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## Dried Dates Fruit and its Biochemical and Nutrient Content: Uses as Diabetic Food

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### ABSTRACT

Date fruit is an important a source of different types of food products. Dates nutrient is adding with the food consumption as the healthiest alternative. It contains a lot of sugar that gives the body high levels of mobility and heat energy which can be easily broken down in the body. Dates are very rich in vitamins, fibre, fat, protein and minerals like sodium, potassium, calcium, magnesium and iron. However, for diabetic patient, it cannot be recommended for having dates without reducing its sugar content. The study was carried out to investigate the reduction method of dates fruit sugar and nutrient content like biochemical content, N, K<sup>+</sup>, Ca<sup>++</sup> and Na<sup>+</sup>. From the results it can be described that fruit weight and diameter were lower in the dried fruit (having hot water treatment and sun drying) than in fresh fruit. Fructose, glucose and inverted sugar content were found lower (decreasing trend) in the dried fruit (having hot water treatment and sun drying) than in fresh fruit at different months after the fruit harvested. In addition to that mineral contents like nitrogen, potassium, calcium and sodium were found lower in the dried fruit than in fresh fruit. Therefore, results conclude that hot water treatment and sun drying treated fruit had the lowest sugar (fructose, glucose and inverted sugar) and nutrient content which is suitable for diabetic patient diet.

**Key words:** Dried dates, reduced sugar, nutrient, diabetic food

### INTRODUCTION

Fresh and ripen dates contain a lot of sugar which makes it an unfavorable food for diabetics. Less sugar based fruit is helpful for the diabetic patients. Dates fruit, fresh or dried, is the perfect for energy in food and snack. It contains fructose, sucrose and glucose which makes it naturally sweet. Dates can provide fiber, fat and cholesterol free. Dates also contain vitamin A, thiamine and complex of vitamin B, folate, vitamin C and vitamin E, vitamin K, along with minerals like calcium, iron, magnesium, manganese, phosphorus, potassium, sodium and zinc (DHC., 2014). Date nutrient is increasingly present mixing with the food consumption as the healthiest alternative (SMQ., 2012). Dates also contain a form of sugar that gives the body high levels of mobility and heat energy and which can be easily broken down in the body. Dates contain a lot of vitamins and minerals. They also contain sodium, potassium, calcium, magnesium, iron, sulfur, phosphorus and chlorine, as well as vitamins A, betacarotene, B1, B2, B3 and B6 (USDA., 2009). The potassium in the dates gives it heart-strengthening capability. The magnesium makes the bones stronger and helps metabolism. It also has mild laxative properties so consuming the fruit can also help constipation and sluggish digestive systems. Dates have also been used in tonics to improve the health of reproductive organs. This fruit is also known to strengthen uterine walls and therefore is known to help in labor for pregnant women. It can also help new mothers in improving lactation while boosting their health and immunity (DHC., 2014).

Dates are popular not only because of their accessibility and availability but also because they can benefit the body in so many great ways. The same benefits do not apply to people suffering from diabetes. Though dates are low in carbohydrates, their high sugar content makes them one of the red-letter items as far as diabetes goes. Dates have no cholesterol or protein and its carbohydrate content is largely made of sugar. Therefore, diabetics are allowed dates only in small amounts and as a part of a healthy meal plan (DHC., 2014). A Glycemic Index (GI) is basically an index categorizing the food based on how quickly the body digests it and converts it into glucose. Glucose for diabetics needs to be controlled. High glycemic foods are usually refined foods, sugar and most carbohydrates. Vegetables and fruits are generally low glycemic foods. This, however, does not hold true for some fruits and vegetables. Dates fall in that category, which is why dates are not readily recommended for people with diabetes. Most sweet fruits (peaches, strawberries and mangos) has low GI, that is good for diabetics (Jenkins *et al.*, 1981).

Hossain *et al.* (2015) reported that the percentage of date glucose, inverted sugar and fructose were showed increasing trend at different months and after dried it become decreasing trend. They also stated that higher biochemical content and DNA ladder or probe (done by gel electrophoresis) was very remarkable and distinct that DNA band or fragment was found wider and narrow at different treatments. In addition to that nutrient content (K and Ca) was found higher and lower at different treatments in dates fruit. The present research was conducted to reduce the sugar and glucose content from dates fruit so that it can be a proper diet for the diabetics without any threatening of sugar. A few literatures are found regarding this research. That is why this research keeps an important role for the recommendation of diabetic patients. The objectives of the research were to reduce the sugar and glucose content of dates fruit.

