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A Perspective of Dates and Application of its Seeds in Discards – A Review

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Abstract- The date (*Phoenix dactylifera* L.) is one of the economically beneficial fruits that is habitually consumed by Middle East peoples for the health aids and enjoyable perception. The date fruits are intake either fresh or processed in several value-added foods including date syrup, date paste, date jam, date bars, date chutney, date pickles, date oil and date coffee due to the rich of nutrients such as carbohydrates, dietary fibers, protein, certain essential vitamins and minerals. And also, it contains high number of phytochemicals including anthocyanin, phenolic, sterols, carotenoids and flavonoids which provides more health benefits to human. Similarly, residue of the date fruits also provides more beneficial effect to the date growers, processors even consumers. The seeds also provide excellent bucket of nutrients, physico-chemical properties and medicinal prosperities. Thereof, dates seeds are utilized to treat variable diseases as native medicine and applicable in certain industries as well including food, pharmaceuticals, oil, animal feed, waste water treatment, bio diesel and bio char. This review paper comprised of the importance and industrial application techniques of date fruit and date seeds.

Keywords: Date fruit, date seeds, industrial application, medicinal value, value-added products.

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1. Introduction

Dates

The dates are very demanded and main food in the arid and semiarid areas of the world (Al–Farsi and Lee, 2008). They have been a wellspring of fundamental riches for the past groups of Arabian worlds. In Arabic countries, dates are considered as one of the staple foods in ancient (Erskine *et al*., 2004) and are consumed as fresh or dried fruits. They are delicious which has sweetened taste and chubby mouth feel. The average weight of date fruit is ranges from 8 g to 28 g. They may oblong or ovate shape (Sakr *et al.,* 2010) and are fairly dry fruits with 10-15% of water and 60-88% of sugar contents (Barreveld, 1993). When dates form in plants, they become yellow and the colour slowly changes into red. Physical characteristics like moisture content of dates are varying according to the stage of the fruit (Kader and Hussain, 2009). The most significant quality characteristics of dates are graded which have good colour and flavor, moisture content in the range of 26–30% and good appearance, free of insects and injuries, cracks and morphological defects (Al-Alawi *et al*., 2017).

The date comprised of many nutritional and pharmacological properties as well, which are the exceptional source of carbohydrates, dietary fibers, protein, lipids, certain vitamins, minerals and bioactive compounds (Nehdi *et al.*, 2010). Carbohydrates form 70% of date fruit dominantly fructose and glucose (1:1). The date also has abundant amino acids but lack of methionine and cysteine. Calcium (Ca), iron (Fe), magnesium (Mg), selenium (Se), copper (Cu), phosphorus (P), potassium (K), zinc (Zn), sulfur (S), cobalt (Co), fluorine (F), manganese (Mn), and boron (B) are the well sourced date minerals (Al-Harrasi *et al*., 2014).

General Consumption of Dates

Most of the date producing countries favors newly ripened dates. Commonly, date fruit is the semi dried, naturally preserved fruit and it is fully ripened while in the tree. Therefore, they are directed to the market without any further processing. However, desiccated dates are the common form of available commercially (Rieger, 2006). Usually, dates are categorized into group of dried fruit, which have highest nutrient content compared with other dried fruits due to the natural drying nature. In disparity, the naturally dried fruits are also artificially dried further to increase the shelf life and eventually for the exporting. Nevertheless, the fully tree ripened fruit has more nutritional value than artificially dried date fruit (Vinson *et al*., 2005). Therefore, fresh fruits are highly preferred and leading in the market.

Value Added Dates

The dates are rich in fiber and antioxidants content and can be versatile used in beverages, dairy and baking industries. Where, they are subjected to develop value-added products, meaning healthy food, including date-based juices, jam, bars, sugar, and flour. They are commercially processed to formulate various date value-added products. The fruits are used to prepare date syrups and date pastes, which are used in the bakery and confectionery industries (Aleid, 2012). Commonly, low-grade dates are used to prepare the date syrups, which can be used in product development instead of sugar, as which are

not influence the quality attributes of the products. The date syrups are composed of bulky quantities of reducing sugars and contain more fructose than glucose. Therefore, the separation of fructose sugar is used to produce value-added, high-quality products. Fructose is considered as the sweetest and ideal dietary sugar (Aleid, 2006).

