

Characterization of Five Iraqi Date Palm Male Cultivar

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Received: January 21, 2015; Published: March 28, 2015

Abstract

Five Iraqi Date Palm Male Cultivar (*Phoenix dactylifera L*) (Ghannami Akhdar, Ghannami Ahmar, Khukri Wardi, Khukri Adi, Khukris-masmi) Characterization was determinate in this study Auxin and gibberellin-like substances concentration and No. of spikes in one spadix, pollen grain average weight in one spadix, Pollen grain Germination and viability % was investigated. Significant differences among the five types of pollen in their endogenous levels of auxin-and gibberellin-like substances. Ghannami Akhdar pollen had the highest concentration of both auxin 56.2 µg/kg fresh weight and gibberellin-like substances 37.9 µg/kg fresh weight while khukris-masmi had the lowest concentration. 39.6 and 30.19 µg/kg fresh weight respectively, Pollen grain viability % and Germination were determined and all male cultivars have high viability over 90% also pollen grain germination more than 80%. It is concluded that Ghannami Akhdar pollen grain is the best among other male cultivar tested.

Keywords: *Phoenix dactylifera*; *Phoenix canarensis*; Date palm; Ghannami; Khukricultivar

Introduction

The date palm is a blessing tree, where it has been mentioned in all holy books (Twarat, Bible, and Holy Quran). The exact origin of the date palm (*Phoenix dactylifera L.*) is still unknown yet because wild date palm from which cultivated palm was developed has never been found. One of the researchers like Albaker [1] mentioned that date palm developed from a genetic mutant in *Phoenix canarensis* and developed by the natural hybridization between different species of date palm. Another opinion mentioned that the origin is *Phoenix reclinata* from tropical Africa or *Phoenix sylvestris* from India or a hybrid between these two species may be the origin of date palm [2]. All the species which belong to genus (*phoenix*) have similar characteristics, but they still far from each other in many other properties that we can't consider any of them as an origin of the other. All these opinions still need scientific and historical documentation.

The botanical name of the date palm as the binomial system is (*phoenix dactylifera L*), with time, many physiological, morphological and genetic changes happened, which required to be differentiated and classified under variety concept, but this phrase is a general botanical expression which includes wild and cultivated varieties. In order to differentiate between the commercial and cultivated varieties, they were called cultivars, which are derived from (cultivated variety) and may be correlated to the name of the region or person in which it was found, and it can be abbreviated by (C.V). So the binomial scientific name of the Barhi variety is (*Phoenix dactylifera L. cv Barhi*).

Sometimes individuals of date palm cultivars appear showing different characteristics than the original cultivar and when these new characteristics are constant and transferred genetically by vegetative propagation then the new trees are called (clone). In Iraq there are three clones known as Khadrawi cultivars (Khadrawi Basra, Khadrawi Baghdad, and Khadrawi Mandli) and these clones differ in the fruit size only. Also there are two clones for the (Deglet Noor cultivar), and the only difference between them is that the first one is early

Citation: Abdulbasit O Ibrahim. "Characterization of Five Iraqi Date Palm Male Cultivar". *EC Agriculture* 1.3 (2015): 153-157.

ripening, and the second is late-maturing clone (Hayani). An Egyptian cultivar has two clones differ in fruit size only, (Ghnami) the Iraqi male cultivar has two clones (Ghanami Akhdar “green”, Ghanamiahmar “red”), and they differ in the spadix color and size [3].

The date palm (*Phoenix dactylifera L.*) is dioeciously species with male and female flowers being produced in clusters, the female inflorescences are hand or mechanical pollinated with pollen grains from male tree.

Selection of pollinizer is important in the date palm as the pollen affects various aspects of fruits development and phenomenon is referred to as metaxinia effects.

Many date palm male cultivars are available in Iraq such as:

- a. Ghanami which have to clones (Ahmar and Akhdar) which have high pollen grain activity.
- b. Khukricultivar which have four clones (Khukri Kraitli, Khukri Wardi, Khukri Adi and Khukri Smasmi).
- c. Ghulami.
- d. Russasi.

These cultivars in most used in pollination in Iraq but this doesn't mean there is no other male clones used in pollination in Iraq. The season of male spadix production started from mid of February till mid of April and this depend on whether factors especially heat units in the region [4].

The cultivars KhurkiAdi, Wardi, Smasmiare early in flowering Smasmi started in the first week while the others started in third week of February but Ghanami Akhdar and Ahmar started in third to end of March. Male spadix is ready to split assumes as a brown color and soft texture, after the spathe breaks the male inflorescence reaches maturity and must be cut at this stage , freshly opened male flowers contain high level of moisture ,if they are not be used immediately , it must be dried .

The endogenous hormone produced directly or indirectly by the pollen grains and also un pollinated flowers as mentioned by Ibrahim [5].

Some morphological and chemical (concentration of Auxin and Gibberellin- like substances) characterization of five Iraqi date palm male cultivars.

Materials and Methods

The experiment consisted of two parts.

Part one: Determination of Auxin and gibberellin-like substances concentration.

After the spathes cracked Strands of male inflorescence from each clone

1. Ghannami Akdhar
2. Ghannami Ahmar
3. Khukri Wardi
4. Khukri Adi
5. Khukrismasmi

Strands of male inflorescence from each above clone separated and spread in a thin layer on paper in a shallow tray in shaded area for 24-72 hours then shacked by hand and pollen grain collected.

The pollen grains were taken at random from the following male clones from five male trees of each clone. to determine the concentration of Auxin and gibberellin-like substances .

