INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2005/07–3–457–459
http://www.ijab.org

# Propagation of the Strawberry Tree Through Seed (*Arbutus unedo*)

I. HAMMAMI[1], M. JELLALI†, M. KSONTINI†, M.N. REJEB†
*Faculty of Sciences of Tunis, University Campus, El Manar 2094, Tunisia*
†*National Institute of Research in Genius Rural, Waters and Forests; Tunis - 2080 - Ariana*
[1]Corresponding author's e-mail: imran.hammami@laposte.net

## ABSTRACT

The Strawberry tree is in timberings of the Mediterranean region. In Tunisia, *Arbutus unedo* generally pushes in regions to high altitude (Kroumirie - Mogods). The bioclimate on these different zones is qualified of humid to sub-humid. There was the idea that the germination of the arbutus was originally very nit and erratic, and the burial of a fruit mixture brewed with fertilizers (or of cow excrements) was the best way to carry a high percentages of germination. The multiplication of the Strawberry tree has been achieved by seeds (sexual multiplication). Seed included in their fruit have a very low rate of germination not passing 4.2%, caused by the presence of certain inhibitory substances diffused by the fruit. The freestanding seed germination is strongly influenced by the temperature and show to an optimal temperature of 20°C a rate of 19.2%. The treatment of seeds to a temperature of 30°C during 6h recorded a rate of 18% germination.

**Keys Words:** Arbutus; Germination; Meadow-treatment

## INTRODUCTION

Arbutus, this cosmopolitan kind counts a dozen of species, of which *Arbutus menziesii* (the arbutus of America) and *Arbutus unedo* L (strawberry tree). It is used in several domains; the strawberry tree produces the forage of good energizing value, leaves and fruits can be used in the pharmaceutical industry; in addition fruits are edible, they are rich in vitamin C. *Arbutus unedo* is an ornamental bush, its beauty resides in the mixture of its foliage green obstinate brightness with its white flowers and its red fruits decorating the bush all along of year.

There was the idea that the germination of the arbutus was originally very nit and erratic, and the burial of a fruit mixture brewed with fertilizers (or of cow excrements) was the best way to carry a high percentages of germination. It was thought that seeds, freestanding of their fruits, would decrease the capacity of germination quickly (Ricardo & Veloso, 1987). The present paper projects to clarify these points and to contribute to the understanding of propagation of the strawberry tree trough seeds.

## MATERIALS AND METHODS

**Vegetable material.** Entire fruits, were used for the extraction of seeds, of seeds extracted from fruit, either one removes seeds directly of the fruit with the help of clamps after its section in two halves, or abducts seeds indirectly; this has been made while soaking fruits in the hot water for several days (about 10 days) then to remove the pulp, and harvests seeds.

**Sown of whole fruit.** 400 mature and fresh fruits of strawberry tree were used which were sown in eight trays of germination, in two types of substratum; The first is the peat that is a plant product (sphagnum), composed of 20% of organic matter on gross earnings, 30% of dry matter on gross earnings, 350-500% of retention in water on dry product, its pH is between 5-6, the resistance is 1000 ohms/cms. The second is the sterile sand that has been sterilized to steams during 24 h to 106°C.

Every tray contains 50 disposed fruits thus in 5 lines of 10 fruits plunged to 2 cm in the sterile sand or in the peat. Four trays have been filled with peat, the four other with the sterile sand. As we know, the fruit is composed by five stalls containing each 4 or 5 seeds; therefore each tray contains on average of 1000 seeds. The peat is irrigated 2 times per week and the sand is watered 3 times per week. The trays have been placed under greenhouse shade.

**Freestanding seed sown on paper blotter.** 1000 seeds of strawberry tree were washed, under a video-scope, to get rid of the. They have been sown in five Petri dishes (200 seeds/ dish), on the paper blotter, placed on a plate in glass, the two extremities of the paper immerse in water and kept to a relative humidity of 100%. The whole is put to germinate in the steams into 30°C. The date of sowing is in the beginning January 2001. A second sample has been sowed by the same way, but it has been put in the steams of conditioning into 20°C. The date of sowing is in the beginning of the month of March 2001. Water absorbed by seeds is added every day.

**Freestanding seeds sowed on substratum.** Seeds of strawberry tree meadow-treated have been sowed in tray of polystyrene that was breakthroughs to the bottom in order to let a good drainage, we prepared then a mixture for

seedling, composed by a third of compost, a third of peat and a third of sand. The whole crumbled well; we adds the mixture then in tray, thereafter we packs it slightly with the help of a small board in wood, after we sows seeds regularly; we covers with a fine layer of the mixture sifted, we packs it slightly as previously with a small board; in end we humidify them with the help of an atomizer, the humidification is made three times per week.

