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Preliminary survival experiments in transplanting pomegranate

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SUMMARY – Pomegranate is usually propagated by rooting hardwood cuttings, which are transplanted to their permanent place after one year in the greenhouse. The cuttings are normally uprooted in winter, while they are usually transferred to the definitive plot between the end of winter and the beginning of spring, always before sprouting, although different factors may intervene to prevent this. We therefore decided to study the latest time it was possible to make this final transplantation, using plants which had rooted in 1997, taken from the greenhouse in December of the same year, kept in cold storage at 5°C and 95-100% relative humidity and planted out at different times in 1998. The results show that this species can be planted out until May (in the ecological conditions of Alicante province) as long as cold storage is adequately carried out.

Key words: Hardwood cutting, rooting, pomegranate.

RESUME – "Expériences préliminaires de survie pour la transplantation de grenadiers". La grenade est généralement propagée par des boutures racinées de vieux bois, qui sont transplantées dans leur site permanent après une année en serre. Les boutures sont normalement sorties de la terre en hiver, tandis qu'elles sont généralement transférées à leur parcelle définitive entre la fin de l'hiver et le début du printemps, toujours avant les rejets, bien que différents facteurs puissent intervenir pour empêcher ceci. Nous avons par conséquent décidé d'étudier le moment le plus tardif où il était possible de faire cette transplantation finale, en utilisant des plantes qui avaient enraciné en 1997, prélevées en serre en décembre de la même année, tenues au froid à 5°C et 95-100% d'humidité relative et plantées à l'extérieur à différentes périodes en 1998. Les résultats montrent que cette espèce peut être plantée à l'extérieur jusqu'en mai (dans les conditions écologiques de la province d'Alicante) tant que le stockage à froid est mené adéquatement.

Mots-clés : Bouture de vieux bois, enracinement, grenade.

Introduction

The production of pomegranate plants, as opposed to other more commonly grown species such as citrus, has still been studied very little, although it is traditionally known by agriculturists in producing areas. Vegetative propagation of the pomegranate is limited almost exclusively to the use of hardwood cuttings, and, less frequently, using suckers and shoots which grow next to the pomegranate trunk. Grafting is a technique which is used almost exclusively for varietal change, or when a new variety is to be propagated of which there are hardly specimens from which to obtain cuttings; the grafting is normally carried out at two preferable moments, in May or in July, although it can also be done at the end of the summer (with dormant buds) (Melgarejo and Martínez, 1992).

Tests on pomegranate cutting rooting for vegetative multiplication of the species are very scarce and the studies which have been carried out do not normally go further than the scope of the area where the studied clone is cultivated. From the brief bibliography on rooting of this species, we do not know of tests on survival or yield in the transplanting of rooting cuttings. Studying this aspect of pomegranate propagation is very important, as the agriculturist often does not have the necessary labour to plant out at the right moment, and also to a certain extent the weather can determine the time when this task is carried out. It is therefore advisable to know the conservation method of the rooted plants and how long they can be kept, so that losses during transportation are minimal.

The aim of this work is to contribute to knowledge on storage conditions of the rooted plants after propagation in greenhouses, and to discover the maximum time for transplanting to the definitive plot, and the losses incurred by delay in this operation.

Materials and methods

The vegetable matter used is cuttings from different pomegranate clones, rooted during spring 1997 and uprooted with bare roots on 23 December 1997. Although different clones were tested in the study, we will centre the study on a mixture of clones which are much used in commercial pomegranate propagation in the area: in particular, clones MO2, MO3, MO4, MO5 and MO6 (which have very similar characteristics), picked at random. These produce good quality fruit, and give high yields with hardwood cutting propagation. The cutting and rooting conditions of these plants are described by Melgarejo *et al.* (1998). The cuttings for the test were taken on 6 February 1997 at La Dehesa estate in the town of Orihuela, where a selection of the above clones is to be found. The plantation of the cuttings was carried out directly in the ground on 18 February 1997, in a plot on the estate of the Escuela Politécnica Superior de Orihuela, after being treated with IBA and base wounds.