## **MATERIALS AND METHODS**

**Fruit materials:** Dates palm trees were selected to collect dates fruit properly from dates palm field from June to October, 2014, Hail, Saudi Arabia. A total of 5 dates fruit trees were selected from the field in the season the dates were harvested on the 15th August, 2014.

**Data collection:** First of all fruits were harvested randomly from all of the selected trees and tagged them properly and finally was brought to the Biotechnology Laboratory, Department of Biology, University of Hail, for measurement. Ten fruit weight and diameter were measured by electric balance of fresh fruit then fresh fruit were ground by grinder and then juice was extracted by cheese cloth net and extracted juice was kept in the freeze for short time for analysis of fructose, glucose and inverted sugar 1st time.

**Fresh fruit preservation for full ripen:** The remaining fruit were kept in the room temperature until the full ripened. In full ripen condition, juices were extracted and analyzed the fructose, glucose and inverted sugar 2nd time after 15 days (Fig. 1a).

**Hot water treatment and sun drying of fruit:** The fruit were pinched the skin by nip and kept for 30 min in a water bath with hot water at 45°C then the fruit were taken out until the stop of water drop. Afterward, the fruit were put in the expose sun drying (40°C) for 8 h and finally kept in the room temperature. The same procedure was followed 3rd, 4th and 5th time at every 15 days interval (Fig. 1b).



Fig. 1(a-f): Structure of date fruit and sugar and nutrient determination procedures, (a) Fresh date fruit water treatment, (b) Sundry fruit, (c) Fructose meter (showing 18.7%), (d) Glucose meter (showing 16.7%), (e) Calcium measurement by calcium meter and (f) Potassium measurement by potassium meter

### Data analysis

**Fructose content determination:** Fructose was determined by using fructose refractometer, Atago-Japan. Three drops of juice sample were put on the disc of the meter and data was displayed and recorded (Fig. 1c).

**Glucose content determination:** Glucose was determined by using glucose refractometer, Atago-Japan. Three drops of juice sample were put on the disc of the meter and data was displayed and recorded (Fig. 1d).

**Inverted sugar determination:** Inverted sugar (combination of glucose, fructose and sucrose) was determined by using inverted sugar refractometer, Atago-Japan. Three drops of juice sample were put on the disc of the meter using small syringe dropper and data was displayed and recorded.

**Nutrient content determination:** Nutrient content [N (as  $\text{NO}_3^-$ ),  $\text{K}^+$  and  $\text{Ca}^{++}$ , Na] was determined by using the nitrate, potassium and calcium digital meter, model: Horiba  $\text{NO}_3$  Meter (USA), Horiba K meter (USA) and Horiba Ca meter (USA). Five drops of juice sample were put on the disc sensor of the meter using small dropper and data was displayed and recorded (Fig. 1e-f).

**Statistical analysis:** Data was analyzed statistically. Standard Error (SE) was done.

**RESULTS**

Figure 1 shows the fruit structure and procedure done in the experiment. Table 1 shows the dates fruit weight and diameter measurement. The lower fruit weight and diameter were found (3.5 g and 1.7 cm) in the dried fruit (having hot water treatment and sun drying) than in fresh fruit. In Table 2, it had been seen that mineral content like nitrogen, potassium, calcium and sodium was found lower in the dried fruit than in fresh fruit. In Fig. 2-4, it had been seen that fructose, glucose and inverted sugar content were found initially higher in the week 0 and 1 in the case of both treatments. Afterward it was found that decreasing trend was occurred in the dried fruit (having hot water treatment and sun drying) than in fresh fruit at different months after the fruit harvested (Fig. 2-4). It had been observed that hot water treatment and sun drying treated fruit had the lowest sugar (fructose, glucose and inverted sugar) and nutrient content (Fig. 2-4).

Table 1: Measurement of fruit weight and diameter.

Dates status	Fruit weight (g)	Fruit diameter (cm)
Fresh ripen fruit	5.1±0.2	2.0±0.01
Dried fruit	3.5±0.1	1.7±0.01

SE: Standard error, Values are given as Mean±SE (n = 10)

Table 2: Determination of nutrient contents

Dates status	N	K	Ca	Na
Fresh ripen fruit	89±0.3	781±0.2	83±0.4	51±0.1
Dried fruit	80±0.4	766±0.3	77±0.2	45±0.1

SE: Standard error, Values are given as Mean±SE (n = 10)