Seen the small size of seeds and the fine protective layer of the tegument, the applied temperatures don't pass 30°C and the time of application doesn't pass the 24 h. Four thermals meadow-treatments to the freestanding seeds was applied; 1) Treatment (T1): 24 h to 0°C then 24 h to 30°C, 2) Treatment (T2): 2 cycles of 24 h to 0°C then 24 h to 30°C, 3) Treatment (T3): 6 h (30°C) and 4) Treatment (T4): 6 h to 30°C then 6 h to 0°C. The Witness treatment was (T0): (Ambient temperature).

100 seeds have been sowed for every meadow-treatment. The manipulation has been repeated three times, seen the number limited of the collected seeds.

## RESULTS

**Sown of whole fruit.** Seed included in their fruit begin to germinate on peat after 10 weeks whereas on sterile sand they took 13 weeks.

The evolution of the seed germination according to the time shows the existence of three phases on the two substrata; the first corresponds in the time of latency, it is the time that flows out between the sown and the germination of seeds that are of 10 weeks on peat and 13 weeks on sterile sand, the second phase is presented by the increase of the germination speed. In which we notes a light increase of the germination rate and the third corresponds to a landing that indicates an annulment of the germination speed.

On peat or on sterile sand the rate of germination is very low, which is 4.2% on peat and 0.67% on sterile sand (Fig. 1).

The statistical analysis shows that the difference in the rates of germination in the two substrata is no significant.

**Freestanding seed Sown on paper blotter.** The germination to 20°C started two weeks after the sowing to reach 19.2% after five weeks. On the other hand to 30°C, the rate of germination is worthless. Then the germination of the strawberry tree is more advantageous to 20°C that 30°C (Fig. 2)

**Freestanding seeds sowed on substratum.** Seeds that don't have incurs any treatment (To: witness) recorded the rate of germination of 14%, the emergence began after two weeks of the sown. Seeds that have incur some thermal treatments (T1: 0°C during 24 h then to 30°C during 24 h; T2: two cycles of 24 h to 0°C then 24 h to 30°C and T4: 30°C during 6 h then to 0°C during 6h) recorded the lowest germination rates, they are respectively 10, 0 and 2%. The time of latency is of three weeks for seeds meadow-treated by T1 and it is of five weeks for seeds meadow-treated by T4.

**Fig. 1. Rate of "fruits" germination in the two types of substratum (Peat & sterile sand)**

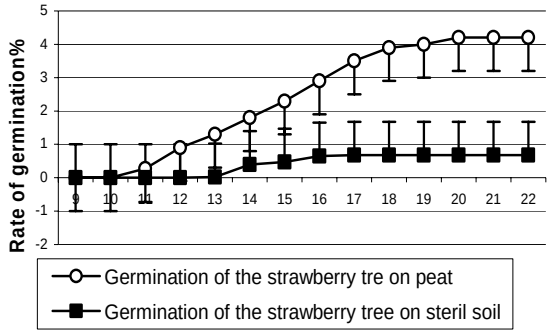
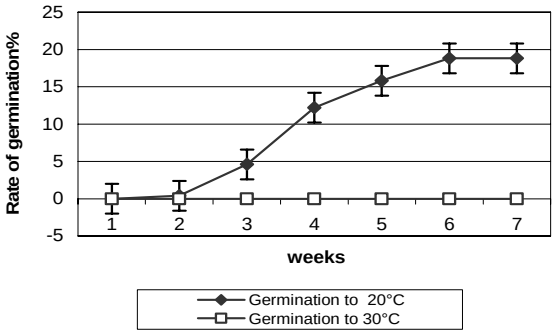



**Fig. 2. Germination rate of arbutus seeds on paper Blotter under two different temperatures (20°C and 30°C)**




The best result is obtained at seeds meadow-treated to a temperature of 30°C during 6 h (T3), the rate of germination is 18%, the emergence began two weeks after the sown (Fig. 4).

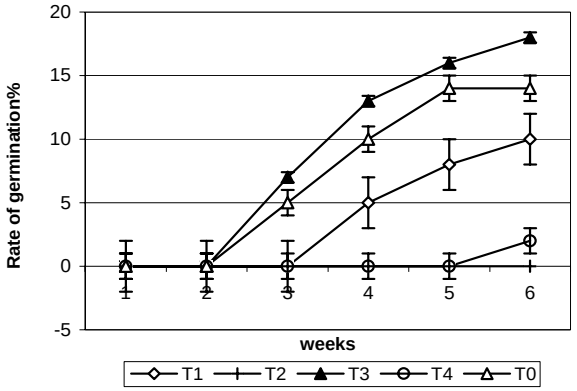
The statistical analyses showed a significant difference between the different treatments to 0.05.

