Global Journal of Agricultural Sciences. Vol. 4, No. 1, 2005: 15 - 18
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Effect of Length of Soaking in Water at Room Temperature and Hot Water Treatment on the Germination of *Mucuna Flagellipes* (*Vogel Ex Hook*) Seeds

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(Received on 9 September 2004; Revision Accepted on 7 February 2005)

ABSTRACT

Two experiments were conducted at the greenhouse of the University of Nigeria Nsukka, to study the effects of pre-sowing seed treatment on the germination of *Mucuna flagellipes* seed. Pre-sowing treatment comprised soaking for varying durations in water at room temperature and soaking in hot water at varying temperatures of 28°, 60°, 80° or 100°C. Results showed Hot water at 40° to 60°C significantly enhanced germination of *Mucuna flagellipes* compared with rather higher temperatures of 80° or 100°C. Soaking in water at room temperature for 36-48 hours resulted in significantly higher cumulative germination over planting the seeds without pre-soaking. Without pre-sowing seed treatments, germination was naturally low.

KEY WORDS: *Mucuna flagellipes*, Seed pre treatment, Germination

INTRODUCTION

Mucuna flagellipes (Vogel ex Hook) belongs to the family of Papilionoidea and has been described as a climbing perennial herb with compound trifoliate leaves (Anonymous 1979, Okigbo 1980). *Mucuna flagellipes* is one of the lesser known and neglected indigenous legumes in Nigeria. Literature information on the crop is scanty generally and there is no report on the study of the crop in a regular field culture. Yet it is very important among the Ibo's of the Eastern states as a condiment and soup thickener. Both the seed and leaf of *Mucuna flagellipes* have high economic values in pharmaceutical industry and other domestic uses (Ene-Obong and Carnovale 1992, Eyiuche 1988).

In-spite of its economic importance it is only grown as a compound crop by some Ibos and it is known to exhibit low germination. The exact cause of poor germination is not well known. Varying pre-sowing seed treatments such as, pre-soaking in, water and hot water treatment (Agboola, 1995; Igweneme 1995, Asiegbu and Onugha 1994) are various methods employed to improve germination of dormant seeds.

The present work was aimed at finding low cost and easily administrable but suitable methods of improving and synchronizing germination in *Mucuna flagellipes*.

MATERIALS AND METHODS

The seeds of *Mucuna flagellipes* were obtained from Nsukka market and was subjected to two pre-sowing seed treatment before germination studies were conducted in the greenhouse at Dept. of Crop Science, University of Nigeria Nsukka.

Experiment I: Effects of hot water pre treatment on the germination of *Mucuna flagellipes*.

There were five hot water treatment involving soaking in water at room temperature (28°C,) soaking in water maintained at temperatures of 40°, 60°, 80° or 100°C each for ten minutes. Water baths were used to maintain the required temperature regimes. After pre soaking treatments, seeds were sown in 40 x 40cm polythene bags each ¾ filled with 12kg of river sand. Ten seeds were sown per bag. The bags were laid out in a completely randomized design and there were six replications. Records consisted of daily count of germinated seeds, seed were scored as having germinated when the radicle length is 1.5 mm long. Other parameters recorded were: complete dormancy period,(CDP)/lag phase, mean daily germination,(MDG) Days to the appearance of first true leaf and coefficient velocity of germination (CVG) which was calculated using the formula outlined by Kotowski (1978) as stated below.

CO-efficient velocity of germination. (CVG)

$$CVG = \frac{1}{N_1 T_1 + N_2 T_2 + N_3 T_3 + \text{---} N_x T_x} \times 100$$

Where: N = are the number of seed germinating within consecutive interval of time.

T = the time between the beginning and the end of the particular interval of measurement (Kotowski 1978).

CDP = Complete dormancy period = number of days from sowing to the start of germination.

MDG = Mean daily germination = final germination period divided by number of days required to attain the value.

CGP = Cumulative germination percentage over 16 days after planting.

All data collected were subjected to statistical analysis using analysis of variances procedure (ANOVA), outlined by Steel and Torrie (1980). Treatment means were separated by the use of least significant difference (LSD) as outlined by Obi (1986).

