Development of techniques for rapid production of rattan seedlings

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Introduction

Rattan industry in Africa has bright prospect for expansion. However, this is hampered by the scarcity of raw materials of rattan (Zoro Bi and Kouakou 2004; Zoro Bi and Kouassi 2004). The low supply of rattan has been attributed to the destruction of natural forest, lack of program for rattan regeneration and plantation allowing the production of planting materials at a large scale in large quantities. Germination of rattan seeds is generally poor and seeds, if available, have erratic germination. Manokaran (1978), Mori and Rahman (1980) found that seeds of various rattan species require 4 to 41 weeks to germinate and percentage of germination varies from 0.02 to 79%. The aim of this work is to develop a strategy which can speed up seed germination in order to develop an efficient seedlings production for rattan.

Material and methods

Seeds of *Laccosperma secundiflorum* and *Eremospatha macrocarpa* were collected in December and January 2007. *E. macrocarpa* (cane diameter <2cm) is known to be the best source of cane in Africa. *L. secundiflorum* (cane diameter ≥3cm) is highly prised as source of cane and used predominantly for furniture frames. Fresh seeds were washed in tap water, treated with detergent solution and washed in sterile water. Excised embryos were washed in sterile water and planted on the following media: medium (M1) made of Murashige and Skoog salt (1962) supplemented with *myo*-inositol (100mg/l), casein hydrolysate (500mg/l); M2 and M3 consist of M1 supplemented with Gibberellins 10^{-6}M and 10^{-5}M respectively and M4 Gamborg basal medium. The embryos were incubated in growth chamber at 28 ± 2°C in total darkness. As for the nursery, the cleaned seeds (after scarification) were subjected to various tests of breaking dormancy (prechilling to 0°C during 4 days, seeds imbibed in GA_3 10^{-6} to 10^{-5}M during 4 days; in KNO_3 10^{-3}M to 10^{-4}M during 4 days and in H_2O_2 5%, 10% and 20% during 1 hour).

Results and Discussion

Germination is noted when the radicle emerged and the young conical shoot took shape. A significant difference was observed between the different media used. The media M2 and M3 gave 29% and 100% of germination rate after respectively 6 and 20 days of incubation for *E. macrocarpa*; 50% and 100% of germination rate after respectively 10 and 24 days of incubation for *L. secundiflorum*. Media M1 and M4 gave 75 to 85% of germination rate after 30 days of inoculation. In the nursery, the first germination was observed 36 days after sowing for *E. macrocarpa* and 60 days for *L. secundiflorum*. Seeds imbibed in GA_3 10^{-5} and 10^{-6}M gave 92% and 57% germination rate after 245 days of sowing for *E. macrocarpa* against 24% and 20% for *L. secundiflorum*. Excised embryos germinate *in vitro* during few days in presence of GA_3. These results suggest that seeds of the two rattan species may have exogenous and/or endogenous dormancy. Indeed, rattan seeds were covered by an impermeable testa which causes the restriction of gaseous and water uptake by embryo (Bradbeer 1988). The dormancy could also result from the fact that the radicle was unable to develop sufficient thrust to cause testa rupture.

Besides maturity and freshness of seeds, the addition of GA3 in the culture media and imbibed seed in GA_3 solution is adequate to speed up rattan seed germination.

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Productive and vegetative responses of 'Gala' and 'Fuji' apple trees under controlled irrigation strategies

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Introduction

Maximizing fruit production and quality with minimum irrigation inputs, i.e., increasing plant water use efficiency is essential in the dry climate of southern Mediterranean regions. Regulated deficit irrigation (RDI) was developed to minimize irrigation inputs for fruit production. It consists in the withholding of water during certain periods to produce a moderate drought stress and obtain beneficial consequences on fruit quality and reductions of vegetative growth. Although results of RDI experiments have been promising for some fruit crops, in species like apple and grapes with concurrent fruit and shoot growth, RDI reduces fruit size and yields (Lötter et al., 1985; Ebel et al., 1995). Further efforts toward improving irrigation efficiency of grapes in Australia has lead to the development of a novel technique, partial rootzone drying (PRD), where only one half of the rootzone is irrigated, whereas the other half is not, alternating the two sides at specific intervals (Dry et al., 1995). The physiological basis for PRD is that roots in drying soil produce abscisic acid (ABA) which is translocated to the leaves, inducing partial stomatal closure, reduced transpiration and increased water use efficiency. Since the other half of the rootzone is kept well watered, the effect on plant water potential is minimal and most metabolic and physiological processes associated to water stress are not affected (Dry et al., 1995; Dry et al., 2000). The objective of this work was to investigate the effect of PRD on yields and fruit quality of 'Gala' and 'Fuji' apple trees in the dry climate of central Sicily.

Materials and Methods

The experiment was conducted near Caltavuturo, in central Sicily, using 72 six-year-old apple trees (36 'Gala' and 36 'Fuji') grown on M.9 rootstock and arranged in a randomized block design. Three treatments were imposed: Conventional irrigation (CI), where 104 mm of water were distributed by a drip system in 17 events to maintain soil moisture above 80% of field capacity; PRD irrigation, where only one side of the rootzone (alternated every 2-3 weeks) received 50% of the CI water; and continuous deficit irrigation (DI), where 50% of the CI irrigation water was applied to both sides of the rootzone. Soil water tension (SWT), stomatal conductance (g_s), fruit growth, and shoot extension were recorded weekly, yield and fruit quality after harvest.

Results and Conclusions

In CI trees and on the wet side of PRD trees, SWT remained generally above -50 kPa (about 80% field capacity) and exhibited fluctuations due to irrigation cycles. In DI and the dry side of PRD trees, SWT progressively decreased to values around -200 kPa. In PRD trees, wet and dry sides were alternated when SWT of dry side reached -100 kPa. In both 'Gala' and 'Fuji', g_s of DI trees was significantly lower than that of CI trees (52% reductions) during the entire irrigation period, while g_s of PRD trees exhibited intermediate levels (24% reductions). In both cultivars, fruit and shoot growth rates were similar for all treatments although 'Gala' fruits of PRD trees tended to be larger than those of CI and DI at harvest, and 'Fuji' shoots stopped growing earlier than 'Gala' shoots. In both cultivars, trees of the three treatments had similar yields, number of fruits, yield efficiency, although PRD tended to reduce yields of 'Gala' trees. In 'Gala', fruit quality was similar for all treatments; in 'Fuji', fruits of PRD and DI trees were firmer and better colored than those of CI trees. This first year of observations suggests that, in 'Fuji', increases in water use efficiency may be attrib-