## DISCUSSION

The management effective of nursery endures considerably a slow and irregular germination (Bonner, 1974). Consequently, we look for testing some efficient artificial treatments to raise the numbness, so that seeds can germinate quickly and uniformly on boards of nursery.

In the survey where mature fruits have been sowed in two types of substrata, we note that the rate of germination is very low. We can assign this result to an inhibition due to the biologic factors (diffusion of inhibitors of germination). Champagnat *et al.* (1969) put in evidence the presence in certain fruits of substances called Blastokolins that inhibits the germination of the seed so much that it is inside the fruit. Our results are in agreement with the works of Ricardo and

**Fig. 3. Germination of arbutus seeds with a thermal treatment on composed substratum by peat, compost and sand**




T1: 24h to 0°C then 24h to 30°C T2: 2 cycles of T1
T3: 6h to 30°C T4: 6h to 30°C then 6h to 0°C
T0: Witness

Velosos (1987) about the germination of the seeds inside the fruits that showed that only a little number of seeds had germinated after 160 days. The higher value of the germination rate has been observed at samples put to the cold weather after a period of 10 months on dry soil. It appears that inhibitors in the fruit have been removed under the combined action of the cold weather and the drying up.

As using the thermal treatment for the freestanding seed germination we recorded a rate of germination of 19.2% at 20°C, after seven weeks of seedling. On the other hand this rate is worthless at 30°C; what has been noted by Bewley and Black (1994) and Bradford (1995) that there is an optimal temperature for seedlings, above and below of which the rate of germination is in decline. This optimal temperature is for the strawberry in vicinities of 20°C. It has also been shown that the treatment of seeds by the GA3 (Auxines) raises the inhibitory effect of high temperature partially (Ricardo & Veloso, 1987).

Results of the seed germination meadow-treated thermally show differences according to treatments. A change of the water temperature creates a mechanical shock that causes changes in the tegument of seed, and facilitates the imbibitions of water and indispensable oxygen to germination (Battaglia, 1993). In our results we notes that the thermal shocks, T1 (24 h to 0°C then 24 h to 30°C), T2 (2 cycles of T1) and T4 (6 h to 30°C then 6 h to 0°C) show the lowest germination rates, that are respectively 10%, 0% and 2%. It can be assigned to the destruction of the fine protective layer of the embryo (tegument). Mapongmetsem *et al.* (1999) observed on seeds of eight forest species indigenous Cameroonian that many died indicating that the cold water and the hot water took contact with embryos, it occurred because the tegument, that adjusts the absorption of water normally, has been damaged and the fast increase in water caused some irreversible damages.

## CONCLUSION

The freestanding seed germination is influenced strongly by the temperature, of this fact it released after two weeks to an optimal temperature of 20°C to reach 19.2% after seven weeks of the sown and beyond of this temperature it becomes worthless.

The freestanding seed germination and meadow-treated by a thermal treatment, has show to a temperature of 30°C during 6 h the most important result (18%). on the other hand the applied thermal shock to the freestanding seeds, damaged the tegument that adjusts the absorption of water normally and induced thereafter an enormous reduction of the germination rate.

## REFERENCES

Battaglia, M., 1993. Modeling seed germination and seedling survival of *Eucalyptus delegatensis* R.T. Baker to facilate optimal reafforestation, *Ph.D. Thesis*, University of Tasmania

Bewley, J.D. and M. Black, 1994. *Seeds. Physiology of development and Germination*, Plenum Press, New York

Bradford, J.K., 1995. Water relations in seed germination, *In:* Kigel, J. and G. Galili (eds.), *Seed development and germination, Marcel Dekker*, pp. 351–90. inc. New York

Champagnat, R., P. Ozenda and L. Bailland, 1969. *Biologie végétale III Croissance, morphogenèse Reproduction*; pp. 442–54. Précis de science biologiques publié sous la direction de p[r] P.P Grassé

Mapongmetsem, P.M, D. Bahiru, A.N. Bernard and S. Eric, 1999. The effect of seed pretreatement to improve germination in eight indigenous tree species in the forests of Cameroon. *Ann.For.Sci*., 56: 679–84

Ricardo, C.C.P. and M.M. Veloso, 1987. *Features of seed germination in Arbutus unedo L* Departamento de boutanica, Instuto Superior de Agronomica National, 2780 Oeiras, Portugal

**(Received 10 December 2004; Accepted 10 March 2005)**