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Summary

"Comparative Studies on Sexually and Vegetatively Propagated Date Palms under Aswan Environmental Conditions"

This dissertation was carried out at the Horticultural Services Orchard, Kom-Ombo Region, Aswan Governorate during two consecutive seasons (2002 and 2003).

The objectives of this study were:

1- Evaluation the performance of palms produced by seedlings (sexual propagation) and palms produced by offshoots (vegetative propagation) for 3 date palm cultivars (dry-dates type); i.e. Sakkoti, Bartamuda and Malakaby such evaluation included:
   a- Vegetative and reproductive traits.
   b- Yield and fruit characteristics.
2- Estimation the genetic similarity between sexually (seedlings) and vegetatively (offshoots) palms for Sakkoti, Bartamuda and Malakaby cultivars under Aswan environmental conditions using PCR-RAPD analysis.

The experimental work:

Three uniform replicates of sexually and vegetatively propagated palms for each of 3 date palm cultivars were chosen and receiving the ordinary horticultural managements.

The following measurements were determined as follow:

1- Vegetative characteristics included palm height and girth, leaf and leaflet length, number of leaflets and spines, spines length and proportions (%) of leaflets and spines.

2- Flowering and fruit set characteristics included date of spathes bursting, spathe length and initial and horticultural fruit set.

3- Yield parameters included date of harvesting, average bunch weight, number of bunches and estimated yield (kg/palm).

4- Fruit physical and chemical characteristics:

A- Physical characteristics:

Fruit weight, fruit volume, specific gravity, flesh weight (g), flesh weight (%), seed weight (g) seed weight (%), fruit height, diameter and shape index, flesh thickness and seed length.

B- Chemical characteristics:

Total soluble solids, sugars content (total, reducing and non reducing), total acidity, moisture content, tannins content and total nitrogen, phosphorous, potassium and crude protein.

5- DNA fingerprinting using RAPD technique of seedlings and offshoots date for 3 cultivars (Sakkoti, Bartamuda, Malakaby)

The obtained results could be summarized as follows:

Vegetative Characteristics:

1- Leaf length was shorter in palms produced from seedlings of Sakkoti compared to those produced from offshoots by 7.03%. Meanwhile the reverse occurred in Bartamuda and Malakaby palms.

2- Leaflets area of rachis was generally greater in palms produced from offshoots compared to those produced from seedlings in all studied "cultivars" (Sakkoti, Bartamuda and Malakaby).

3- Number of leaflets per leaf was higher in offshoots palms compared to seedling palms (except in Bartamuda palms).

Flowering and fruit set:

1- Palms produced from offshoots (vegetative propagation) induced generally higher number of spathes per palm compared to those produced from seedlings (sexual propagation).

2- There was no significant difference between palms produced from offshoots and those produced from seedlings in spathe length character.

3- Initial and horticultural fruit set percentages were higher in palms produced from offshoots than those produced from seedlings in three studied "cultivars".

Yield parameters:

1- Number and average weight of bunches in palms produced from seedlings were lower than those produced from offshoots.

2- Greater reduction in palm yield due to sexual propagation was more pronounced in Sakkoti (35.21% decrease) followed by Bartamuda (14.02% decrease) and the least reduction was found in Malakaby (4.09% decrease).

Fruit characteristics:

(A) Physical characteristics:

1- Sexual propagation resulted in reduction in fruit weight, fruit volume, **pulp percentage** of Sakkoti and Malakaby. Meanwhile Bartamuda palms had a different trend.

2- Fruit height and diameter of palms produced from sexually propagation were less than those of palms produced from offshoots in all studied "cultivars".

3- Seed weight was found to increase (a disadvantageous) in fruits of palms produced from seedlings in Sakkoti (13.27% increase) and Malakaby (5.66% increase meanwhile slight decrease occurred in Bartamuda (2.2% reduction).

B- Chemical characteristics:

1- Fruits of palms produced from seedlings had lower percentages in total soluble solids, total sugars, reducing and non-reducing sugar contents than those of palms produced from offshoots.

2- Fruits of palms produced from seedlings contained higher total acidity contents compared to those of produced from offshoots.

3- Moisture content was higher in Sakkoti and Bartamuda fruits produced from seedlings than those produced from offshoots meanwhile Bartamuda fruits had a reverse trend.

4- Potassium-the predominant element in date fruits-was higher in Sakkoti and Bartamuda fruits produced from seedlings compared to those produced from offshoots, meanwhile, Malakaby fruits had a different trend.

DNA Fingerprinting Using RAPD Technique:

The similarity indices between vegetatively and sexually palms differed according to cultivar, i.e. low similarity was observed between vegetatively and sexually Sakkoti palms (16.70, 50.00 and 14.30%), while a moderate similarity between vegetatively and sexually palms was in Bartamuda (25.00, 16.70 and 71.40%) and Malakaby (44.40, 57.10 and 57.10%).

In general, 10 major and important traits were selected to illustrate differences among palms in relation to propagation method. These traits were: 1) leaflets area of rachis 2) initial fruit set, 3) horticultural fruit set, 4) estimated yield per palm, 5) fruit weight, 6) fruit height, 7) flesh weight, 8) total sugars, 9) tannins content and 10) fruit moisture content. Seven out of the 10 traits indicated a constant trend associated with propagation mean

for all cultivars. These traits included: leaflets area of rachis, initial fruit set, horticultural fruit set, estimated yield per palm, fruit height, total sugars, fruit moisture content. The other 3 traits (fruit weight, flesh weight and tannins content) were found to have a special trend in only 2 cultivars meanwhile the other cultivar would have an opposite or unclear trend.

Generally, sexual propagation resulted in reduction-at various degrees-of leaflets area of rachis, initial fruit set, horticultural fruit set, estimated yield per palm, fruit weight (except in Bartamuda), fruit height, flesh weight (except in Bartamuda) and total sugars. Moreover, increase in tannins and moisture content which is a disadvantage was also associated with sexual propagation.

In conclusion, date palms produced from seedlings were negatively influenced in most vegetative, flowering, fruit set and yield and fruit characteristics. The former was true in all 3 studied biotypes at different degrees.

Finally, there was a relationship between the results obtained using RAPD analysis and those obtained in phenotypic characterization measurements (Vegetative, reproductive and fruit characteristics) in sexually and vegetatively palms, i.e. low genetic similarity was observed between sexually and vegetatively Sakkoti palms reflecting the high differences in their phenotypic characters. Meanwhile, a moderate genetic similarity was observed between sexually and vegetatively palms in Bartamuda and Malakaby cultivars associated with their phenotypic characters.

Recommendation:

The present study indicates the following recommendations:

1. The necessity of surveying the rest of date palm cultivars grown in Aswan and determination of their genetic similarities using the DNA fingerprinting. Therefore, superior variants should be vegetatively propagated.
2. Avoiding sexual propagation in Sakkoti (and therefore similar cultivars which exhibit same trend) due to large availabilities between sexual and vegetative propagation.
3. In case of moderate to high similarities between sexual and vegetative propagation (as shown in Malakaby and Bartamuda), it can safely recommend sexual propagation when offshoots production is not available (limited).