INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

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EFFECT OF SEED TREATMENT ON SEED AND SEEDLING QUALITY CHARACTERS IN REDGRAM cv. Co (Rg) 7

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ABSTRACT
Seed lots were evaluated for their influence at laboratory condition both with existing seed treatment (seed hardening) and newer seed management technique (designer seed).The results revealed that designer seed (seed hardening with 100 ppm $ZnSo_4$ and coating with polymer @ 3 ml kg^{-1} of seed that were added with bavistin @ 2g kg^{-1} and imidacloprid @ 1ml kg^{-1} of seed along with *Pseudomonas fluorescencs* 10 g/kg and *Rhizobium*) recorded highest germination per cent than control and existing treatment (hardened seed). Likewise, field emergence and seedling vigour characters also higher in seeds imposed with invigorative seed treatments.

KEYWORDS; $ZnSo_4$, Polymer, Bavistin, *Pseudomonas fluorescencs*, *Rhizobium*.

INTRODUCTION

Red gram [*Cajanus cajan* (L.) Millsp] is an important pulse crop in India. It is also known as Pigeonpea or Arhar or Tur. India is the largest producer and consumer of Red gram in the world. It contains about 22% protein, which is almost three times that of cereals. Red gram is mainly consumed in the form of split pulse as dal, which is an essential supplement of cereal based diet. It is particularly rich in lysine, riboflavin, thiamine, niacin and iron. The low productivity is due to the lack of high yielding varieties / hybrids, poor keeping quality and lack of storage facilities (Karivaradaraaju, 2000). To increase the pulse production is development of high yielding varieties/hybrids and development for proper seed and crop management techniques specific to crop and varieties as the management techniques alone can expose the full genetic potentiality of genotypes either hybrids and varieties. Quality seed is the key for successful agriculture, which demands each and every seed should be readily germinable and produce a vigorous seedling ensuring higher yield. 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. By giving the nutrients to the seed as pre sowing treatment, viability and vigour of the seed could be improved and the productivity can be enhanced. 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. 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 & METHODS

Genetically pure, freshly harvested seeds of redgram obtained from Department of Pulses, Tamilnadu Agricultural University, Coimbatore – 03 served as the base material for the study. The bulk seeds were imposed with following treatments. The treatments are T_1: Control + *Rhizobium*, T_2: Bavistin 2g/kg + *Rhizobium*, T_3: Seed hardening with $ZnSO_4$ 100ppm (soaking in 1/3 volume of seed to solution ratio for 3h) as per CPG and the integrated seed management technique (as per suggested by Anon, 2009) + *Rhizobium*, T_4: Seed hardening with $ZnSO_4$ 100ppm+ Seed coating with Polymer 3ml/kg + Bavistin 2g/kg + Imidacloprid 1ml/kg + *Rhizobium* ,T_5: Seed coating with Polymer 3ml/kg + Bavistin 2g/kg + Imidacloprid 1ml/kg + *Rhizobium* ,T_6: Seed coating with Polymer 3ml/kg + Bavistin 2g/kg + Imidacloprid 1ml/kg + *Pseudomonas fluorescencs* 10 g/kg + *Rhizobium* ,T_7: Designer seed (Seed hardening with $ZnSO_4$ 100ppm + Seed coating with Polymer 3ml/kg + Bavistin 2g/kg + Imidacloprid 1ml/kg + *Pseudomonas fluorescencs* 10 g/kg + *Rhizobium*). The seeds hardened, coating and designed as above along with untreated seeds were observed for the following seed quality and seedling characters 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 & DISCUSSION

The results of the study revealed that designer seed recorded the highest germination (92 %) by 14 % respectively compared

to control (79%). Likewise seedling vigour characters also higher in seeds imposed with invigorative seed treatment. The vigour of seeds measured as seedling quality characters, the root and shoot recorded higher values of 25 per cent and 9.2 per cent in designer seed when compared to control, respectively (Table 1). Basu (1994) opined that in seed hardening resulted in higher metabolic activity, the efficacy of which promoted the seedling growth that extends upto productivity (Shenbaganathan, 2003, Ananthi, 2011). Kamalam and Nair (1989) observed improvement in root and shoot growth of paddy seedling due to the earliness of germination and seedling growth in hardened seed. The increase in seedling dry weight with invigourated seed was also focused to the enhanced lipid utilization through glyosalate cycle, a primitive pathway leading to faster growth and development of seedlings to reach autotropic stage well in advance (Jayaraj, 1977). Henckel (1964) described the pre-sowing hardening or imbibitions and drying methods and furnished the results of physiological and biochemical changes in seed so as to get the characters that are favourable for drought tolerance. It was also argued that during soaking, seeds become physiologically advanced by carrying out some of the initial steps of that resulted in improved germination, seedling length, drymatter accumulation and vigour index (Natesan, 2006).

TABLE 1: Influence of seed management techniques on initial seed quality parameters in redgram cv . Co (Rg) 7 at Laboratory condition

Treatments	Germination (%)	Root length (cm)	Shoot length (cm)	DMP /10 Seedlings (g)	Vigour Index (G%+ SL (cm))	Field emergence (%)
T_1	79 (62.72)	5.1	20.7	0.290	2038	68(54.70)
T_2	82(64.89)	5.5	21.1	0.305	2207	70(56.79)
T_3	86(68.02)	5.9	21.5	0.317	2356	77(61.34)
T_4	88(69.73)	6.2	22.0	0.330	2481	79(62.72)
T_5	80(63.43)	6.0	21.8	0.300	2224	71(57.41)
T_6	90(71.56)	6.4	22.5	0.359	2601	81(64.15)
T_7	92(73.92)	6.8	22.8	0.375	2723	84(66.42)
Mean	85(67.21)	5.9	21.7	0.325	2375	76(60.66)
SEd	1.288	0.132	0.628	0.002	2.404	2.054
CD (P=0.05)	2.680	0.275	1.306	0.004	4.999	4.407

(Figures in parentheses indicate arcsine values)

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 (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. Seed coated with *P. fluorescens* produced desirable results, both by increased germination as well as seedling growth (root and shoot length) and vigour of pulses (Figure 1). The enhancement in the seedling growth noticed in this study could be attributed to suppression of deleterious microorganisms and pathogens; production of plant growth regulators such as gibberellins, cytokinins, and indole acetic acid; increased availability of minerals and other ions; and more water uptake **(**Ramamoorthy *et al.*, 2001).

Control **Designer seed**

FIGURE 1: Influence of pre sowing seed management on germination in redgram cv. Co (Rg) 7

The results of the present investigation also exhibited that designer seed recorded the maximum field emergence over untreated seeds The designer seed recorded 23 per cent increased field emergence over control. Kavitha (2002) in black gram, Giang and Gowda (2007) in rice, 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. 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).

CONCLUSION

In line with these views, in the present study, the seed designed as seed hardening with 100 ppm $ZnSo_4$ and coating with polymer @ 3 ml kg^{-1} of seed that were added with bavistin @ 2g kg^{-1} and imidacloprid@ 1 ml kg^{-1} of seed along with *Pseudomonas fluorescencs* 10 g/kg and *Rhizobium* (designer seed) recorded the highest initial seed quality characters under laboratory condition which might be due to the physiological activation and protection rendered against secondary infection and infestation of seed mycoflora by the pesticide. Natesan (2006), and Selvakumari (2010) also with their experience on seed handling with combinations of physical and physiological seed treatments, expressed that these treatments could synergistically act on improving the seed and seedling quality characters.

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