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Promotion of seed germination and subsequent seedling growth of loquat (*Eriobotrya japonica*, Lindl) by moist-chilling and GA_3 applications

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Abstract

The germination of loquat seeds faces certain problems. The present research was designed to study the promotion of the germination of loquat seeds by moist-chilling and GA_3 applications. The results showed that loquat seeds display an endogenous dormancy that can be released by moist-chilling treatment for a certain period. In this respect, the best treatment was moist-chilling for 3 weeks at 5 ± 1 °C or 1 week of moist-chilling followed by soaking in 250 ppm GA_3 solution for 20 h. These treatments significantly increased germination percentage (88 and 85%, respectively) and decreased time to 50% germination (T50) (31.5 and 40.7 days, respectively) compared to control (51% and 56 days, respectively). Also, the characteristics of the obtained seedlings were much better than the control seedlings. In addition, the 3-week moist-chilled seeds contained the highest soluble protein concentration and were characterized by the synthesis of new protein band of 161.7 kDa that was absent in all other treatments. This treatment lead to the absence of five polypeptides bands (222.5, 201.5, 109.5, 71.1 and 49.3 kDa), which were synthesized in GA_3 treatment, and the presence of a higher number of polypeptide bands compared with those of other moist-chilling periods and the control treatments. However, increasing the moist-chilling period over 3 weeks significantly decreased both germination percentage and T50. The combination between GA3 and moist-chilling treatments produced differential effects on seed germination, soluble protein and the number of protein bands depending on the length of the moist-chilling period. Although GA3 application on un-chilled seeds resulted in more synthesis of protein bands than other tested treatments, it did not improve the germination process. The concentration of soluble inorganic phosphorus of the tested seeds was negatively ($r = -0.57^*$) and the concentration of soluble organic phosphorus positively

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($r = +0.49^{*}$) correlated with the germination percentage. It was concluded that treatment of moist-chilling for 3 weeks or 1 week moist-chilling followed by 250 ppm GA_3 is recommended for promoting the germination process of loquat seeds and improving growth characteristics of the subsequent seedlings.

Keywords: *Eriobotrya japonica*; Seed dormancy; Protein analysis; Phosphorus concentration

1. Introduction

Loquat trees originate and commercially are produced mainly in China and Japan. Fruits can be consumed fresh or processed in several forms. Loquat leaves and fruits traditionally have been considered to have high medicinal value and there is strong evidence of pharmaceutically active compounds (see Lin et al. (1999)). In Egypt there is growing interest to cultivate loquat trees especially on new reclaimed land.

Generally, the loquat tree is very well adapted to virtually all soils that have good internal drainage and hence grows equally well in the acid and the alkaline soils. Therefore loquat seedlings are preferred over apple, pear and quince as a rootstock for commercial loquat fruit production under most conditions (Morton, 1987; Lin et al., 1999). However, the germination of loquat seed, in general, faces certain problems such as the low germination percentage and velocity as well as the slow growth of the subsequent seedlings. Such problems obstruct the use of loquat as a convenient rootstock in loquat propagation. On the new reclaimed land, the quince rootstock is usually used in spite of its undesirable characters such as the shallow root system and the high susceptibility to salinity. Therefore, enhancement of loquat seed germination is important in propagation and breeding programmes as well as for testing and using germplasms.

Various dormancy breaking and germination stimulating treatments have been tried with seeds of many fruit species such as papaya (Nagao and Furutani, 1986), persimmon (Taha, 1987), peach (El-Khoreiby and Salem, 1985; El-Dengawy, 1997) and loquat (Polat and Kaska, 1992; Polat, 1997). In this respect, gibberellic acid and moist-chilling treatments seem the most promising in many woody species (Powell, 1987). The aim of the present study was to find a practical method to promote loquat seed germination and the subsequent seedling growth by means of moist-chilling and GA_3 applications. Also, to examine the effect of such treatments on the biochemical changes associated with the germination of the treated seeds.

2. Materials and method

Loquat seeds cv. ‘‘Advance’’ *(Eriobotrya japonica*, Lindl), were collected from mature fruits that were picked from one tree in a private orchard at Damietta Governorate, Egypt, during the 1998–1999 seasons. The collected fruits were transported to the experimental nursery of Mansoura University and the seeds were extracted and immediately washed with tap water, divided to 8 groups (60 seeds for each). Each group was divided into 4