Experiment 2: Effects of different Durations of soaking in water at room temperature on the germination of *Mucuna flagllipes*.

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Table 1: Effects of hot water treatment on the dormancy period (DP lag phase), Cumulative germination percentage (CGP), mean daily germination (%) (MDG) and co-efficient velocity of germination (CVG) in *Mucuna flagelipes.*

Hot water (°C)	CDP	CGP	MDG	CVG	Days to 50% germination	Days to first true leaf.
Room temp (28°C)	9.2	53.2	3.3	7.6	15.2	28.3
40	6.3	85.3	5.3	8.0	10.3	24.5
60	6.3	88.2	5.5	8.1	10.4	25.5
80	9.3	52.5	3.5	7.4	16.4	27.1
100	9.3	45.3	2.8	7.2	16.5	28.7
LSD (p =0.05)	0.8	4.4	0.4	0.02	0.8	0.9

Table2: Effects of length of soaking the seeds in water at room temperature on the dormancy period (DP, lag phase), Cumulative germination (%) (CGP), mean daily germination (%) (MDG) and co-efficient velocity of germination (CVG) in *Mucuna flagellipes.*

Duration of Soaking in water (hours)	CDP	CGP	MDG	CVG	Days to 5% germination	Days to first true leaf.
0	9.3	53.3	3.3	6.1	16.5	27.5
12	8.3	70.8	4.4	7.5	14.3	25.4
24	7.3	73.2	4.5	7.7	13.2	22.5
36	7.2	81.5	5.1	7.9	11.3	22.3
48	7.2	85.2	5.3	8.1	10.2	21.6
LSD (p =0.05)	0.8	1.3	0.2	0.1	0.9	0.3

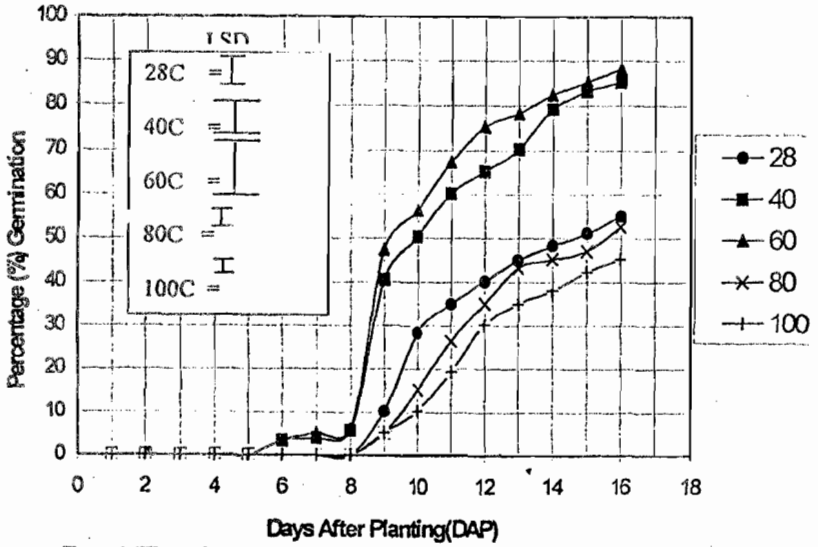

Figure 1: Effects of hot water pre-treatment on the germination (%) of *Mucuna flagellipes* seed

