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PHYSICO-CHEMICAL METHODS FOR OVERCOMING HARDSEEDEDNESS IN *CASSIA ITALICA* (MILL.) SPRENGEL SEEDS

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Initial percentage of dormant seeds in *Cassia italica* was around 86. It was observed that in this species is mainly due to impermeability of seed coat to water. Treatment of the seed coat with concentrated sulphuric acid for 20 minutes resulted in maximum germination (avg. 81%). Mechanical scarification of the seed coat with fine sand paper also removed dormancy and gave on an average 73% normal seedlings. Impaction and hot water treatment were not very effective in overcoming dormancy in this species.

Key words: *Cassia italica* hard seededness, dormancy, germination

The seeds of *Cassia italica* like majority of the seeds from this genus become dormant during maturation due to resistant and impermeability of the integuments. This physical barrier to moisture is caused by hard and thick seed coat and is responsible for dormancy in the genus *Cassia* (Bhattachrya and Saha, 1990). This dormancy must preferably be broken before sowing in order to avoid erratic and non-uniform crop stand. Dormancy in such seeds can be broken by softening the seed coat through various physical or chemical treatments. In order to raise the percentage of germination or to shorten the period required for obtaining optimum plant stand various type or wet or dry treatments are employed. Wet treatments include soaking the seeds in hot water, acids organic solvents, oxidizing agents etc., while dry treatment includes heating, impaction, chipping, nicking, threshing, burning, ageing etc. (Karluki and Powell, 1988; Duguma *et al.* (1988). These treatments are highly specific and no one type is universally effective (Aveyard, 1968, Clemens *et al.* 1977). Distinct differences in the degree of seed coat dormancy have been noted for several legume species. (Lopez and Aviles, 1988; Bhattacharya and Saha, 1990; Bebawi and Mohamed, 1985). However, the most commonly practiced methods are mechanical scarification and concentrated sulphuric acid treatments developed by Hughes (1915) and Hopkins (1923) respectively. Unless carefully executed, mechanical scarification could damage/injure the embryos

and thus render them more vulnerable to attack by micro-organisms in the soil. The present investigation was therefore undertaken to study the effectiveness of different methods in reducing the hard seed content in *Cassia italica* seeds without adversely affecting their viability.

MATERIALS AND METHODS

Fully matured seeds of *Cassia italica* were collected to study the problems of hardseedednes. The seeds were divided into five lots and subjected to the following treatments;

a) Soaking of seeds in hot water bath set at different temperatures for varying durations viz;

65°C.....30 min

70°C ..... 30 min

75°C .... 15 min

80°C .... 3 min

80°C .... 5 min

80°C .... 10 min

b) Immersion of seed in concentrated sulphuric acid for varying lengths of time and subsequently washing them in running water for 30 minutes.

c) Scarification of seeds between sheets of sand paper for 1 minute

d) Impaction was achieved by putting the seeds in two flasks, one lined with sand paper and the other without it and shaking the same vigorously for 1 minute.

e) Control (untreated)

Three replications of 50 seeds each per treatment were placed in completely randomized design in the germinator set at 25°C with fluorescent light for 12 hours day/night cycle. The Petridishes were evaluated on the 10th day for normally germinating seedlings and the data were statistically analyzed.

RESULTS AND DISCUSSION

The germinability of *Cassia italica* seeds after different treatments is shown in Table 1. It is evident from the results that scarification by different methods resulted in significant improvement in germination. The overall comparison of means among and within treatments for germination shows that treatment with concentrated sulphuric acid for 20 minutes and subsequently washing in running tap water for 30 minutes was the most effective treatment of reducing the hardseed content in *C. italica* seeds (81% normal seedlings against 14% in the control). Mechanical scarification was also effective giving a final 73%

Table 1. Effect of various physico-chemical treatments on the mean germination percentage of *Cassia italica* seeds

Treatment	Mean Germination%
Control	14
Hot water	
65°C 30 min	17
70°C 30 min	20
75°C 15 min	25
80°C 3 min	25
80°C 5 min	32
80°C 10 min	8
Concentrated Sulphuric acid	
5 min	29
10 min	51
15 min	59
20 min	81
25 min	69
30 min	62
35 min	60
40 min	60
Mechanical scarification	
Fine sand paper (1 min)	73
Impaction	
With sand paper	42
Without sand paper	28
S ±	3.04
CD (5%)	4.09
CD (1%)	5.39

normal seedlings. Impaction and hot water treatments however did not prove very effective in overcoming hardseededness in this crop species.

Various treatments known to enhance germination in hardseeded crop species have been in use for many years. Todaria and Negi (1992) observed that different *Cassia* species responded differently to various treatments. However, they found that mechanical scarification followed by water soaking gave good germination. According to this group, the difference in the optimum time of maximum germination and effectiveness of different treatments on different species suggests differences in seed coat thickness. Jaykumar *et al.*, (1989) observed that treatment with potassium nitrate, Benxyl adenine and Etherel did not help break dormancy in seeds of *C. sericea* however treatment with concentrated sulphuric acid for 9 minutes resulted in 100 per cent germination. Similarly, immersion of seeds in 98% sulphuric acid for 45 minutes followed by 1 hour soaking n water and seed coat scarification with a commercial mill for 4 minutes proved to be most effective treatments for overcoming dormancy in *C. sieberiana* seeds (Todd *et al.*, 1993).

In the present study, acid treatment for 20 minutes proved to be the most effective and rapid method for breaking dormancy in *Cassia italica* closely followed by mechanical scarification. The latter method although safe and cheap, is suitable only for seed testing laboratories and genebanks which handle small quantities of seeds at a time.

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