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Physico-chemical analysis of oil present in different verities date palm (pulp and seed) of District Khairpur

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Abstract

The *Phoenix dactylifera* date palm is considered as the most important product in distrait Khairpur Mirs. Which is additionally of the most important dates manufacturing district in Pakistan. The *Phoenix dactylifera* have an economic importance due to its crop, that is most nutrient and energy providing that food.Dates are made in certain nutrients and which offer a good source of fast energy because of high sugar content. The date palm contains to carbohydrate in addition protein, minerals vitamin and fats etc. The edible oil of the main component are triglycerides (95/98%). The small component (5/2%) with mono di-glycerides, sterols, tocopherols, fat soluble vitamins and free fatty acid. The main purpose of this study was to determine the physicochemical properties according to the (AOCS) stander of oil extracted. According to the stander American oil chemist society method were checked by physicochemical properties also fatty acid composition date palm oil. The date palm pulp the oil sample the free fatty acid was found to be dominant. Comes about of display think clearly demonstrated that date palm oil good source of fatty acids. Bioactive component is also rich sourceof pulp oil.

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Introduction

Date (*Phoenix dactylifera*) is one of the oldest food crops in the human race and has been used for 6000 years (Kwaasi, 2003). Because of its highest dietary, economic values, and health, in addition to its aesthetic and environmental advantage, it plays a most important role within the diet of natives of date-growing regions. Date flesh contains carbohydrates of of 2.3g/100g, 73.5g/100g, proteins ash of 1.5g/100g and fat of 0.2g/100g. It also additionally offers a powerful supply minimum of fifteen minerals like an iron (1.0mg), calcium (39.70mg), phosphorus (56.80mg), magnesium (43.24mg), sodium (0.8mg), zinc (0.29mg), potassium (655mg), copper (0.288mg), selenium (1.9mg) and manganese (0.298mg) with vitamins A, C, B1, B2, folic acid and nicotinic acid in 100g of date flesh (Al-Shahib and Marshall, 2003).

Because of different factors such as variety, climate, location, amount of fertilization and type of cultural practices, the chemical composition of dates is variable (Al-Rawahi *et al.,* 2005). Date fruits ripen early within the summer season and few reckoning on verities at the tip of the season (August/ September) in Arabic word, all verities date palm four separate stage of maturity naming, like khala, rutab, kimri and tamr. kimris initial section is distinguished by 2 stage. Fruit weight, size sugar accumulation moisture content and acidity area unit improve in the 1st step. The fruit enlargement, weight gain and sugar accumulation method occur in step 2, however at a decrease rate, the moisture content continues to increase fast and also the acidity decrease marginally. During khala stage, the fruit color change from yellow to green or red depending upon verities, the fruit are increase diameter, weight and length. The date palm begins to soft and loses water in Rutab stage. Characterized by a firm texture with darker color and its good storability (Al-shahib and Marshall, 2003) is Tamar stage.

Different kinds of date items are now developed by the food industry, including date bars, date-syrup, date-paste, date-jam, date-honey, date wafers, date cookies, date vinegar, date squares (Ramaswamy and Ahmed, 2005). In many food products, the amount of sucrose can be substituted with date-paste and used as filler in food formulations (Alhamdan and Hassan, 1999). Qualitative data generation is becoming important in the current period, which would be beneficial not only for consumers and processors, but also for exporters. Chemical composition refers to health and nutritional advantages that are important to consumers.

The physical parameters are maturity indices; the date palm (*Phoenix dactylifera*) is grown in the world's dry and semi-arid regions and is a significant member of the Palmaceaee family (Saafi *et al.,* 2008; Al-Jasser, 2009; Jamil *et al.,* 2010). Palm trees, particularly in the Arab Gulf region, are abundant all over the world. In most of the Abian countries it is considered to be the most important tree (Mustafa *et al.,* 1983; Jamil *et al.,* 2010). The fruit exploitation of date palm trees, on the other hand represents major economic support for indigenous peoples (Reynes *et al.,* 1994). Because of its high carbohydrate content (70-80 percent), dates are rich in some nutrients and provide a good source of rapid energy. The majority of dated carbohydrates are in the form of fructose and glucose that are readily absorbed by the human body (Myhara *et al.,* 1999; Al-Farsi *et al.,* 2005; Mrabet *et al.,* 2008). Date seeds end up as waste products of several date fruit-processing plants in most instances.