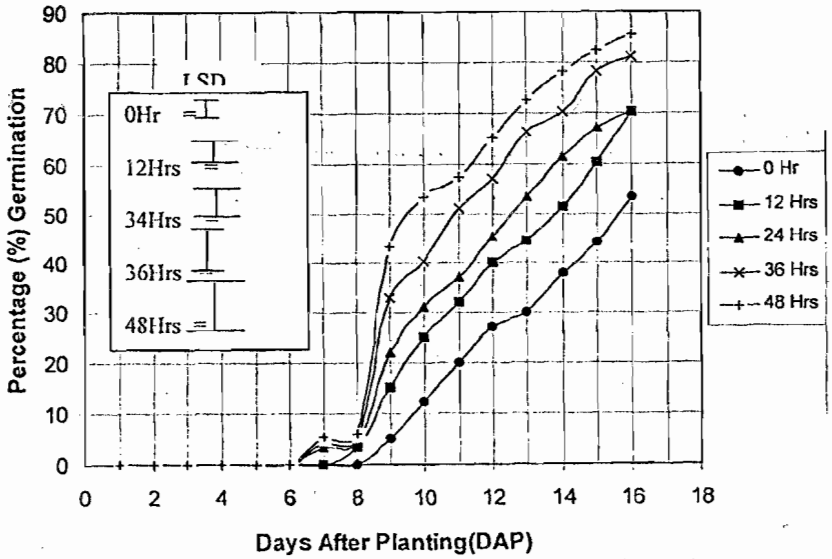

Figure 2: Effects of length of soaking the seeds in water at room temperature on the germination (%) of *Mucuna flagellipes* seed at different days after planting

At room temperature seeds were soaked for Durations of 0, 12,24,36 or 48 hours. One lot of seeds which was not soaked served as the control, there were six replications. Sowing and data collections were done as described in experiment 1.

RESULTS

Hot water pre treatment

Soaking the seed of *Mucuna flagellipes* in water at 100°C significantly depressed germination (figure 1). The period of complete dormancy (lag phase) was significantly shortened in seeds soaked in water at 40° and 60°C. These treatment also gave earlier germination that was consecutively better than hot water at higher temperatures of 80° and 100°c respectively. There were evidence that warm water (40° and 60°c) enhance rapid germination and growth of Mucuna flagellipes seedlings as indicated by the highest cumulative germination percent, mean daily germination and Co-efficient velocity of germination (Table 1).

Effects of length of soaking in water at room temperature.

All cases of pre-soaking in water at room temperature significantly improved the germination of *Mucuna flagellipes* seed over the seed that was not pre-soaked in water (figure 2). Seed germination began at seven days after planting and was fairly uniform in all soaking treatments.

The soaking duration of 24, 36 or 48 hours gave significantly higher co-efficient velocity of germination and shortened period of complete dormancy (lag phase) over soaking duration of 12 hours or where there was no soaking of seeds before planting (Table 2). Production of the first true leaf was earliest with 48 hours soaking and least with the seeds that were not pre soaked.

DISCUSSION

Viable seeds with good germination are of great importance to the farmer for good crop establishment and for high yields (Agboola 1992, Gillard and Bamidele 1981). It is however, known that many crop seeds may fail to germinate in good time and may ordinarily fail to give satisfactory germination unless they are given some treatments that will enhance germination (Asiegbu and Onugha 1994, Agboola 1992 and Oladrian 1986).

Hot water at high temperatures of 80°C or 100°C proved injurious to seed of *Mucuna flagellipes*, while hot water treatment of 40° and 60°C for ten minutes appeared optimum for treating the seeds for improved germination. Generally there has been no report on the germination of *Mucuna flagellipes* in literature on which to base comparisons. However, Oladiran (1986) reported improved germination in pepper seeds treated with hot water at 40 – 70°C, while high temperature of 100°C was injurious. Similarly, Igweneme (1995) reported that the temperature of 77°C was optimum and significantly improved germination of *Parkia biglobosa* and *Prosopis africana*.

Soaking of *Mucuna flagellipes* seed in water at room temperature improved germination over where the seed was planted direct. Heartman and Kaster (1987) observed that soaking seeds of *papaya* in water aids in over coming seed coat dormancy and stimulated germination. The progressive increase in the mean daily germination and co-efficient velocity of germination with increased duration of soaking *Mucuna flagellipes* seed in water corroborated the results by Mac Donal (1986) who obtained similar results when pepper seed was soaked in water for 24-36 hours.

Based on the study, germination of *Mucuna flagellipes* can be greatly improved by soaking either in hot water at 40° or 60°C for ten minutes or in water at room temperature (28°C) for 36 to 48 hours before planting. Soaking in water as pre-sowing seed treatment has probably the least cost of handling and can be easily used by low input farmers, as it does not call for much cost or expertise.

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