Greenhouse Rooting of Date Palm Offshoots Using an Inverted Mist System

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Abstract. The rooting percentage of small size date palm offshoots is rather low, so that their use in propagating is worthless. For this reason, they are discarded during the separation of the large offshoots. However, there have been several trials for rooting these offshoots using the overhead mist system. These trials were unsuccessful due to the decay of the meristematic heart (the main growing point).

This work was conducted during 1990/1991 season to evaluate the inverted mist system as a method for propagation Khalas offshoots of different weights. Also the different morphological stages of root formation on these offshoots were described.

It was found that rooting of small as well as large weight offhsoots was achieved after four months. However, root number and growth was better as the offshoot weight increased.

Two types of roots were identified:

The first is cylindrical, non branched roots, originating from leaf axils. The second is smaller in diameter and branched, originating from the old roots that were present at the time of offshoot separation.

Introduction

Date palm represent the most important fruit tree in Saudi Arabia. Besides being of importance for fruit production, it is also one of the main trees for ornamental and landscape purposes. Thus, there is always an increased demand for offshoots of superior cultivars.

Using offshoots for propagation of date palms is up till now the main method in order to insure true to type trees (Al-Bakr, 1972, Wally et al., 1979 and Al-Hag Said, 1989). It is usually recommended that the offshoots would not be less than 10 kgs and up to 25 kgs (Nixon, 1959, Toutain, 1966, and Khairy, 1983). Since the rate of success of small size offshoots to root is rather low, their use in propagation is worthless (Al-Bakr, 1972, Wally et al., 1979). For this reason, they are discarded during the separation of the large offshoots.

Some workers tried to use the mist propagation technique for rooting small offshoots. However, their efforts were not fruitful due to high heart infection leading to high mortality (Reuveni et al. 1972).

New techniques that would encourage rooting of small offshoots are greatly needed. This report deals with the description of the use of an inverted mist system for two purposes:

1) Determination of survival percentage of small sizes of Khalas offshoots as compared to large sizes.
2) Description of root formation morphology in date palm.

Materials and Methods

This work was carried out in the lathhouse in Dirab Agric. Res. Exp. Sta., KSU, Riyadh, Saudi Arabia during the season of 1990/1991.

The assembly shown in (Fig. 1) was constructed so that only the bases of the offshoots (Fig. 2) were sprinkled automatically with water for five minutes every hour. In this way no water reached offshoot heart. The system allowed the sprinkled water to be pumped back in the main tank (thus forming a closed circuit). The bases of the offshoots were regularly examined. Whenever any sign of infeciton was visible, it was directly treated with the suitable fungicide.

Fig. 1. Showing a general view of the inverted mist system used in this work.

Fig. 2. Showing offshoot bases and the ease for their examination.

Khalas date palm cultivar was used in this study. Offshoots of the following weights were separated, from about 15 years old palms, in the 1st of June:-

1) Offshoots weighting from 2 to less than 4 kgs.
2) " " " 4 to " " 6 kgs.
3) " " " 8 to " " 10 kgs.

After offshoot separation, it was directly disinfected using captan solution. they were then planted in the setup described above. Each of these weight categories was represented by six offshoots.

Four months later, photographs were taken at the different stages of root formation. The offshoots were kept in the setup for six months, after which the survival percentage was determined.

Results and Discussion

The inverted mist propagation system described in this report proved to have two main advantages:

1) It allowed the offshoot bases to stay in high humidity atmosphere along with good aeration. These are important requirements for rooting.

2) It allowed easy observation of offshoot bases so that both root morphology as well as infection incidence could be followed.

Data of (Table 1 and Fig. 3) indicated that small offshoots were successfully rooted and survived under the inverted mist system described in this report. While Reuveni et al. (1972) failed to obtain good survival by suing mist propagation technique, due to high incidence of shoot tip infection, it was found that this could be avoided by using the system adapted in this work.

Table 1. Survival percentage of Khalas offshoots six months after their planting in the inverted mist system.

Offshoot wt.	Survival percentage
2– less than 4 kgs	66.6
4– less than 6 kgs	83.3
8– less than 10 kgs	90.0

Fig. 3. Showing root formation on a 3 kgs. offshoot 4 months after planting.

