IMPROVEMENT OF PAPAYA SEEDLING EMERGENCE BY KN03 TREATMENT AND AFTERRIpenING

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ABSTRACT

Extended storage studies were conducted on papaya, Carica papaya L. cv. Kapohoa Solo, seeds to observe the effect of KN03 treatment (9 and 25 C) and length of storage (0, 2, 6, and 12 months) on percent germination. Seeds treated with KN03 maintained a constant seedling emergence percentage of 46.7 ± 2.7% throughout the 12 month period at both storage temperatures. Control seeds stored at 25C, however, had increased germination percentages (from 11 to 40%) after 2 months storage. Control seeds stored at 9 C displayed a slower increase in seedling emergence percentages. An increase in the percentage of seedling emergence during storage suggests that papaya seeds undergo afterripening.

INTRODUCTION

Papaya, Carica papaya L., is one of the few tropical crops that is seed propagated. However, the seeds often germinate poorly (Chacko and Singh, 1966; Lange, 1961; Perez et al., 1980). In Hawaii, up to 15 seeds are sown in each planting hole to obtain a suitable number of trees required for a hermaphroditic population (Chia et al., 1989). Inhibitory substances in the papaya seed coat and the sarcotesta have been implicated as factors that reduce germination (Cairns, 1968; Lange, 1961; Reyes et al., 1980). In addition to inhibitory substances, Nagao and Furutani (1986) reported that about 20% of papaya seed are embryoless.

Papaya seed germination is increased by soaking seeds (with sarcotesta removed) in a 1.0 M KN03 solution for 15 min prior to sowing (Nagao and Furutani, 1986; Furutani and Nagao, 1987); however, the effect of extended storage and storage temperature on germination of KN03 treated seeds have not been investigated, thus this was the objective of our experiment.
MATERIALS AND METHODS

Seeds from fully ripened papaya 'Kapoho Solo' fruit (494 ± 52.3g) were collected and mixed in a 12 liter plastic container to obtain a homogenous seed lot. The sarcotesta was removed by abrading the seeds in a blender fitted with rubber-coated blades and then washing the seeds under running tap water for 2 hr. Any remaining sarcotesta was removed by hand. The clean seeds were separated into two equal lots, blotted dry on paper towels, and one lot immediately soaked in 1.0 M KNO₃ for 15 min as described by Nagao and Furutani (1986). The remaining lot of seeds was soaked in water for 15 min for use as a control. After the soaking, the KNO₃ treated and the control seeds were placed on no. 10 mesh screen and air-dried for 7 days at 25 C prior to storage treatments.

KNO₃ treated and control seed lots were divided into half and then into thirds (3 replicates) for storage. Each replicate was sealed in a 35 ml polyethylene container that was then sealed in separate 252 ml air-tight aluminum cans. The seeds were stored for 12 months in a refrigerator at 9 C or stored in an air conditioned laboratory maintained at 25 ± 3 C.

Percent seedling emergence was obtained by sampling 100 seeds from each replicate after 0, 2, 6 and 12 months storage. Seeds were sown 0.5 cm deep in 15.5 cm plastic pots containing moistened no. 2 grade vermiculite. The pots were kept in a fiberglass greenhouse (23 ± 8 C) and seedling emergence counted when the cotyledons unfurled to the horizontal position. Each treatment consisted of 3 replicate pots with 100 seeds per replicate.

RESULTS AND DISCUSSION

Seeds planted immediately after soaking in KNO₃ displayed a higher seedling emergence (50%) compared to control (water soaked) seeds (11%) (Fig. 1). The higher seedling emergence percent after treatment with KNO₃ is consistent with previous reports (Nagao and Furutani, 1986; Furutani and Nagao, 1987). At 2 and 6 months of storage, there were no differences between KNO₃ treated seeds stored at 9 or 25 C (Fig. 2). Control seeds stored at 25 C had significantly higher seedling emergence after 2 months storage compared storage at 9 C (Fig. 2). After 12 months of storage, there were no differences between KNO₃ treated and control seeds stored at 9 or 25 C (Fig. 2).

Soaking seeds in KNO₃ overcame an inhibition associated with fresh papaya seeds. Control seeds that had been stored for 2 months at 25 C had seedling emergence percentages similar to KNO₃ treated seeds. Maximum seedling emergence for seeds maintained at 25 C occurred after 2 months of storage compared to more than 6 months for seeds stored at 9 C. The steady increase in percent seedling emergence for control seeds during storage suggests that papaya seeds undergo afterripening. Prior to this study there have been no reports on afterripening of papaya seeds.
The beneficial effects of KNO₃ soaking over control seeds was observed only when seeds are sown immediately or within 2 months of storage at 25 C. Storage for 12 months at 9 or 25 C did not decrease percent germination for both KNO₃ soaked and control seeds.

LITERATURE CITED


Fig. 1. Percent germination of KNO3 treated and control papaya seeds prior to storage at 9 and 25 C. Standard error for the experiment was ± 5.9%.
Fig. 2. Percent germination of KNO₃ treated and control papaya seeds held at 9 and 25 C and stored for 2, 6, and 12 months. Standard error for 2, 6, and 12 months experiments was ± 3.7, 3.6, and 1.4%, respectively.