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# THE USE OF THE MODIFIED CHIP BUDDING METHOD FOR ROSE PROPAGATION IN THE FIELD

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**Abstract:** The experiments were carried out to investigate the use of the modified chip budding method on hardwood cuttings of rootstock (*Rosa odorata* L.) at the workbench, and to compare the method with 'T' budding as started-eye for propagation of budded rose plants in the field under the Mediterranean coastal climatic conditions. Scion buds were taken from cvs Dallas, Jacaranda and Gabriella. Desirable well developed budded plant ratios, from 71.0 to 82.7 %, were obtained by using the modified chip budding at the workbench and planting budded cuttings in the field at the same time in late autumn and winter. Modified chip budding had also advantages in the number of rooted cuttings that could be budded, bud union percentage and well developed budded plant ratios compared to 'T' budding as started-eye. The highest bud union and well developed budded plant ratios were recorded in cv Dallas. Modified chip budding method could eliminate some steps used in 'T' budding, and provide a longer time for scion development.

**Key Words:**Propagation, budding method, rose

**Açıkta Gül Fidan Üretiminde Modifiye Yonga Aşı Yönteminin Kullanımı**

**Özet:** Bu çalışmada, Akdeniz Bölgesi iklim koşullarında, açıkta aşılı gül fidanı üretiminde modifiye yonga aşının masa başı aşısı olarak uygulanabilirliği araştırılmış ve bu yöntem sürgün göz aşısı olarak 'T' göz aşısı ile karşılaştırılmıştır. Araştırmada *Rosa odorata* L. anaç olarak kullanılmış, aşı gözleri Dallas, Jacaranda ve Gabriella çeşitlerinden alınmıştır. Geç sonbahar ve kış mevsimlerinde anaç çeliklerinin masa başında modifiye yonga aşı yöntemiyle aşılanarak aynı tarihte açığa dikilmesiyle oldukça yüksek iyi gelişmiş aşılı bitki oranları (% 71.0-82.7) elde edilmiştir. Ayrıca bu aşı yönteminin sürgün göz aşısı olarak uygulanmasıyla, 'T' göz aşısına göre; aşılanabilen köklü çelik sayısı, aşı tutma oranı ile iyi gelişmiş aşılı bitki oranının arttığı saptanmış, en yüksek aşı tutma ve iyi gelişmiş aşılı bitki oranları ise Dallas çeşidinde belirlenmiştir. Bu yöntemle 'T' göz aşısındaki bazı işlemler ortadan kaldırılmış ve kalemlerin büyümesi için daha uzun bir süre sağlanabilmiştir.

**Anahtar Kelimeler:** Çoğaltma, göz aşısı yöntemi, gül

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## Introduction

In recent years, a rapid increase has occurred in Turkish cut flower production and rose is one of the main crops of the cut flower industry. Turkish growers generally use grafted rose plants and produce their starting materials using the 'T' budding method. In the Mediterranean coastal regions of Turkey, *Rosa odorata* is mainly used as rootstock. Hardwood cuttings are planted in the field during late autumn and winter seasons. After rooting is completed, they are budded by using 'T' budding as started-eye from the end of May to the middle of June. Using this propagation system, saleable budded rose plants can be grown in one year period. However, the air temperature may sharply increase before or during budding period. This causes lack of bark separation of the rootstocks and significantly decreases bud union rate (8).

As known, there are many methods to produce roses vegetatively (5,6,9). Grafting and budding methods used in rose propagation show wide differences from country to country or even from region to region related to rootstock properties, facilities and propagation habits (5,6,7,11). After 1980s, investigations have focused on methods which provide year round production or reduce propagation period in grafted or budded rose plant production (8,11). Previous experiments showed that chip budding was quite satisfactory for propagating field roses by indoor bench grafting in winter on dormant unrooted rootstock cuttings, and also mentioned the advantages of chip budding over "T" budding (1,2,3). It was also stated that modified patch budding could be easily made on dormant unrooted *Rosa odorata* L. cuttings and obtain satisfactory budding success under the Mediterranean coastal climatic conditions (8). In Turkey, 'T' budding is the method commonly used. However, the growers have some difficulties in

using this method in the Mediterranean coastal region as mentioned above. So the growers need to use new techniques that can eliminate bud union problems and some steps in 'T' budding, providing a longer time to maximise scion development.