The objective of this study was to determine the nutritional value, the proximity of the analysis, the composition of fatty acids, the sugar content and the bioactive properties of the various date seeds produced in Riyadh, Saudi Arabia. In arid and desert areas, it is the main crop for agricultural income that establishes secondary crop culture (barley, alfalfa and clove as forage) which provides a favorable environment for both human and animal regions (Hodel& Johnson, 2007). Almost 5000 date palm cultivars are found all over the world (Osman, 1984; Bashah, 1996; Jaradat & Zaid, 2004). Hassan *et al.* (2006) recorded in Pakistan that the area of date palm cultivation increased from 1990 to 2003. With nearly eighty-five varieties, Khairpur district is considered a biodiversity center for date palms in Pakistan.

Tissue culture and direct shoot regeneration strategies have been proposed to ensure the sustainability of high-quality varieties (Markhand *et al.,* 2010; Khan & Bi Bi, 2012).

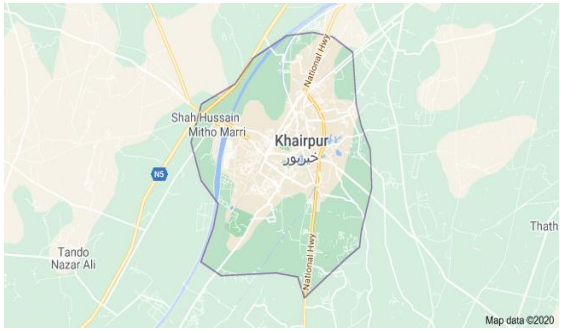
Usually, seeds are rich in unsaturated fats and are considered a good food in moderation, although not all seeds are edible. In the rainy season, typically between the months of April and September, the plant produces its fruits. At the end of the twigs, the flowers emerge in clusters and are small and dark green in color, producing from the flowers the fruit of two varieties: long spirals and short circular in shape [8]. Pressing, solvent extraction and rendering are the general methods used to acquire fat and oil from oil bearing fruits. The procurement of crude oil and fats mainly requires physical changes or unit operations, but conversions in the refining and further processing of such oils are concerned with chemical changes. There are more than 200 verities of dates with different shapes and flavors, however, all of them are the same in nutrition. We are going to introduce some of these different types of dates. Zahididates they have a rich nutty flavor which is often peanut butter with a slight taste that brings dried apricots to mind. Zahididates are medium-size and oval in shape. They have light brown skin and a thick, golden inner meat that encloses a single seed. Consuming these dates can prevent many diseases such improving memory and vision. Aseel dates these semi-dry dates are sweet and delicate in flavor and are known for aesthetic date flavor.

Materials and methods

Description of study area

Khairpur, also called Khairpur Mirs, city, Sindh province, south-central Pakistan. The city lies along the Khairpur East Canal, 11 miles (18 km) south of the Indus River. Except for the irrigated Indus River valley, the province is arid and has scant vegetation. The dwarf palm, *kher* (*Acacia rupestris*), and *lohirro* (*Tecomaun dulata*) trees are characteristic of the western hill region. In the central valley, the babul tree is the most dominant and occurs in thick forests along the banks of the Indus. Mango, date palm, banana, guava, and orange are typical fruit-bearing trees cultivated in the Indus valley.

The latitude of Khairpur, Sindh, Pakistan is 27.529951, and the longitude is 68.758141. Khairpur, Sindh, Pakistan is located at *Pakistan* country in the *Cities* place category with the GPS coordinates of 27° 31' 47.8236" N and 68° 45' 29.3076" E.