It could also be observed that the number of roots that were developed on the offshoots was greatly increased as its weight increased as shown in Fig. 3 as compared to Fig. 6. This might be due to higher foodreserves in large offshoots. Reports of other workers are in agreement with this result. They indicated that root formation is better as large size offshoots were used (Nixon, 1959, Dowson and Ponsiot, 1965, Toutain, 1966, Khairy, 1983).

Moreover, data of table (1) clearly indicated also that small as well as large size offshoots survived for six months (date of the experiment termination). The survival rate was higher in the large size category.

2: Morphology of root formation:

Two types of roots were recognized on the offshoots bases:-

The first type was cylindrical non-branched roots; originating from leaf axils. The morphological stages of this type of roots is described in Figs. 4 and 5. In Fig. 5 the first appearance of the root of this type is a brownish pretrupence (outgrowth) in the leaf axil. As this outgrowth continue its growth, it became white in color (Fig. 5), and have a cylindrical appearance. Figure (5) shows also that even at more advanced stages of growth of this kind of roots, there were no visible branching or hair formation.

Fig. 4. Showing the first appearance of the cylinderical root as a brownish outgrowth in the leaf axil.

Fig. 5. Showing the different stages of cylinderical root extension.

The other type of roots that were observed were those forming on the old root parts that were left after offshoot separation. These roots, as shown in Fig. (6), were much smaller in diameter than the first type described before. Moreover, these roots were fibrous, longer and branched.

It is well known that water absorption increases as the root diameter decreases because more exposed absorbing surface is available. Thus, the second type of roots, which is fibrous, are more effective in absorbing water than the cylindrical ones (Al-Bakr, 1972, Wally, 1979). It is suggested that these fibrous roots, forming on the remains of the old ones, plays an important role in offshoot survival in early stages of offshoot establishment after separation and planting. This suggestion is supported by the observations reported by Al-Bakr, 1972 who indicated that preventing offshoot old roots from drying, always resulted in increased survival rate.

Thus great care should be taken to insure that the severed roots found on the bases of the separated offshoots does not dryout. This will increase the formation of fibrous roots which in turn increase survival.

It could be concluded that, under inverted mist system, the small size offshoots (which are usually discarded) could be used for propagation.

Fig. 6. Showing the fibraus roots forming on the older severed ones, note the branching and smaller diameter.

Moreover, since fibrous roots forming on the old severed ones are important in water absorption, drying of offshoot bases should be avoided.

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تجذير فسائل نخيل البلح الصغيرة باستخدام الري الرزازي في الصوب

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وجد أن نسبة نجاح تجذير فسائل نخيل البلح ذات الأوراق الصغيرة تكون قليلة لدرجة تجعل استخدامها غير مجدي ـ ولذا فإنه يتم استبعادها خلال عملية الفصل ـ وقد أجريت العديد من المحاولات من قبل لاستخدام هذه الفسائل في الإكثار باستخدام الري الضبابي ـ ولكن باءت هذه المحاولات بالفشل نظرًا لتعفن القمة النامية لهذه الفسائل.

وقد أجرى هذا البحث بهدف تقييم طريقة الري الرزازي السفلي على إكثار فسائل النخيل مختلفة الأوزان ـ كما تم توصيف المراحل المورفولوجية المختلفة لتكوين الجذور على هذه الفسائل.

وقد استخدم في هذه الدراسة فسائل من صنف الخلاصي خلال موسم. وقد وجد أن طريقة الري الرزازي السفلي كانت ناجحة في إنتاج الجذور على مختلف الأوزان المستخدمة بعد أربعة أشهر من الزراعة ـ وقد اتضح أيضًا أن كمية الجذور ونوعيتها كانت أفضل كلما زاد وزن الفسيلة ـ كما وجد أن الجذور المتكونة على الفسائل تتكون من نوعين: أحدهما أسطواني غير متفرع وناتج من آباط قواعد الأوراق أساسًا ـ والثاني عبارة عن جذور أقل سمكًا ومتفرعة ومتكونة على أجزاء من الجذور القديمة الموجودة على الفسيلة عند الفصل ـ مما يوضح أهمية المحافظة على هذه الجذور أثناء عملية الفصل والزراعة.