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Assessment of genetic variation between some Libyan date palm (*Phoenix dactylifera* L.) cultivars using molecular markers

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بسم الله الرحمن الرحيم

" وَفِي الْأَرْضِ قِطَعٌ مُتَجَاوِرَاتٌ وَجَنَّاتٌ مِّنْ أَعْنَابٍ وَزَرْعٌ وَنَخِيلٌ صِنْوَانٌ وَغَيْرُ صِنْوَانٍ يُسْقَىٰ بِمَاءٍ وَاحِدٍ وَنُفَضِّلُ بَعْضَهَا عَلَىٰ بَعْضٍ فِي الْأُكُلِ ۚ إِنَّ فِي ذَٰلِكَ لَآيَاتٍ لِّقَوْمٍ يَعْقِلُونَ"

صدق الله العظيم

سورة الرعد أية (4)

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ABSTRACT

In this investigation, some fruit characteristics of eight Libyan date palm genotypes (collected from three different regions in Libya) were measured as well as sugar and tannin contents were estimated to distinguish between these genotypes under investigation.

Moreover, finger printing of these eight Libyan date palm genotypes was performed on the molecular level using three different techniques, these were inter simple sequences repeats (ISSR), sequences related amplified polymorphism (SRAP) and Amplified fragments length polymorphism (AFLP). The results revealed a kind of biodiversity among the genotypes under investigation, either on the morphological or biochemical and molecular levels.

Introduction

The botanical name of the date palm, *Phoenix dactylifera* L., is presumably derived from a Phoenician name "phoenix", which means date palm, and "dactylifera" derived from a Greek word "daktulos" meaning a finger, illustrating the fruit's form.

Another source refers this botanical name to the legendary Egyptian bird, "Phoenix", which lived to be 500 years old, and cast itself into a fire from which it rose with renewed growth**, Zaid and Wet (1983)**. This resemblance to the date palm, which can also re-grow after fire damage, makes the bird and the date palm share this name, while "dactylifera" originates from the Hebrew word "dachel" which describes the fruit's shape.

Belonging to the Angiosperms-Monocotyledons, *Palmaceae* is a family of about 200 genera and 1, 500 species**, Dowson (1982)**. Phoenix (*Coryphoideae Phoeniceae*) is one of the genera which contain a dozen species, all native to the tropical or subtropical regions of Africa or Southern Asia, including *Phoenix dactylifera* L. According to **Dransfield and Uhl, (1986)** date palm is classified as follows: Group: Spadiciflora, Order: Palmea, Family: Palmaceae, Sub-family: Coryphyoideae, Genus: Phoenix, Species: *Dactylifera* L.

In 2001 the top five date producing countries were Egypt, Iran, Saudi Arabia, Pakistan and Iraq, accounting for about 69% of total production. If the next five most important countries are included, i.e. Algeria, United Arab Emirates, Libya, Oman and Morocco, then this percentage rises to 90%. This clearly indicates that most of the world's date production is concentrated in a few countries in the same region.

Date fruit has been identified as a highly nutritious food with many functional benefits to human health. Date fruits have been studied for

their proximate, mineral, and phytochemical compositions, and several authors have reviewed the value of date fruits as an emerging "healthy" food **(Al-Farsi and Lee 2008; Vayalil 2012)**. However, date seeds, the major by-product of commercial date fruit processing, have not been fully utilized. It is anticipated that date seeds could be an excellent source of some bioactive compounds with potential applications in the food and pharmaceutical industries. Date fruits and seeds are of high research interest due to their high nutritional value and high contents of functional ingredients.

This investigation aimed to study the variation among some date palm genotypes grown in different locations in Libya on the base of the fruits morphology, some of the fruit biochemical contents such as tannin and sugar contents and to study the biodiversity among these genotypes under investigation in the molecular level using different molecular techniques such as SRAP, ISSR and AFLP florescent dye.

LITERATURE REVIEW

Morphological and biochemical study

Samarawira (1983) reported that the total sugars in the date palm fruit is between 70 and 80%. Approximately 60% of the dry weight at the Khalal and early Rutab stages of fruit development is sucrose. High-yielding varieties of date palm have fruit yield potentials of 12.0 tons/ha, equivalent to an estimated production of 7.2 tons/ha of sucrose if the fruit is harvested at the stage of maximum sucrose accumulation. The estimated sucrose production from the date palm compares very favourably with the world average of 6.6 tons/ha for sugarcane and the sugar beet average of 5.6 tons/ha for Europe. The relatively high sugar content of the fruit suggests that the date palm may have an important agro-industrial future as a potential source for refined sugar.

Bacha *et al*. (1987) studied some physical and chemical characteristics of the fruits of four different date palm cultivars during three stages of fruit development (kimri. khalal and tamar). The results showed that such characteristics varied greatly from one stage to another with some variations between cultivars and seasons. Fruit weight, size, length, diameter and seed weight increased from Kimri to Khalal stages followed by a slow decline in the tamar stage. Moisture, ash, protein and tannins contents decreased sharply especially in the tamar stage. Total soluble solids (T.S.S.) and total sugars increased progressively from Kimri, Khalal and tamar stages.

The date palm not only provided a concentrated energy food, it also yielded a variety of products for use in agricultural production and for domestic utensils, and practically all parts of the palm had a useful purpose. Examples of such uninhibited growth can still be found in some of the more remote areas of the Sahara**, FAO (2002).**