http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (11): 1801-1802, 2000

Breaking Seed Dormancy in *Sesbania rostrata*

P.C. Sarker, [1]S.M.A. Hossain, [1]M.S.U. Bhuiya and [1]M. Salim
OFRD, RARS, Hathazari, Chittagong, Bangladesh
[1]Department of Agronomy, BAU, Mymensingh, Bangladesh

Abstract: Three physical treatments viz. Sand paper scraping, beating and hot water treatments and two chemical treatments viz. Concentrated sulphuric acid and ethyl alcohol were included in the study. These treatments were applied on seeds of two sizes viz. large and small. Results of the experiments revealed that sand paper scraping and concentrated H_250_4 showed more effective performance than beating and hot water treatments in breaking *seed* dormancy of *Sesbania rostrata.* Ethyl alcohol had no effect on breaking seed dormancy. Large seed showed lesser dormancy than small one. Sand paper scraping 113 revolutions) of large seed gave the highest germination (97.8%).

Key words: *Sesbania rostrata*, Dormancy

Introduction

Sesbania rostrata is a high biomass producing crop and used as green manure, fuel, feed, fencing and trailing materials. It has extensively been used as a good source of organic matter in many countries to maintain soil fertility. It has nitrogen fixing stem as well as root nodules. The nitrogen fixation potential of *Sesbania rostrata* is higher than that of soybean and the contribution has been estimated 200 kg ha^{-1} in 50 days (Rinaudo *et al*., 1982). *Sesbania rostrata* can supply the highest biomass along with the highest percentage of nitrogen than do *S. aculeta* and *S. sesban* (BRRI, 1987). But it is reported by workers in field and research stations that it exhibits poor germination (30-35%) while local species *S. aculeta* germinates upto 70-80% (Bhuiya and Bari, 1989). Depending upori maturity and storage condition, *Sesbania rostrata* may have upto 95% hard seeds (Amin, 1987). For this dormancy breakdown of *S. rostrata* is very much essential to get higher germination and uniform plant growth. Until now a very few investigation on hard seededness of *S. rostrata* seed has been conducted to develop an efficient technique to break dormancy. The present study was, therefore, under taken to find out the ways and means of breaking seed dormancy of *S. rostrata*to improve the germination percentage.

Materials and Methods

The seeds of *S. rostrata* were graded into two seed lots i.e., lot-1 and lot-2 depending upon seed size. Grading was done by 2 mm mesh sieve. In Lot-1, there were seeds above 2 mm diameter mesh i.e., large sized seeds. Seeds below 2 mm diameter mesh i.e., small sized seeds. Seeds below 2 mm diameter mesh i.e., small sized seeds were graded as lot-2. Seeds were air dried and were taken separately in polyethylene bags for studying. In case of sand paper scraping, the seeds were scarified by a manually operated sand paper scarifier for 0, 1, 5, 10, 12, 13, 15, 20 and 25 revolutions. Revolution for 12 and 13 times were included in the design latter to get the highest mode of germination due to sand paper scraping. Revolution means circular movement of the telescopic cylinder against the flat metal bars. During revolution, the flat metal bars were just dragged the sand against the abrasive wall of the telescopic cylinder and gouge the seed coat at numerous places. These goused areas served as the points of water entry, For beating, five hundred seeds were tied with cotton cloth and were beaten on a cemented floor for 5, 10, 15, 20, 25, 30, 35, 40 and 45 times maintaining a constant beating height of about 61 cm. Beating here means dashing the seeds themselves to the cemented floor for breaking the seed coat. Five hundred seeds, in case of boiling water treatment, were taken in a clean and thin cotton net and steeped in boiling water for 0, <1, 1, 2, 3, 6, 9, 12, 15 and 18 sec. For concentrated sulphuric acid (98%) treatments, the seeds were scarified by steeping for 0, 8, 12 m, 16 m 20, 24 and 28 minutes within it. The volume of seeds and acid was maintained at 1:2. During steeping, the seeds in acid were stirred with a glass rod constantly. When the treating was over, excess acid was decanted from each beaker. For ethyl alcohol treatment, five hundred seeds were steeped for 12, 24, 36, 48, 60, 72 and 84 hours in a glass bottle (air tight). After the treatment, the seeds were air dried and were set for germination in a sand germination media. The media was kept saturated upto 14 days after seed placement by adding water as and when necessary. The experiment was laid out in a completely randomized design using one hundred seeds per treatment with four replications. Data on germination were collected regularly upto 14 days. Normal seedlings were counted and the germination percentage was recorded. The statistical analysis of collected data were done and the mean values were adjusted by DMRT.