The purpose of this study was to investigate the use of the modified chip budding method on unrooted *Rosa odorata* hardwood cuttings at the workbench, and to compare this method with 'T' budding as started-eye for rose cultivars such as Dallas, Jacaranda and Gabriella under field conditions.

**Material and Methods**

The experiments were performed at the Horticultural Research Institute, in Erdemli, Icel (Turkey), during 1993-1994. The modified chip budding method used in the experiments were realised in the following four steps as described by Garner (4): 1. The stock bark was cut vertically downwards 20-25 mm with minimum amount of wood, the width being judged according to the width of the bud slice (shield) to be inserted. 2. Two-thirds of the length of the bark slice in relation to previous operation formed was removed. 3. A similar slice (shield), but including a bud, was cut from the scion as in the 'T' budding technique, but without de-wooding, and was cut horizontally at the bottom. 4. The shield was then placed partly beneath the remaining portion of the stock bark and the two component were held firmly together by wrapping with plastic tape until bud union was completed. The 'T' budding performed in the experiment was carried out in the conventional way as described by Hartman and Kester (5), Hasek (6) and Uzun (10).

Two separate experiments were conducted.

*Experiment 1*: Hardwood cuttings from one year old stems of *Rosa odorata* were taken and prepared 20-21 cm in length and

7-10 mm n thickness on November 26-27 and February 14-15. They were budded by using the modified chip budding method at the workbench on the same dates. The bud scions were taken from mature pants of cvs Dallas, Jacaranda and Gabriella grown in a heated glasshouse. Before planting in a sandy soil in the field, budded cuttings were treated with 1000 ppm IBA by using the quick dip method for 5 seconds. The experiment was set in a factorial design and three replicates with one hundred budded cuttings per experimental unit. Rooting percentage of rootstock, bud union, the time from budding to 50 % of bud sprouting and the well developed budded plant ratios were recorded. Data were subjected to analysis of variance according to the split-plot experimental design with planting times assigned to main plots and cultivars to subplots.

*Experiment 2*: Hardwood cuttings of *Rosa odorata* were made as described in the first experiment without budding and planted in a sandy soil in the field on November 28-29. The cuttings rooted and their sprouts reached a length of 25-30 cm by the third week of May. The buds from cvs Dallas, Jacaranda and Gabriella were budded onto the rooted cuttings by using the modified chip budding and 'T' budding methods on May 21 and 22. The bud scions were taken from mature rose plants grown in the glasshouse. The experiment was designed in completely randomised plots. There were three replicates with one hundred rooted cuttings per experimental unit. During the experiment, bark separation percentage of rootstocks (only for experimental plots that 'T' budding was made in), bud union, the time from budding to 50 % of bud sprouting and the well developed budded plant ratios were determined. Data was subjected to variance analysis according to the experimental design.

In each experiment, the hardwood cuttings were planted in two parallel rows with 15 cm distance between cuttings and 120 cm distance between rows. The soil was sandy loam with 0.9 % organic matter. The trickle irrigation lines were placed close to the each row of cuttings. Irrigation was started at the end of March and continued until the end of October. Rooted cuttings and budded plants were irrigated as needed and fertilised at two week intervals via the irrigation system by 150 N - 30 P - 100 K (ppm) + microelements (Fe, Mn, Zn, Cu and Mo) during the growing period.

In the modified chip budding method made at the workbench, the sprouts arisen from the top buds of rooted cuttings were pinched off, leaving a leafy part of stems with 15 cm in length. This was done at the end of March. All the other cultural practices were done as in the 'T' budding method for started-eye (6,10). In 'T' budding and the modified chip budding made as started-eye, the conventional propagation methods were used as described by Hartman and Kester (5), Hasek (6) and Uzun (10). Budded plants were grown until the end of October.

