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Effect of Hot Water, Sulphuric Acid and Nitric Acid on the Germination of Rose Seeds

A. Younis, A. Riaz, R. Ahmed and A. Raza
Institute of Horticultural Sciences
University of Agriculture
Faisalabad
Pakistan

Keywords: physical dormancy, *Rosa* species, scarification, seed treatment

Abstract

Rose seeds exhibit difficulties in terms of germination due to strong dormancy. The aim of this investigation was to use different treatments such as hot water (98°C for 24 hours), 50% sulphuric acid for 30, 60 and 90 seconds, and 65% nitric acid for 30, 60 and 90 seconds to get the best treatment to allow the highest germination rate. The data were statistically analyzed using analysis of variance and means were compared by DMR test at 5% probability. The results showed that treating rose seeds with sulphuric acid for 30, 60 and 90 seconds broke the dormancy of rose seeds and enhanced the germination rate and duration as compared to other treatments. No significant effect of the nitric acid and hot water treatments was observed.

INTRODUCTION

Roses belong to one of the most popular groups of ornamental plants and have a long history. Roses are deciduous, rarely evergreen, and upright or climbing shrubs, with more or less prickly branches (Krüssman, 1981). The fruit, the rose hip, is a pseudocarp or false fruit, consisting of fleshy walls surrounding a cavity containing the seeds (Graham and Primavesi, 1993). The genus *Rosa* L. belongs to the Rosaceae family.

Rose seeds pose difficulties in terms of germination due to strong dormancy. This dormancy could last several months depending on the environmental conditions (Beinaert, 1936; Ferwerda, 1956; Huxley, 1992; Hartmann and Kester, 2002). However, a better understanding of germination metabolism in general and the working of the growth regulating substances have allowed to stimulate the germination of dormant seeds (Bewley and Black, 1994). Roses vary widely in the ease with which the seeds germinate. In some species germination may exceed 90% within a few weeks of sowing. *Rosa multiflora* is a good example. On the other hand, *Rosa canina* has mostly low viability, often not more than a third of the seeds producing seedlings, and these erratically over a number of years (Rowley, 1956). It is investigated that *Rosa* species vary in their seed germination requirements. Nearly all species germinate best with a period of cold stratification, while others benefit from a warm stratification period followed by cold stratification. Keep in mind that seeds vary in germinability based on growing conditions during seed maturation, seed ripeness, seed storage time and presence of disease or insect pests (Holloway, 1996). To ensure germination, it is necessary to weaken the pericarp by some means, e.g. acid or by supplying high temperature. Yambe et al. (1988) stated that the germination percentage of *Rosa multiflora* Thunb. achenes was greatly increased when they were treated with 1% Driselase, a macerating enzyme, for 36 hours. These enzymes likely loosened the bond between cells along the suture of the pericarp and forced the pericarp to split. How fast the seed germinates is determined by both genetic and environmental factors (Gudin et al., 1990). Therefore it is important to study how the rose seeds respond to different chemicals and hot water treatments.

MATERIALS AND METHODS

Present research was conducted in the Institute of Horticultural Sciences, University of Agriculture, Faisalabad during the years 2002-05. For this experiment,

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seeds were collected from *Rosa* 'Gruss an Teplitz'. Rose hips were harvested when they have just begun to turn red or orange and before the pulp becomes soft. Soften the hips in a container of water for 1-2 days at room temperature. Macerate the hips by rubbing them against a metal screen or soil sieve or mixing in a blender with water. Wash the pulp thoroughly, and most seeds will float to the top where they can be separated from the heavier hips. Dry the seeds on absorbent paper for 1-2 days. Then, to enhance the germination of rose seeds an experiment was conducted with the following treatments:

1) Control (distilled water for 24 hours),
2) Hot water (98°C for 24 hours),
3) Sulphuric acid (50% for 30, 60 and 90 seconds)
4) Nitric acid (65% for 30, 60 and 90 seconds)

A total of 50 seeds per treatment were used. Germination percentage for each treatment was recorded. The data were statistically analyzed using analysis of variance and means were compared by DMR test at 5% probability (Steel et al., 1997).

