and poor fertility status of the soil. The alternate option to increase the pulse production will be combining the seed hardening, coating and pelleting techniques in both irrigated and rainfed ecosystems.At present several seed enhancement techniques are available for quality upgradation. It has two goals; one is related to seed designing and other to seed functioning. Seed designing can be achieved by the seed management techniques viz., fortification, hardening, coating and pelleting. Various pre-sowing physiological and chemical seed treatment methods are available to increase the productivity. Pre-sowing seed hardening treatments with chemicals, nutrient solutions, growth regulators and botanicals have been developed as a potential agro-technique to induce drought tolerance without impairing the germination potential of seeds. A judicious and comprehensive package of crop specific seed management techniques starting from dormancy breaking treatments ,seed germination and vigour augmenting treatments, seed protection treatments and finally seed handling and conditioning treatments need to be developed from sustainable good crop growth and productivity (Sasthri and kalaivani,2010). Among several non physiological seed treatments, coating or pelleting can indirectly improved seed germination and seedling establishment. In the present study, seeds were evaluated for their influence at laboratory condition both with existing seed treatment, seed hardening (Anon, 1997; Anon,2005) and newer seed management technique, designer seed that focused on integration of seed management techniques, pertaining to invigoration and protection, as the seed is known as the carrier of new technologies (Agrawal,1995).

MATERIALS AND METHODS

Genetically pure, freshly harvested breeder seeds of blackgram (Phaseolus mungo) cv. ADT 3 obtained from Agricultural Research Station, Bhavanisagar – 638 451 served as the base material for the study. The bulk seeds were hardened with 100 ppm ZnSO4 (soaking in $1/3^{rd}$ volume (seed to solution ratio)) for three hours and dried back to original moisture content as per crop production guide (Anon, 2005)) and designed the coating of hardened seed with polymer 3 ml kg^{-1} + carbendazim 2 g kg^{-1} + imidacloprid 1ml kg^{-1} suggested during Crop Scientist Meet (Anon, 2009)

Following seed treatment the hardened and designer seed along with untreated seeds were evaluated for the following seed quality parameters at laboratory are germination (%), root length (cm),shoot length (cm), drymatter content (mg/ 10 seedlings), vigour index and field emergence (%).The data obtained from experiments were analysed for 'F' test of significance following the methods described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

The results of the satudy revealed that seeds hardened with $ZnSO_4$ improved the germination (95 per cent) by three per cent compared to control (92 per cent), while that of designer seed (98 per cent) by six per cent. In line with germination, the seedling vigour characters were also more in seeds imposed with invigorative treatment. In the present study the root and shoot length recorded 5.1 and 9.2 per cent higher values in hardened seed and 7.0 and 13.0 per cent in designer seed when compared to control, respectively.

Basu (1994) opined that $ZnSO_4$ hardening enhanced metabolic activity and promote the seedling growth. The increase in dry weight was claimed to be due to enhanced lipid utilization through glyoxalate cycle, a primitive pathway leading to faster growth and development of seedlings to reach autotropic stage well in advance of others and enabling them to produce relatively more quantity of dry matter (Jayaraj, 1977). It was also argued that during soaking, seeds become physiologically advanced by carrying out some of the initial steps (Vijaya, 1996; Natesan, 2006) that resulted in improved germination, seedling length, drymatter accumulation and vigour index.

Coating is one of the non physiological seed treatments, that can indirectly improve the seed germination and stand establishment by extending its protection against seed mycoflora and thereby the natural seed deterioration (Scott, 1989; Kavitha, 2002) .According to Manjunatha *et al.* (2008), the higher germination and seedling vigour was due to increase in the rate of imbibition where the fine particle in the coating acts as a "wick" or moisture attracting material or perhaps to improve germination. An improvement in growth parameters of maize observed in pink polykote film coated seeds might be attributed to the nutrient effect present in coating material and also due to enhanced seedling establishment because of high metabolic activity of seed (Rathinavel *et al*., 1999). Sherin (2003) and Sureshvegulla (2008) also reported an improvement in growth parameters due to polykote film coating in maize. Selvakumari (2010) in maize also reported that pre sowing hardening and designer seeds improved the seed quality characters.

The results of the present investigation also exhibited that designer seed recorded the maximum field emergence over hardened and untreated seeds The designer seed recorded 4.3 per cent increased field emergence over control and 3.2 per cent over hardened seed (Table 1).

The improvement in field emergence could be attributed to activation of cells, which resulted in the enhancement of mitochondrial activity leading to the formation of more high energy compounds and vital biomolecules, which are made available during the early phase of germination (Dharmalingam *et al*., 1988). Enhanced field emergence due to coating of seeds with nutrients was also reported by Begam (2001) in blackgram. Kavitha (2002) in black gram, opined that pre sowing hardening improved the initial field emergence and also the final productivity. Sorghum seeds slurry coated with 3g red polymer + 2g carbendazim + 1ml imidacloprid kg^{-1} of seed, increased the yield by 24.5% over control (Sarithadevi, 2004). Vijayakumar *et al*. (2007) in cotton reported that seed coating with polymer enhanced the productivity of seeds, while Natesan (2006) in blackgram, and Selvakumari (2010) in maize reported that designer seed, the integration of seed management techniques (hardening + coating + pelleting) improved the productivity of seeds. Kamalan and Nair (1989) expressed that during soaking, seeds would become physiologically advanced by carrying out some of the initial steps of germination and the subsequent improvement in germinationality of these hardened seed could be due to fact that such advanced step in the germination process which on further placement for germination, remember the stage of initial imbibition step and continue from that stage for further growth and development.

CONCLUSION

In line with the views, in the present study also, seed designed with seed hardening with 100 ppm $ZnSO_4$ for 3 h + coating with polymer @ 3 ml kg^{-1} of seed + carbendazim @ 2g kg^{-1} of seed and imidacloprid @ 1 ml per kg^{-1} of seed (designer seed) recorded the highest initial seed quality characters under laboratory condition which were six per cent higher than control and three per cent higher than hardened seed.

Table 1. Influence of seed and crop management techniques on initial seed quality parameters in blackgram cv.ADT 3 at laboratory condition

Treatments	G (%)	RL (cm)	SL (cm)	DMP (mg / seedlings)	VI	FE (%)
Control	92 (73.57)	18.1	19.5	221	3459	87 (68.86)
Hardened seed	95 (77.08)	19.2	22.8	244	3990	88 (69.73)
Designer seed	98 (81.87)	19.5	23.6	262	4224	91 (72.54)
Mean	**95 (77.08)**	**18.9**	**21.9**	**242**	**3891**	**89 (70.63)**
SEd	1.12	0.13	0.32	5.79	127.3	2.61
CD (0.05)	2.74	0.31	0.79	14.1	311.5	5.38

(Figures in parenthesis indicates arc sine values)

G-Germination, RL-Root length, SL-Shoot length, DMP-Drymatter production, VI-Vigour index, FE-Field emergence

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