Results and Discussion

Germination of *S. rostrata* seed significantly varied with seed size and sand paper scraping/beating, hot water treatment and chemical treatment. The interaction between seed size and sand paper scraping/beating also had significant effect on germination. But there was found no significant effect on interaction between seed size and hot water treatment or chemical treatment. Large seed had higher germination percentage than the small seed (Table 1). This result may be supported by Grant Lipp and Ballard (1964) who found that the larger seeds were less dormant than the small seeds irrespective of the cultivars of subterranean clover. Results in Table 2 showed that large seeds with 13 revolutions gave the highest percentage of germination (97.75%) which was statistically identical for small seeds with 20 revolutions resulting 94% germination. The result is supported by Amin (1987) who observed the sand paper scarification of *S. rostrata* resulted maximum 94% germination. The lowest percentage of germination was found in control treatment for both the large (13%) and small seeds (12.5%). Interactions between seeds size and sand paper scraping/beating treatments revealed that large seed with less number of revolutions resulted more percentage of germination than small

Table 1: Effect of seed size due to scarification on germination of *S. rostrata* seed

Seed size	Scarification techniques		
	Sand paper scraping/beating	Hot water treatment	Chemical treatment
Large	55.24a	47a	46a
Small	50.86b	43b	41b

The figures having different letters differ significantly at 1% level by DMRT

Table 2: Effect of seed size and sand paper scraping and beating on germination of *S. rostrata* seed

Interaction of seed size × sand paper scraping/beating	Germination (%)
Large × control	13.00m
Large × 1 revolution	26351
Large × 5 revolution	59.5Ofg
Large × 10 revolution	92.5Oab
Large × 12 revolution	91.75ab
Large × 13 revolution	97.75a
Large × 15 revolution	92.00ab
Large × 20 revolution	88.50abc
Large × 2.5 revolution	82.50bcd
Large × 5 times beating	20.501m
Large × 10 times beating	21.751m
Large × 15 times beating	38.00jk
Large × 20 times beating	37.00jk
Large × 25 times beating	39.75jk
Large × 30 times beating	40.75hij
Large × 35 times beating	51.25gh
Large × 40 times beating	50.75gh
Large × 45 times beating	50.25ghi
Small × control	12.50m
Small × 1 revolution	29.60k1
Small × 5 revolution	45.50hij
Small × 10 revolution	68.25ef
Small × 12 revolution	73.00de
Small × 13 revolution	75.00de
Small × 15 revolution	79.75cd
Small × 20 revolution	94.00a
Small × 25 revolution	88.00abc
Small × 5 times beating	20.501m
Small × 10 times beating	21.751m
Small × 15 times beating	38.00jk
Small × 20 times beating	37.00jk
Small × 25 times beating	39.75ijk
Small × 30 times beating	4.075hij
Small × 35 times beating	51.25gh
Small × 40 times beating	50.75gh
Small × 45 times beating	50.25ghi

The figures having common letter(s) do not differ significantly at 1% level by DMRT

Table 3: Effect of steeping period in hot water on germination of *S. rostrata* seed

Steeping period	Germination (%)
Control	18.13e
Just steeping < 1 second	62.63a
Steeping for 1 second	56.75ab
Steeping for 2 seconds	52.50abc
Steeping for 3 seconds	47.00bcd
Steeping for 6 seconds	46.50bcd
Steeping for 9 seconds	44.25cd
Steeping for 12 seconds	43.88cd
Steeping for 15 seconds	40.00cd
Steeping for 18 seconds	38.13d

seeds. Germination percentage due to beating for both large and small seeds increased with the beating number in a minimum rate upto a certain level and then decreased (Table 2).