The rooted plants were conserved in cold storage from the time of being uprooted until being planted, bearing in mind the results of previous tests on conservation conditions which we had carried out. The conservation temperature was $5\pm 1^{\circ}\text{C}$ and relative humidity was maintained between 95 and 100%. The temperature was controlled using an electronic thermostat, and humidity control, using a psychrometer installed in the cabinet. Whenever the humidity reached 95%, the plants were sprinkled manually with water to raise the environmental humidity to 100%.

In order to discover the survival capacity of the plants on transplantation, they were transplanted to the definitive plot on the dates shown in Table 1, bearing in mind that in the cultivation area, transplantation is normally carried out in the months of February and March.

Table 1. Transplantation survival of pomegranate cuttings conserved in cold storage at 5°C and 95-100% relative humidity

Plantation date	No. of cuttings planted	No. of cuttings that survived transplantation	% of cuttings that survived transplantation
12-02-98	300	298	99.3
15-04-98	271	241	88.9
15-05-98	52	52	100.0
05-06-98	52	13	25.0
10-06-98	49	14	28.6
23-06-98	49	6	12.2
07-07-98	51	1	1.9

The first transplantation was carried out on 12 February 1998 and the last on 7 July 1998. The final control on the survival of the plantlets was carried out on 8 August 1998.

The transplanted plants were watered using drip irrigation, applying 9 litres of water per plant each week, except in the case of those transplanted on 15-4-98, which were watered using buckets as there was a water shortage during the rooting period.

The average temperatures during the plantation and rooting period were as shown in Table 2.

Table 2. Average temperatures ($^{\circ}\text{C}$) during 1998

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
12.2	13.0	15.3	17.1	19.1	23.6	26.6	26.6

Results and discussion

The results of the test, showing plantation date, number of transplanted plants and number of plants which survived transplantation, are shown in Table 1.

Before analysing the results shown, it must be pointed out that during the cold storage of the plants, an error was detected in the environmental humidity control on 5-6-98, when the humidity in the cabinet was 60%, and it was observed that at that moment there was a high level of dehydration in the conserved plants, which had a notable influence on the transplantation survival results from that date onwards. This degradation of the vegetable matter, along with the increase in temperatures in the months of June and July, meant that there was virtually no survival in the latter month.

We see that until mid-May it is possible to conserve the rooted pomegranate cuttings in cold storage and obtain maximum survival of the transplanted plants.

From the start of June, the survival of the transplanted plants decreases noticeably, although we are not sure that survival at this time of year can not be higher than in the results of the test, especially bearing in mind the error in the humidity maintenance of the cold cabinet where the plants were being conserved. Nevertheless, the survival probability of the transplanted plants from June onwards may decrease noticeably because of the increase in temperature from this month onwards which makes transplant success more difficult.

Conclusions

From the study carried out on the above clones, in the ecological conditions of La Vega Baja on the Rio Segura, we can conclude that:

(i) It is possible for pomegranate plants, which have rooted and then been uprooted with bare roots, to be conserved in cold storage at $5\pm 1^{\circ}\text{C}$ with 95-100% humidity for at least 5 months, without this causing transplantation failure, with the above temperature and humidity conditions being optimum for pomegranate plant conservation during the test period.

(ii) The reduction of humidity during the conservation in cold storage of the rooted plants can have a very negative influence on the transplant survival of the pomegranate plants, reducing the conservation period in which transplantation can be carried out with an acceptable success percentage.

(iii) Until new survival tests are carried out in the weather conditions of this test, transplantation should not be later than the end of May.

(iv) It would be advisable to repeat the test, maintaining the specified humidity conditions (95-100%) without variation during the conservation period, to determine more precisely the deadline for transplanting this species economically.

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