**Results**

The results obtained from the experiment 1 showed that the seasons of planting significantly influenced on rooting of *Rosa odorata* hardwood cuttings, bud union and bud sprouting (Table 1). IBA treatment did not eliminate the effect of the seasons on rooting. Rooting percentage was high in hardwood cuttings prepared and planted in late autumn. On the other hand, bud union was high in all cultivars in hardwood cuttings budded by using the modified chip budding at the workbench in winter. Also, there were significant differences in bud union percentages between cultivars. The highest bud union percentages were obtained from Dallas and Jacaranda for each season. The time from budding to 50 % of bud sprouting was longer

Table 1: Effects of planting times and cultivars on the success of modified chip budding on *Rosa odorata* L. hardwood cuttings at the work bench.

| Planting Time | Cultivar | Rooting percentage of rootstock (%) | Bud union (%) | Time from budding to 50 % bud sprouting (day) | Well developed budded plant (%) |
|---|---|---|---|---|---|
| Late autumn (26 November) | | | | | |
| | Dallas | 94.6 a[z] | 86.0 bc | 128.0 a | 81.4 a |
| | Jacaranda | 93.3 a | 86.3 c | 125.0 ab | 80.6 ab |
| | Gabriella | 93.0 a | 76.3 d | 123.3 b | 71.0 c |
| Winter (14 February) | | | | | |
| | Dallas | 88.3 b | 93.7 a | 82.0 c | 82.7 a |
| | Jacaranda | 88.6 b | 90.0 b | 75.3 d | 79.8 ab |
| | Gabriella | 89.3 b | 86.6 bc | 72.0 d | 76.8 b |
| Significance | | | | | |
| | Season (S) | ** | *** | *** | NS |
| | Cultivar (C) | NS | ** | *** | *** |
| | S X C | NS | * | NS | NS |

[z] : Mean separation within columns by Duncan's multiple range test , 5 % level.
NS, *, **, *** : Non-significant or significant at P< 0.05, 0.01 or 0.001, respectively.

in late autumn planted cuttings and was thus dependent on the season when outside conditions were favourable for sprouting. In each season, buds from Gabriella and Jacaranda needed shorter time for sprouting than buds of cv Dallas (Table 1).

Because of the low percentage of rootstock rooting and high percentage in bud union in winter budding, no significant difference occurred in the well developed budded plant ratios between seasons. The highest well developed budded plant ratios were recorded in Dallas and Jacaranda.

In experiment 2, there were significant differences in bud union, the time from budding to 50 % of bud sprouting and the well developed budded plant ratios between budding methods and cultivars (Table 2). During 'T' budding, bark separation percentage of rooted cuttings was recorded in the experimental plots assigned to 'T' budding. It was found that bark separation percentages varied between 93.6% and 95 % at the time of budding. All of the rooted

Table 2: Effect of budding methods on budding success of rose cultivars on *Rosa odorata* L. rooted cuttings as started eye.

| Budding method | Cultivar | Bark separation percentage of rootstock (%) | Bud union (%) | Time from budding to 50 % bud sprouting (day) | Well developed budded plant (%) |
|---|---|---|---|---|---|
| 'T' Budding | | | | | |
| | Dallas | 93.6 | 80.7 bc[z] | 47.3 a | 73.5 cd |
| | Jacaranda | 95.0 | 78.3 c | 36.0 c | 71.4 de |
| | Gabriella | 94.0 | 73.3 d | 34.6 b | 67.9 e |
| Modified Chip Budding | | | | | |
| | Dallas | - | 87.3 a | 40.0 c | 86.2 a |
| | Jacaranda | - | 83.3 b | 30.6 d | 82.0 ab |
| | Gabriella | - | 79.7 bc | 28.6 d | 77.6 bc |
| Significance | | | | | |
| | Method (M) | | *** | *** | *** |
| | Cultivar (C) | | *** | *** | ** |
| | M X C | | NS | NS | NS |

[z] : Mean separation within columns by Duncan's multiple range test , 5 % level.
NS, **, *** : Non-significant or significant at P< 0.01 or 0.001, respectively

cuttings could be budded in the experimental plots assigned to modified chip budding, because bark separation was not necessary for this method.

