

**IMPROVING THE GERMINATION RATE OF ARRACACHA
(*ARRACACIA XANTHORRHIZA* BANCROFT) BY THERMOTHERAPY**

J. E. Menezes, F. F. Santos, and A. W. Moita*

Abstract

A study was conducted at CNPH-EMBRAPA to test the effect of thermotherapy on the incidence of saprophytic fungi (*Alternaria alternata*, *Cladosporium* sp., *Penicillium* sp., and *Fusarium* sp.) during germination. Arracacha seeds were classified as large and medium, and put into sacks for treatment with warm water (50 °C) for 5, 10, and 20 min. After each treatment, seeds were dried on paper towels at room temperature. Three days later, the germination test was conducted in a split-plot, randomized complete block design, with four replicates of 50 seeds in temperature gradient chambers at 15, 20, and 25 °C and a check treatment for each temperature. Germination was evaluated every 7 days; a seed was considered as germinated once the radicle emerged. In both seed-size classes, treatments of 5 and 10 min were superior to the checks at 20-25 °C after 35 days. Overall, a direct relationship was observed between fungal development and the treatment period in warm water. Exposure to warm water for 20 min affected the germination rate, except at 20 °C in the large seeds.

Introduction

Arracacha, whose origin is in the Andean region of Colombia, is multiplied vegetatively through sprouts, and the main product for consumption comprises the roots. Normally, farmers do not wait until the plant reaches the reproductive stage to harvest the roots, hence, the production of sexual seeds and their potential for propagation are unknown to most people.

Slow germination and early vigour are among the most important problems limiting the use of recombinant seed in breeding. The phytosanitary status of different seed lots must also be reviewed. Researchers have tried to develop simple techniques to evaluate arracacha seed quality. For guapuruvu seeds, hot water treatment was one of the best methods of enhancing seed germination, whereas for forest species from the Amazon region, hot water (90 °C) killed seeds, whether the treatment lasted for 5, 10, or 15 min.

* Centro Nacional de Pesquisa de Hortaliças of EMBRAPA, Brasília, Brazil.

Proceedings of the Tenth Symposium of the International Society for Tropical Root Crops, held in Salvador, Bahia, Brazil, October 23-29, 1994

The effect of thermotherapy on the development of saprophytic fungi and arracacha seed germination was assessed at three different germination temperatures at the Centro Nacional de Pesquisa de Hortaliças (CNPQ) of EMBRAPA, Brazil.

Materials and Methods

Seeds produced in southern Minas Gerais were used for this study. First, they were classified by size, as either large (6.56 g/1000 seeds) or medium sized (5.64 g/1000 seeds). They were then placed in sacks for treatment in warm water (50 °C) for 5, 10, and 20 min. After each treatment, seeds were dried on paper towels at room temperature. Three days later, the germination test was conducted in a split-plot, randomized complete block design, with four replicates of 50 seeds in temperature gradient chambers (NK System TG-100-AD) at 15, 20, and 25 °C, with a check treatment for each temperature. Germination was evaluated every 7 days until 35 days; a seed was considered as germinated once the radicle emerged. Given the exploratory nature of this experiment, no statistical analysis was done.

Results

For large seeds treated for 20 min in warm water, the development of saprophytic fungi (*Alternaria alternata*, *Cladosporium* sp., *Penicillium* sp., and *Fusarium* sp.) was reduced, compared with the check, and the 5- and 10-min treatments. However, the germination rate was affected, reaching particularly low levels at low temperatures. At 20 °C, while the development of saprophytic fungi was noticeably reduced with time exposure to warm water, the germination rate was maintained at intermediate levels (34%-45%). At 25 °C, the length of exposure to warm water negatively affected the germination rate.

For medium-sized seeds, both the germination rate and fungal control increased with time of exposure, up to 15 min. Apparently, 20 min of exposure to warm water was excessive, affecting seed viability. Any seed treatment reduced the germination rate at 25 °C, compared with the check.

Discussion and Conclusions

Thermotherapy with hot water has often been used for reducing the incidence of pathogens and enhancing seed germination in different species. In this study, the development of saprophytic fungi in arracacha seeds was reduced with increased exposure to hot water (50 °C). Similar results have been reported for carrots: a 20-min treatment in warm water (50 °C) was effective in controlling *Alternaria dauci*; 50-55 °C was the optimal temperature range for

Proceedings of the Tenth Symposium of the International Society for Tropical Root Crops, held in Salvador, Bahia, Brazil, October 23-29, 1994

treating carrot seeds to control *A. dauci* and *A. radicina*. The maximum temperature tolerated by tomato seeds was 60 °C for 20 min, whereas passion fruit seeds responded positively to treatment with hot water at 40-50 °C.

Based on the foregoing results, we can conclude that exposure of seeds to hot water for 20 min affects the germination rate, although the incidence of saprophytic fungi was reduced as the treatment with hot water extended. To compromise between the positive and negative effects of the hot water treatment, a time of 5-10 min is recommended. The optimal germination temperature for arracacha seeds in this study was 20 °C.