Date's City, Khairpur

During the harvest season in Khairpur, a new city is developed with different activities of date palm having age of not more than two months. Many people earn their livelihood from Date Palm. It is like a big festival which can be seen everywhere in the area. The farmers are picking the "Rutab" fruit of different cultivars, harvesting Date Palm in Pakistan, current status and prospective Abul-Soad A. A., 2010Page 13 of 86.

The "Khalal" fruit for making "Chohara1" by boiling then curing them on mats made from the fronds of palm tree, and trucks transferring the crop within the area. The settlements of temporary immigrants from surrounded areas who are coming to earn some money are the common sign of Khairpur. Also, the smell of "Chohara" can be easily determined from the air during these months at Khairpur. The city of dates becomes the cynosure of date‟s exporters to look for a business chance to export Khairpur dates abroad while the international demand is increasing.

There are few plants working on dates processing at the„ date‟s city‟, however, the standards of the processed dates in these processing units need to be improved. It is one of the challenges in front of the industry to increase the price of Pakistani dates to resist the competent prices of the international market. But, fund is still the main hindrance facing the research institutes to continue in this sector and conduct the required research whether on the product of current plants or establish a world-model small processing plant.

Nutritional Values of Dates

Dates are one of nature's sweetest treats. Their high sugar content may have you wondering whether dates are considered a healthy choice. Dates are definitely sweet, but as a fruit, they also provide beneficial micronutrients and some fiber. You may want to consume dates in moderation, but they are by no means an empty-calorie food. Here's what we love about them.

Calibration and prediction samples

Date palm seed oil was determination of conjugated linolenic acid from. The sixteen binary calibration standards PSO and vegetable oil were ready within the concentration range of 0.1-86%. The total verities before than analysis had been homogenized using the vortex at 18000 revolutions per minute for 4min.

ATR FTIR Measurements

The alternative parameters had been as follows: decision" 4cm-1, scans 32, SB-ATR" accent with ZnSe crystal, variety 4000-650cm-1. ATR Infrared spectra of date palm oil have been recorded the usage of FTIR "Thermo Nicolet 5700" fixed with deuterated a triglycine sulfate detector "DTGS". The software system version seven. 2 (OMINIC) becomes use for records and acquisition device manipulate. Regarding fifty of oil sample became poured onto the crystal material for spectra recording. when each, trendy/pattern the crystal became fastidiously wiped with sleek tissue determined by manner of manner of n-hexane alkane series cleanup to get rid of the lines of before pattern and recorded new historical past spectrum of air.

Oil Extraction

Oil was extracted from any seed or waste sample using hexane as a solvent using the AOCS process. 10g of the sample was put into the cellulose thimble and placed inside the extractor, and then 300ml of hexane was applied to the round bottom flask. The temperature was set at 70c and the procedure lasted approximately 4 hours. After complete extraction. A rotary evaporator was used to evaporate the solvent. The extracted oil was kept at 4 c for further study in the refrigerator.

Moisture Content

Using the AOCS official process, the moisture content of sample waste (peel and seed) was determined. In an aluminum moisture dish, 5g of the waste sample was weighed and dried in an oven at 130 to 1c for 3 hours.

Moisture= Initial wt : Dried wt :/ Initial wt:

Ash Content

For ash material, according to the AOCS process, 2g of the (peel and seed) sample was ignited in the muffle furnace at 600 ⁇ 15 c for 4 hours.

Saponification Value" (S.V.)

Approximately 1g of oil was dissolved in a round bottom flask of 25 ml of 0.5N ethanolic KOH and a few boiling chips were applied. For 60 minutes, the ethanolic mixture was refluxed until fully homogenized by the gasoline. Using phenolphthalein as an indicator, the ethanolic solution was titrated with 0.5N HCL until the pink color disappeared.