The paste is the processing of date fruits, which is a way of preserving the fruit and offering flavorful choices for adding it to make different foods, especially in baked goods and confectioneries. Because it consists of a high level of invert sugar, dietary fiber, minerals, and trace elements. The dates as raw materials for jam production were explored by Besbes *et al*. (2009). The date varieties had a significant effect on the chemical and physical properties of the date jams, which expressed the best overall acceptability (Besbes *et al*., 2009). The fruits are also used to produce date vinegar, which ferments eagerly and produces dark and rich vinegar that has a fruity aroma (Matloob, 2014).

The single-cell protein (SCP) is formed from microorganisms such as bacteria, yeasts, fungi, and algae using diverse substrata as bases of carbon and energy. The dates are a good latent substrate for SCP production. Because they consist of 65–87% carbohydrate content, including sucrose, glucose, and fructose, which are rapidly metabolized by most microorganisms. SCP can be utilized as an animal feed for cattle, sheep, fish, and poultry (Aleid, 2006). Yeast can be produced by using dates, which are a good source of substrate for yeast production. The syrup holds a high level of sugars, biotin, and pantothenic acid compared with molasses, almost comparable quantities of nitrogen, phosphorus, and magnesium, and potassium (2:2:2:1). However, this composition is enough for yeast making in bakeries (Aleid *et al*., 2009). The dates are used to produce the canned products. Adding dates to the canned chickpea had a significant consequence on chickpea color according to the amounts of dates (Al-Jassas *et al*., 2014).

Therapeutic Values of Dates

The medicinal properties of the date are very advantageous. It provides strength, fitness, and relief against pains, including fever, stomach illnesses, memory disorders, nervous syndromes, and increases immunity. Along with, they shield in contradiction of numerous chronic diseases, including cancer and heart diseases (Vyawahare *et al*., 2009) and contain anti-oxidant and anti-mutagenic properties as well (Allaith, 2008). Panahi and Asadi (2009) stated that date fruit extract controlled the blood cholesterol levels. The date flesh and the seeds have anti-inflammatory properties and reduce the bulging in the foot and adjunct arthritis (Mohammed and Al-Okbi, 2004). They are an abundant source of hydroxyl pope folic acid, which helps to increase immunity and battle against cancers. People in the Middle East who eat dates in the morning are helped to reduce the toxic material from an empty stomach (Vyawahare *et al*., 2009).

Dates are applied for the curing of abdominal dilemmas (Al-Qarawi *et al.,* 2003) and they are applied for medicinal cleansing due to its high phenolic insides. Because of its anti-dysentery and laxative effects, it is supposed that a daily dose of seven dates drenched in water and taken before bed can slay massive gastro-intestinal roundworms. The dates solution prepared by boiling of free fiber date stuffs material with pinch of table salt, can be applied to treat the dryness consequential from vomiting and diarrhea (Manickavasagan, 2012). The stomach acidity can be reduced the blood acidity by consuming water extracts of dates. Further, it can be used to assist the ingestion of milk

particularly in sensitive children, because of the date fibers are lenient and do not annoy the sensitive stomach.

Sore throat, colds and inflammation of mucus membranes are treated by dates syrup. Dates brew with fenugreek are recommended to treat bronchial asthma. The date pastes plus margarine are acting as antipyretic medicine. Therefore, it can be applied outside on the sores as well as on the noxious bites to avert the poisonous consequences. The powdered seeds paste are help to cure the impact of malarial fever and further it acts as antihistaminic drug to control allergies. Coffee prepared with crushed date stones is assist to recover from gout pains (Manickavasagan, 2012). Date palm roots are also recommended for toothache (Lim, 2012). The general therapeutic use of dates and its products can be ingested as a tonic, particularly for women who are expecting delivery and at perinatal stage (Manickavasagan, 2012). The dates not only aid in actuating the birthing but may also reduce the post-delivery haemorrhage. The dates' potassium, glycine, and threonine are believed to induce the milk hormone and to solve the male sterilities (Shehzad *et al.,* 2021).