RESULTS

Germination in rose seeds in normal conditions is difficult due to the hard seed coat. Different treatments, scarification with sulphuric acid (for 30, 60 and 90 seconds) and scarification with nitric acid (for 30, 60 and 90 seconds), soaking in hot water of 98°C for 24 hours and soaking in distilled water for 24 hours were used to find out the best combination of treatments for enhancing germination. Data were recorded on the number of seeds germinated after 2, 4, 6 and 8 days in *Rosa* 'Gruss an Teplitz'. The results showed that 30 and 60 s scarification treatment with sulphuric acid had significantly enhanced the germination speed and rate in rose seeds. No significant effect of the nitric acid treatments, soaking in distilled water and hot water (98°C) was observed. The means of germination for each treatment are presented in Table 2.

From the analysis of variance of the data (Table 1) it was observed that there were significant ($P \leq 0.01$) differences among the treatments, days taken for germination and interaction between treatments and days to germinate. Further comparison of the data indicated that the maximum germination was occurred which was significantly different from other and got the top position (Table 2). It was observed that seeds treated with sulphuric acid for 60 s attained the top rank position followed by seeds treated with sulphuric acid for 30 s. The seeds treated with nitric acid, hot water (98°C) and distilled water showed no significant effect on germination.

DISCUSSION

Rose seed often takes two years to germinate. This is because it may need a warm spell of weather after a cold spell in order to mature the embryo (McMillan, 1985; Huxley, 1992). Rose seeds exhibit dormancy. Dormancy is a condition where seeds will not germinate even when the environmental conditions (water, temperature, and oxygen) are permissive for germination (Hartmann and Kester, 2002). Seed dormancy prevents immediate germination but also regulates the time, condition and place that germination will occur. In nature, different kinds of primary dormancy have evolved to aid the survival of the species by programming the time of germination for particular favorable times in the annual cycle (Atwater, 1980; Baskin, 1998).

Jackson (1968) found that chemicals exist in both fruit wall and seed coat of roses which inhibit germination in rose achenes (seeds), but these can be removed by treating them with different chemicals. The rose seed is in both exogenous and endogenous dormancy when the hip is ripe (Gudin et al., 1990) and contains growth inhibitors, and the embryo itself needs after-ripening (Gordon and Rowe, 1982). It was reported by Blundell (1973) that untreated seeds of roses take at least two to three months to germinate and that some hybrid seeds may take up to a year.

The results of the present study showed that treating rose seeds with sulphuric acid for 30, 60 and 90 seconds broke the dormancy of rose seeds. The results also showed that treating rose seeds for more than 60 s significantly decreased the germination capacity.

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Hot water had no significant effect on the germination of rose seeds. The results also indicated that the type of dormancy in rose seeds is physical dormancy, which is due to hard seed coat. Seeds with physical dormancy fail to germinate because the seed is impermeable to water (Hartmann and Kester, 2002).

The use of germination stimulants on rose seeds had previously been attempted by Wan and Hor (1983), who used sulphuric acid to enhance the germination in rose seeds. The results of their study showed that an increase in germination was achieved through treating seeds with sulphuric acid for 30 s. Allen (1967) treated rose achenes with Gibberellin 200 ppm and got significant increase in the seed germination. The results of Jin-Bo et al. (1995) are contradictory with the present results. They treated rose seeds with hydro choleric acid. However softening of pericarp by hydro choleric acid failed to cause rose seeds to germinate, implying that the physical restriction imposed by the pericarp is not the exclusive cause of dormancy in roses.

Exposing the seeds for nitric acid decreased significantly the germination capacity because nitric acid being corrosive might have damaged the embryos of some seeds suggesting that rose seeds should not be exposed to nitric acid. Hot water (98°C) and distilled water treatments had no effect on seed germination of rose seed, suggesting that these were not corrosive enough to break the hard seed coat dormancy (Atwater, 1980; Baskin, 1998).