The Saponification Value (SV) is determined using the formula below.

$$\text{"SV (mg of KOH/g of oil)"} = \frac{(\text{Blank reading} - \text{sample reading})\text{mL} \times \text{M HCl} \times 56.1 \text{ sapmle"}}{\text{Weight of sample(g)}}$$

Free Fatty Acids Value" (FFA)

In short 20 ml of ethanol was taken in a conical flask, 2, 2-3 drops of laxative indicator were applied, and titrated for neutralization inside (0.01N) of NaOH till pink color seems. The oil sample and quantify once more with alkali till the pink color emerges when the answer within the flask has been heated.

"FFAIn fats and oils FFA% was calculated by using formula given below.

$$\% = \frac{28.2 \times \text{mL (NaOH)} \times \text{N(NaOH)}}{\text{Weight of sample(g)}}$$

Peroxide Values (PV)

Approximately 2g of oil weight in to a 200 ml conical flask, added 5ml chloroform then add 10ml of glacial acetic acid the content of the flask thoroughly shook until the complete dissolution of oil. After that 0.5ml of saturated solution of potassium iodide was mixed added and left in the dark foe few minutes. In the finish 15ml distilled water added to the flask and titrated against with 0.01N sodium thiosulphate within the presence of starch indicator until the blue color disappears.

The PV was calculated with the help of by formula given below.

$$\text{"PV (mEq/kg of oil)} = \frac{(\text{Blank value} - \text{sample value})\text{mL} \times \text{N of sodium thiosulphate}}{\text{Weight of sample(g)}} \times 10\text{"}$$

GC-MS Temperature Programming for date palm Essential Oil

Date palm oil was analysis through GC-MS, the similar situations and parameters used as optional in section 3.6.1 with slight modification in the temperature program. Starting oven temperature was 8°C maintain for 260 °C with ramp rate 5°C/min and kept for 10 min at last temperature. Five min, raised to

Results and discussion

Table 1 Show the results of pulp matter, moisture, ash, PV, SV, and IV in dakkhi, aseel, and zahidi pulp matter. The highest value of seed oil was noted in the Dakkhi verity 0.51% as compared to the aseel 0.45% and zahidi 0.42%. Moisture was noted high in dakhi pulp 0.04% samples as compared to the other two varieties. In case of the ash content the highest values was found in dakkhi pulp which is 0.62% whereas lowest range noted in aseel 0.60%, and zahidi 0.57%.

The peroxide values was noted highest in dakkhi pulp 0.45 (meq02/kg) as compared to the aseel 0.43 (meq02/kg), and zahidi 0.39 (meq02/kg). The Saponification is the most important parameter. For saponification the values was noted high in Dakkhi pulp which is 0.40(mgKOH/g) and lowest value in aseel 0.38 (mgKOH/g), zahidi 0.35 (mgKOH/g). The iodine value found maximum in dakkhi variety 0.10 (g12/100g) whereas found lowest value in aseel 0.0 (g12/100g), and zahidi 0.07 (g12/100g).

Table 1. Physicochemical characteristics of three varieties date palm pulp matter.

Varieties	Seed oil%	Moisture %	Ash%	PV (meq02/kg)	SV (mgKOH/g)	IV (gI2/100g)
Dakkhi	0.51	0.04	0.62	0.45	0.40	0.10
Aseel	0.45	0.02	0.60	0.43	0.38	0.08
Zahidi	0.42	0.01	0.57	0.39	0.35	0.07

Table 2. Physicochemical characteristics of three varieties date palm seed.