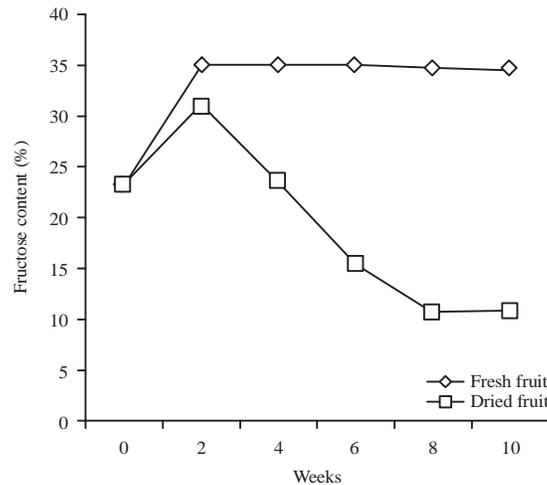


Fig. 2: Fructose content of fresh and dried fruit at different weeks

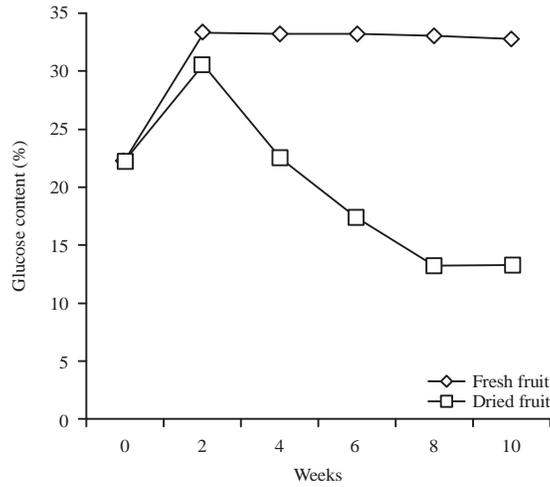


Fig. 3: Glucose content of fresh and dried fruit at different weeks

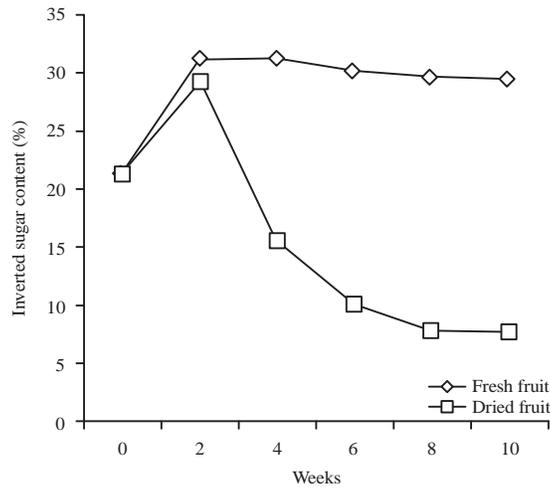


Fig. 4: Inverted sugar content of fresh and dried fruit at different weeks

## DISCUSSION

In the results it has been seen that fruit weight and diameter were reduced in the dried fruit (having hot water treatment and sun drying). It might be due to the water dehydration and osmosis factor in the fruit. Kannall (2013) reported that dried fruit and fresh fruit contain many of the same health benefits but differ slightly in vitamin and mineral content. Both dried and fresh fruits supply with antioxidants and fiber, which are beneficial for the health, however dried fruit has lost a small percentage of its vitamins during the dehydration process.

Overall sugar content like fructose, glucose and inverted sugar were found higher initially it was due to the conversion of sugar from hard ripe stage to soft or full ripe stage. It was found lower trend in the dried fruit (having hot water treatment and sun drying) than fresh fruit at room temperature after 2 weeks. It might be due to the dehydration process by sun drying. Mineral content like nitrogen, potassium, calcium and sodium was found lower in the dried fruit than in fresh fruit. These results were supported by Kannall (2013). USDA (2009) reported that dates

contain 696 mg potassium, 64 mg calcium and 10 mg sodium. So, our results are supported by the results of USDA (2009). Polynapas (2015) stated that dehydrated jackfruit contained lower sugar content than non-dehydrated jackfruit. Hossain *et al.* (2009) reported that the sugar content represented by Total Soluble Solids (TSS) of the harvested elephant apple fruit was bit higher in exposed sunlight (35°C) treated fruit than in room temperature (28°C). After a certain period, TSS content was slightly reduced. Initially, there was an increasing trend in TSS values and then decreasing slow and steady.

## CONCLUSION

From the results it can be concluded that hot water and sundry treatment was the best technique for reducing the sugar content from date fruit. It can be recommended that it may be an important diet for the diabetic patient due to the reduction of overall sugar content compared to the fresh fruit having higher sugar content.

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