The germination percentage increased when seeds were just steeped in boiling water and then gradually decreased with the increased period of steeping (Table 3). The result suggests that hot water treatment has a positive effect on breaking seed dormancy. This was supported by Gill *et al.* (1986) that boiling was an effective method for increasing Acacia farnesiana (L) seed germination. Steeping *S. rostrata* seeds in boiling water for less than 1 second showed the highest percentage of germination (62.63%) and the lowest percentage of germination (18.13%) germination by steeping seeds of *S. rostrata* in hat water. Treatment with boiling water for 75 sec increased germination from 4 to 78%. Treatment of seeds for more than 75 sec resulted deformed seedlings (Sheelavantar *et al*., 1989). Germination percentage increased gradually with the period of steeping in conc. H_2SO_4 upto 24 min and then decreased (Table 4). The highest percentage of germination (87.38%) was observed by steeping seed in conc. H_2SO_4 for 24 minutes which was at per with 28 min steeping resulting 86.13% germination. This result is in conformity with that of Amin (1987) who observed maximum germination (96%) of *S. rostrata* in sulphuric acid scarification. Treating *S. rostrata* seeds with conc. H_2SO_4 for 30 min increased germination from 12 to 94% (De and Rerkasem, 1992). Steeping in ethyl alcohol was identical to control and was the lowest. Ethyl alcohol had no effect on breaking dormancy of *S. rostrata* seed. This may be fact that erotion and incision to the seed coat by sulphuric acid treatment made the hard seeds permeable to water i.e., increased germination percentage.

Table 4: Effect of chemical treatment on germination of *S. rostrata* seed

Chemical treatment	Germination (%)
Control (No chemical treatment)	18.13e
Steeping in conc. H_2SO_4 for 8 minutes	69.13d
Steeping in conc. H_2SO_4 for 12 minutes	73.13cd
Steeping in conc. H_2SO_4 for 16 minutes	75.38bc
Steeping in conc. H_2SO_4 for 20 minutes	79.25b
Steeping in conc. H_2SO_4 for 24 minutes	87.38a
Steeping in conc. H_2SO_4 for 28 minutes	86.13a
Steeping in Ethanol for 12 hours	20.63e
Steeping in Ethanol for 24 hours	17.50e
Steeping in Ethanol for 36 hours	16.38e
Steeping in Ethanol for 48 hours	15.38e
Steeping in Ethanol for 60 hours	17.13e
Steeping in Ethanol for 72 hours	15.38e
Steeping in Ethanol for 84 hours	15.75e

References

Amin, M.A., 1987. Studies on breaking seed dormancy of *Sesbania rastrata* (Brem and Uberm). M.Sc. Thesis, University of the Philippines Los Banos, Los Banos, Philippines.

BRRI., 1987. The annual report for 1987. Bangladesh Rice Research Institute, Joydebpur, Gazipur, pp: 98.

Bhuiya, M.S.U. and M.N. Bari, 1989. Vegetative propagation of Sesbania. Farming System Research and Development Programme (FSRDP). FSRDP. Publication No. 11, pp: 1.

De, N.N. and B. Rerkasem, 1992. Breaking seed dormancy in *Sesbania rostrata*. Int. Rice Res. Notes, 17: 20-21.

Gill, L.S., R.O. Ogede and S.W.H. Husaini, 1986. Studies on the seed germination of (*Acacia farnesiana* L.) Wild. J. Tree Sci., 5: 92-97.

Grant Lipp, A.E. and L.A.T. Ballard, 1964. The interrelation of dormancy, size and hardness in seed of *Trifolium subterraneum* L. Aust. J. Agric. Res., 15: 215-222.

Rinaudo, G., B. Dreyfus and Y.R. Dommergues, 1982. Influence of *Sesbania rostrata* green-manure on the nitrogen content of rice crop and soil. Soil Biol. Biochem., 15: 111-113.

Sheelavantar, M.N., S. Rao, P.S. Matiwade and A.S. Halepyatis, 1989. Boiling water treatment to improve germination of *Sesbania rostrata*. Int. Rice Res. Newslet., 14: 23-24.