Varieties	Seed oil%	Moisture%	Ash%	PV(meq02/kg)	SV(mgKOH/g)	IV(gI2/100g)
Dakkhi	0.10	0.32	0.47	0.50	0.17	0.12
Aseel	0.09	0.30	0.45	0.48	0.16	0.11
Zahidi	0.07	0.29	0.43	0.46	0.14	0.08

Table 2. show the result of date palm seed moisture, ash, PV, SV, and IV in dakkhi, aseel, and zahidi date palm seed. The maximum value of seed oil was noted within dakkhi varieties 0.10%as compared to the aseel 0.09% and zahidi 0.07%. In case of the moisture content the highest value was found in dakkhi 0.32% seed whereas lowest range note in aseel 0.30% and zahidi 0.29%. Ash content was noted within least value in zahidi 0.46% 0.47% and aseel 0.45%now highest value in dakkhi 0.47%. The peroxide value is very high in dakkhi 0.50 (meq02/kg) and very low in aseel 0.48 (meq02/kg) and zaahdi 0.46 (meq02/kg). The Saponification valu is the highest in dakkhi 0.17 (mgKOH/g) and lowest in aseel 0.16 (mgKOH/g) and aseel 0.14 (mgKOH/g). The ioden value determine maximum in dakkhi 0.12 (g12/100g) and lowest value in aseel 0.11 (g12/100g) and zahidi 0.08 (g12/100g).

Table 3. Fatty acids composition of date palm seed oil.

Fatty Acid%	Lauric C12:0	Myristic C14:0	Palmitic C16:0	Stearic C18:0
Dakkhi	19	9.4	10.5	1.08
Aseel	20	10.2	11.3	1.10
Zahidi	17	8.7	10.2	1.04

Table 3 the present Lauric acid was noted highest in Aseel Variety (20%) of lauric acid and lowest in Zahidi (17%) of same fatty acid in seed oil, where as in Dakkhi seed oil had values of lauric acid as (19%). Saturated myristic acid was also higher in Aseel (10.2%) and lower in Zahidi (8.7%) and in Dakkhimyristic fatty acid was noted (9.4%).

The other saturated palmitic acid was found in heighest quantities as (11.3%) in Aseel and found lowest as (10.5%) in Dakkhi. However lowest values of palmitic acids among all varieties of Zahidi date palm oil seeds as (10.2%). The Stearic acid concentration was noted high in Aseel as (1.10%) and minimum percentages were found in Zahidi (1.04) but in between values were noted in seed oil of Dakkhi datepalm. The order of fatty acids were found as Aseel>Dakkhi>Zahidi.

Table 4. Fatty acids composition of date pulp oil.

Fatty Acid%	Lauric C12:0	Myristic C14:0	Palmitic C16:0	Stearic C18:0
Dakkhi	5.3	4.2	5.2	7.4
Aseel	4.8	3.8	4.8	6.8
Zahidi	4.7	3.7	4.2	6.5

Table 4 indicates the results of date pulp lauric, mayristic, stearic in dakkhi, aseel, and zahidi. In case of the lauricthe highest values were found in Dakkhi pulp (5.3%), whereas lowest range were noted in Aseel (I4.8%), and Zahidi showed the values in pulp oil as (4.7%). Mysridtic acid was found in highest concentration in Dakkhi as (4.2%) and lowest percentages were noted in in Aseel (3.8%).

However the Zahidi date varities showed middle range values as (3.7%). Palmitic and stearic both were in high ratio in Dakkhi (5.2%, 7.4%) and Zahidi date palm breed showed the lowest quanties of fatty acids both palmitic and stearic acid. All three breeds of date palm pup oil were found as in decreasing order of different fatty acids as Dakkhi>Aseel>Zahidi.

Conclusions

It was concluded that the physic chemical parameters such as Ash contents, Moisture contents, Peroxide values, Saponification values and Iodine values were found high in seed oil of Dakhi date palm varieties which were analyzed. Dakkhi pulp oil showed maximum values of different physico chemical parameters as compared to other two sampled date palm varieties of study area.

The concentration of obtained fatty acids in all sampled verities of date palm seed oil the increasing order of fatty acid were as Lauric acid>Palmitic acid>Myristic acid>Stearic acid. The pulp oil of Aseel date the concentration of all analyzed fatty acid was in highest concentration as compared to Zahidi and Dakkhi date palm. However all found values were within the safe and recommended list of WHO and FAO.

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Conflicts of Interest

No potential conflict of interest was reported by authors.

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