Johnston (1977) soaked rose seeds in hot water at 96°C but he could not obtain significant results. The author indicated that the treating rose seeds with hot water might not have been able to penetrate the endosperm to enhance the germination.

CONCLUSION

From the results of this study it can be concluded that sulphuric acid treatment overcomes the seed dormancy in rose seeds. The results also showed that the type of seed dormancy in roses is physical dormancy (seed coat dormancy). Seed soaked for more than 60 seconds may lead to a decrease in germination because of embryo damage by the acid. Based on these results use of sulphuric acid for breaking dormancy of rose seeds is recommended and the time for soaking the seeds in sulphuric acid should be 60 seconds.

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Tables

Table 1. Analysis of variance for germination of rose seeds.

SOV	D.F.	S.S.	M.S.	F Value
Treatments	7	9963.15	1423.30	1408.63**
Days	3	2833.36	944.45	934.71**
Treatment x Days	21	3064.05	145.90	144.40**
Error	64	64.66	1.01	
Total	95	15925.24		

* = Significant ($P \leq 0.05$), ** = Highly significant ($P < 0.01$).

Table 2. Mean ± SE for germination of rose seeds.

Treatments	2 days	4 days	6 days	8 days
Distilled water	0.0±0.00 ^{e}	0.0±0.00 ^{e}	0.0±0.00	0.0±0.00 ^{e}
Hot water (98°C)	0.0±0.00 ^{e}	0.0±0.00 ^{e}	1.7±0.33 ^{de}	3.3±0.88 ^{de}
Sulphuric acid				
30 sec.	2.3±0.33 ^{de}	20.7±0.88 ^{bc}	35.5±0.88 ^{a}	41.3±0.88 ^{a}
60 sec.	5.0±0.58 ^{de}	28.7±0.88 ^{ab}	38.3±0.67 ^{a}	42.7±0.33 ^{a}
90 sec.	2.3±0.33 ^{de}	7.0±1.15 ^{cde}	11.7±0.67 ^{cde}	17.0±0.58 ^{bcd}
Nitric acid				
30 sec.	1.0±0.58 ^{de}	3.7±0.67 ^{de}	5.0±0.58 ^{de}	8.0±0.58 ^{cde}
60 sec.	3.3±0.88 ^{de}	4.7±0.33 ^{de}	6.7±0.33 ^{cde}	10.7±0.33 ^{cde}
90 sec.	0.3±0.33 ^{e}	3.0±0.58 ^{de}	4.3±0.33 ^{de}	7.7±0.67 ^{cde}

Research on Lengthening th Cut Flower

Yuniarti, P.E.R. Prahardini and P.
Assessment Institute for Agricultu
Jl. Karangploso KM 4, Malang
Indonesia

Keywords: dipping solution, disti

Abstract

Chrysanthemum is the r Java. Among the spray kind, variety. Preliminary study sh potassium nitrate, silver thio s element at various concentrati compared to those dipping in various concentrations and dis The aim of the research was tc the shelf life of 'Cat Eyes' chry variety, harvesting from farm Java from January to June 20 samples were selected from 70 and every 10 flower stems, flow water and transported to the p city. Arrived in the laboratory, were taken, then all the rest of as long as 60 cm and all the le Each flower stem was then dip 500 ml glass bottle. All treatm The research used Fully Rand from distilled water containi silver thiosulfate, citric acid, be concentrations as treatments, r of storage life of the flower, c began to wither. The result sho ppm silver thio sulfate can pr from 11 to 21 days after harves

INTRODUCTION

In the area of Pasuruan F the agro-tourism. The supportin potential agro-ecology for fru opportunity to build the main a character is Tutur district. This a potato, cabbage, paprika and c business nowadays is the growi prospective one for supporting a

Many varieties of good c successfully produced by the ch popular spray kind is 'Cat E destination markets are Surabay demand of chrysanthemum is h demand. One of the marketing than that from West Java.

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