Bud union percentages were higher in the modified chip budding method than those of 'T' budding in all cultivars, when budding was made as started-eye. Also, significant differences in bud union success occurred between cultivars (Table 2). The highest bud union percentages were obtained from Dallas in each budding method. Modified chip budding slightly shortened the time from budding to 50 % of bud sprouting. The scion buds sprouted about one week earlier in the modified chip budding method compared to the other method. The time from budding to 50 % of bud sprouting was the shortest in Gabriella and the longest in Dallas as in the experiment 1. The difference between budding methods in the well developed budded plant ratios was high compared with the difference in bud union percentage as a result of the bark

separation rate in 'T' budded cuttings (Table 2). The well developed budded plant ratios were significantly higher in modified chip budding than in 'T' budding. Budding methods did not eliminate the differences in the well developed budded plant ratios between cultivars and the highest well developed budded plant ratios were recorded in Dallas.

**Discussion and Conclusion**

It was found that rooting ability was high in *Rosa odorata* hardwood cuttings harvested and planted in late autumn. IBA treatment did not eliminate differences in rooting percentages between seasons. In a previous experiment, similar results were reported and they were explained by the effects of air and soil temperature on rooting and root formation during the rooting period (8). In the experiment 1, quite high bud union percentages ( from 76.3 % to 93.7 %) and well developed budded plant ratios ( from 71.3 % to 82.7 %) were obtained by using the modified chip budding on *Rosa odorata* hardwood cuttings at the workbench. Similar results were shown by Davies at al. (1) on the use of bench chip budding on dormant *Rosa multiflora* L. hardwood cuttings, and by Karaguzel (8) on the use of modified patch budding on dormant *R. odorata* hardwood cuttings.

According to environmental conditions, 50 % of scion bud sprouts were obtained by the end of March in all cultivars planted in late autumn. The earliest started-eye 'T' budding can be done at the end of May in the Mediterranean coastal region of Turkey. After the budding, the scion bud sprouting takes place within nearly one or one and an half month period. About two and an half month period can be saved to elongate the scion growth and development time by using the modified chip budding method at workbench. Also, modified chip budding and rooting are realised almost at the same time, so that

many cultural steps are easily eliminated as in the 'T' budding case. On the other hand, modified chip budding could be made indoors during the "downtime" of winter as found and mentioned by Davies Jr. et al. (2).

In experiment 2, the results showed that there were clear-advantages of modified chip budding as started-eye comparing to 'T' budding in the field. Firstly, all of rooted cuttings could be budded by using modified chip budding, but not all the cuttings assigned to 'T' budding could be budded due to bark separation rates. It was also been noted by Garner (4) and Hartman and Kester (5) that chip budding could be easily done on the dormant rootstocks incontrast to bark separation was necessary to carry out 'T' budding.

Bud union percentages and the well -developed budded plant ratios were higher with the modified chip budding than with the 'T' budding, when they were done as started-eye. Also it was found that modified chip budding slightly shortened the time from budding to 50 % of bud sprouting in comparison to 'T' budding. The results can be explained by the large surface contact between all layers of bark and young wood in modified chip budding, therefor shorter time is required for the establishment of vascular connections between scion and rootstock.

It can be concluded that modified chip budding on hardwood cuttings at the workbench can be used for propagation of budded rose plants in the field in the Mediterranean coastal region of Turkey. On the other hand, by using the modified chip budding on rooted cuttings as started-eye, bud union and the well developed budded plant ratios were increased and the sprouting time was slightly shortened in all cultivars compared with 'T' budding.

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