

Seed Treatment Effects on Emergence of Luffa Sponge Gourd

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Luffa sponge gourd (*Luffa aegyptiaca* Mill.; also *L. cylindrica*) belongs to the Cucurbitaceae along with squash and pumpkin (*Cucurbita* spp.), gourd (*Cucurbita* spp., *Lagenaria* spp.), melon (*Cucumis melo* L.), and cucumber (*Cucumis sativus* L.). It is an annual climbing vine with tendrils, growing primarily in tropical and subtropical regions. The seeds are flat, smooth, and black or white (11). This species has been cultivated since ancient times in the far east and the Indian subcontinent, and has since been introduced to the Middle-east and Africa, and more recently into the Americas. The fruit is harvested at an immature stage (both fruit and seeds are soft), and is eaten as a cooked vegetable (prepared like summer squash). In most countries, it is cultivated in small plots in family gardens, usually for domestic consumption, with commercial cultivation being of secondary importance. However, it is beginning to appear in the international market place (6, 7).

Germination percentages of several vegetable species have been shown to increase after seed treatment with chemicals and various osmotica (1, 4, 10, 13, 18). Luffa seed germination has been reported to be slow and sporadic (2). Low percentage of seed germination is a major problem in establishing a luffa crop, with typical rates of less than 75% (17).

The seeds of many species of cucurbits are non-endospermic and germination is epigeal. Dormancy can be severe problem in some cucurbit species. It is comparatively easy to induce dormancy by testing the seeds for germination in unfavorable environments. In particular, the germination test substrate should not be too moist and only very low intensity light treatments should be applied. In most cases, it is probably best to perform seed germination tests in darkness. Successful dormancy-breaking treatments in sponge gourd are observed to be use of constant temperatures with optimum range of 30 to 35°C, scarification of the seeds before germination, cracking the seed coat before germination, and use of moist sand for the germination medium.

In contrast to other members of the Cucurbitaceae, the germination of sponge gourd seeds is promoted

by light (3). Poor field emergence and erratic stands lead to increased variation in plant development which can result in yield reduction. Both survival and performance of seeds after sowing are affected by physical, chemical, and biotic factors. Temperature, light, drought, flooding, and gaseous (O₂ and CO₂ concentration) environments are physical factors that influence seedling emergence (5, 8, 14). Poor field emergence is consistently observed where spring temperatures fluctuate dramatically (9, 15, 16). In areas where crops are harvested once-over (for example, cucumbers that are machine-harvested), non-uniform emergence is of particular concern (13). Since a species cannot become established in and colonize new habitat until it has completed the stages of germination and seedling establishment, it is most important to study the effect of soil factors on the germinating seeds and young seedlings (12).

There is little published information on the effects of seed treatment on germination of luffa gourd. It would be useful to increase the germination rate of luffa seeds, especially for those interested in commercial production of the crop. Therefore, the objective of this study was to determine if treating luffa sponge gourd seeds prior to planting would improve the germination rate.

Methods. This study was conducted in two parts. Experiment one consisted of a single cultivar (Fletcher) and nine seed pre-treatments. The design was a randomized complete block with five replications of ten seeds each. The seed pre-treatments were: acetone soaking (16 hours at 25°C), sandpaper (25 shakes in an 75 x 305 mm tube lined with coarse-grade sandpaper), soaking in a beaker of water (not aerated) for 12, 24, and 36 hours at 25°C, or moist cloth bags (102 x 152 mm cotton bags) soak for 12, 24, and 36 hours at 25°C. The moist cloth bags were wetted after seeds were added by soaking under water for 1 minute. Bags were kept moist by adding 10 ml of water every 24 hours. The control was untreated seeds. The experiment was started on 11 October. Seed pre-treatments were performed on

the preceding one or two days (depending on treatment duration).

Experiment two had three cultigens (Fletcher, PI 163295, and PI 391603) and eleven seed pre-treatments with four replications of ten seeds per replication. The treatments included all those of experiment one, along with soaking in a water beaker for 48 hours, and moist cloth bags soaked for 48 hours. The acetone treatment was reduced to 12 hours followed by three water rinses prior to seeding. The experiment was started on 2 November. Seed pre-treatments were performed on the preceding one or two days (depending on treatment duration).

In both experiments, the seeds were planted in a peat-lite mix in 100-mm diameter plastic pots with 10 seeds each. The pots were placed on heating mats set at 32.2°C for the duration of the experiment. Emergence data were collected daily for 12 days (15 days for experiment two). The data collected were analyzed using PROC GLM of SAS.

Results. The first experiment was conducted to evaluate the effects of seed treatments on emergence. The results revealed no significant differences among the seed treatments except the acetone treatment which was significantly lower (56%) than the other treatments (Table 1). The control emergence was higher than the mean suggesting there were no emergence problems associated with this lot of seeds.

In the second experiment, seeds with previously tested germination rates were used. 'Fletcher' initially had a germination rate of 62%, PI 163295 and PI 391603 each had a germination rate of 70%. The seed pre-treatment times were increased to determine whether germination could be improved. The analysis of variance (data not shown) indicated highly significant differences among cultigens and significant differences for the cultigen by treatment interaction. However, most seed pre-treatments were not significantly different from the control. 'Fletcher' seed germination was significantly better than that of PI 163295 and PI 391603. PI 163295 and PI 391603 were not significantly different from each other.

Table 1. Effects of seed treatments on percentage of emergence of luffa sponge gourd using three cultigens in two experiments.

Seed germination pre-treatment	Experiment 1		Experiment 2	
	Fletcher	Fletcher	PI 391603	PI 163295
Acetone (16 hr, no)	56	-	-	-
Acetone (12 hr, rinse)	-	85	32	28
Sandpaper	92	88	55	40
Water soak 12 hr	98	80	52	65
Water soak 24 hr	90	88	60	65
Water soak 36 hr	94	95	65	40
Water soak 48 hr	-	88	60	30
Moist cloth bag 12 hr	90	82	42	42
Moist cloth bag 24 hr	92	72	42	68
Moist cloth bag 36 hr	98	78	58	58
Moist cloth bag 48 hr	-	85	72	50
Control	96	95	58	42
LSD (5%)	12	7	7	7
Mean	90	85	54	48
CV (%)	2	2	2	2

^ZData are means of 5 replications of 10 seeds each for experiment 1, and 4 replications of 10 seeds each for experiment 2. Water soaking treatments did not include aeration.

A previous experiment using 'Fletcher' luffa gourd showed no improvement in seed germination after

pre-treating the seeds with growth regulators such as gibberellic acid-3 and ethephon (17).

Based on the tests conducted, acetone is not recommended as a seed treatment for improvement of seed germination in luffa gourd. The remaining treatments could be used to pregerminate seeds so as to remove seeds that were slow germinators or non-germinators. Pregermination would also be useful to establish a crop in the field with one plant per hill, and with all plants at the same stage of growth.

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