Extraction and purification of auxin and gibberellin-like substances: The extraction procedure for auxin and gibberellin-like substances was similar to that of Ibrahim [5]. In brief, for auxin-like substances, 10g of fresh pollen grain from each male clone were extracted with 80% MeOH for 48 hours, at 4°C in darkness, during that time the alcohol was changed twice. The methanolic extracts of each sample were combined and evaporated to the aqueous phase under vacuum in a rotary evaporator at 40°C. The aqueous phase was made up to 50 ml with distilled water. Then, basic lead acetate was used to clean the extract. After readjusting the aqueous phase to pH 2.5 with 1N H₂SO₄, the acidic fractions were partitioned three times against equal volumes of freshly distilled E2O. The separated fractions were evaporated to a small volume convenient for further purification by HPLC. For the determination of gibberellin-like substance, 5g fresh pollen grains from each male clone was similarly extracted except that 80% M_e2CO was used as the solvent for extraction and the clean acidic fractions were shaken out three times with EtOAc. The combined ethyl acetate fractions were evaporated as described for auxin-like substances. HPLC quantitative analysis of auxin and gibberellin-like substances:

The analyses were performed by HPLC (Shimadzu, Osaka, Japan) using a 4.6X250 mm C-18 reverse-phase column packed with 5 µm particle size (Fisher, U.S.A). The mobile phase was 0.1 M phosphoric acid: methanol 60:40 (v/v) at pH 2.5. HPLC analyses were performed at a wave length of 205 nm for gibberellin-like substance and at 280 nm for auxin-like substances. Isocratic elution procedures were used to obtain effective separation of auxin and gibberellin-like substances. Standard plant growth regulators, indole-3-acetic acid (IAA) and gibberellin acid (GA3) were prepared in different concentrations in phosphoric acid-methanol. The relationship between area and concentration were linear over the rang used.

- a. Part Tow:Pollen grain viability % and Germination
- b. Five male spadix were taken from each date palm cultivars to study:
- c. No. of spikes in one spadix.
- d. Pollen grain average weight in one spadix [6].
- e. Pollen grain viability %.

The capacity of pollen to germinate and grow normally is known as viability. The viability test can help in selecting pollen types which are highly viable.

Germination test of pollen grains.

Pollen grains are germinated in liquid medium. Two drops of germination liquid medium from each treatment are separately spread on a slide and examined under light microscope to obtain germination percentage.

Four random replicates are to be used and only 100 pollen grains could be examined in each replicate.

The emergence of pollen tube growth is considered as an indicator to pollen germination [7].

Results and Discussion

It is evident from Table 1 that there are significant differences among the five types of pollen in their endogenous levels of auxin-and gibberellin-like substances. Of the five types, Ghannami Akhdar pollen had the highest concentration of both auxin-and gibberellin-like substances while khukrismasmi had the lowest concentration.

From the table1 and 2 we can conclude:

- a. The cultivars Ghanami Akhdar, Khukri wardi have the highest rate of spike number in one spathe and high pollen grain average weight compared to the others.
- b. All male cultivars have high viability which was over 90%.
- c. Pollen grain germination percentage in all five types of pollen was more than 80% in all cultivars but was highly significant in Ghannami Akhdar and Ahmar (88,87)% respectively.

Cultivar/ clone	Auxin- like substances µg/kg	Gibberellin-like substances µg/kg
GhanamiAkhdar	56.9	37.2
GhanamiAhmar	53.2	34.7
KhukriWardi	45.3	34.5
KhukriAdi	45.1	35.6
Khukrismasmi	39.6	30.1
LSD(p = 0.05)	3.5	0.6

Table 1: Concentration of Auxin and Gibberellin- like substances in five male clones of date palm male.

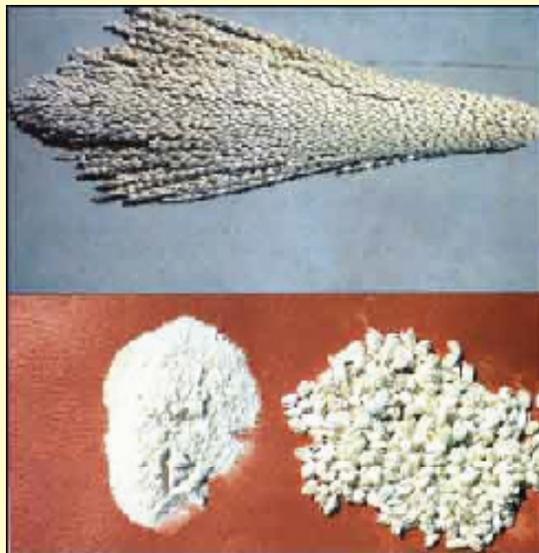
Cultivar/ clone	No. of spikes in the spathe	Pollen grain average wt. (gm)	Pollen grain viability%	Pollen grain germination%
GhanamiAkhdar	350	750	97	88
GhanamiAhmar	300	500	95	87
Khukriwardi	350	650	96	85
KhukriAdi	285	590	93	83
Khukrismasmi	275	490	90	80
LSD(p = 0.05)	30.9	25.5	1.9	1.8

Table 2: Pollen grain average weight , viability and germination.

Conclusion

- a. The cultivars Ghanami Akhdar and Khukri Wardi have the highest rate of spike number in one spathe (350) spikes for each and high pollen grain average weight (750, 650) gm compared to the others.
- b. Pollen grain germination percentage in all five types of pollen was more than 80% in all cultivars but was highly significant in Ghannami Akhdar and Ahmar (88,87) %respectively.
- c. Ghannami Akhdar male cultivar is the best pollinator among other male cultivars.





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Volume 1 Issue 3 March 2015

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