By-Product of the Dates; Date Seeds

The date seeds are the by-products of the date fruits and liberated in processing industries. Generally, fruit fleshes are only consumed, though whole fruits, including seed have possibilities to consume. The date seeds are very good source of nutrient content and is highly recommended for preparation of different types of foods due to rich source of dietary fiber (Al-Farsi and dan Lee, 2008). The amount of dietary fiber present in date seed is about 58%. They are rich in minerals such as, sodium, potassium, calcium, iron, copper, magnesium, manganese, zinc, phosphorus, lead and cadmium. Therefore, the date seed powder can be utilized instead of barley in the food production (Ali-Mohamed and Khamis, 2004). Soluble protein like, albumin, globulin, prolamin and glutelin are also accessible in the seed of date (Hamada, 2002).

Phenolic compounds of date seed such phenolic acids and flavonoids hold several valuable properties, including antioxidant, anti-carcinogenic, antimicrobial, anti-mutagenic, and anti-inflammatory actions, and relieving the cardiovascular incidences (Shahidi and Naczk, 2004). The phenolic content (48.64 mg /100 g) composited with gallic acid, protocatechuic acid, p-hydroxybenzoic acid, caffeic acid, p-coumaric acid, ferulic acid, acid m-coumaric and o-coumaric acid (Al-Farsi and dan Lee, 2008). Moreover, the seeds can be applied in the field of medicals to cure chronic diseases, renal stone, bronchial asthma, cough, hyper-activity, weak memory, relaxation of the intestinal and uterine musculature. Also, they support in falling blood pressure, rising body protein by dropping fat, regularizing blood sugar and soothing the pancreas (Hossain *et al*., 2014).

Table 01:
Nutrient compositions of date fruit and seed (g/100 g; # mg/100 g)*

Component	Date Fruit	Date Seed
Moisture *	9.43–21.53	8.64–12.25
Protein *	1.22–3.30	4.81–5.84
Fat *	0.11–7.33	5.71–8.77
Ash *	1.43–6.20	0.82–1.14
Carbohydrate *	65.7–88.02	2.43–4.65
Dietary fiber *	1.9–16.95	67.56–74.20
Magnesium #	56–150	51.7–58.4
Calcium #	123–187	28.9–38.8
Phosphorus #	12–27	83.6–68.3
Potassium #	289.6–512	229–293
Sodium #	4.9–8.9	10.25–10.4
Iron #	0.3–2.2	2.30–2.21

(Alharbi et al., 2021)

Value Addition of Date Seeds

Date seed dust has a probable for usage in food applications (due to its outstanding nutritional profile, especially, high fiber (Amany *et al*., 2012). The seed can be useful materials for making flour and could be used in the various preparations such as cakes, breads, pastries and others. It is based on their dietary fibre content, which makes them suitable for the preparation of fiber–based foods (Larrauri *et al*., 1995). One of the research findings indicated that bread developed with 10% bristly date-pits fiber had more dietetic fiber and equivalent sensory properties compared with the bread developed using the wheat bran (Najafi, 2011). The jam can be prepared using date seed powder (Mirghani *et al.,* 2012) and the powder was supplemented in jam formulation to improve the fiber contents and the product quality. Dessert also can be produced using date pit powder as a high fiber dessert (Alamri *et al*., 2014).

The seed powder is used to produce alternative drink coffee because date seeds have no risks of caffeine; therefore, they help to reduce the risk of large amount of caffeine consumption. Roasted date seeds can be grinded and use for those people who consume more coffee. Conventionally, the beverage has been used in Middle East for a period. The drink can be prepared using date seed powder and mixed with boiled water slowly and it will produce the foam (Sekeroglu *et al*., 2012). This drink can be comparable with *Arabica* coffee brews and it contains same aroma (Saafi-Ben *et al*., 2012). It helps to reduce the blood pressure, relaxation of the intestinal and uterine musculature, in enhancing body protein by declining fat and reduction of body temperature and blood sugar level. The drink is helped to increase the memory power as well (Ghnimi *et al.,* 2015).

The date seed oil could be measured as edible oil that can be applied in makeups and medicines. Further, it has lower amount of unsaturation fatty acids and small amount of linoleic acid than the generally used vegetable oils (Boukouada *et al.,* 2014) and they could protect the skin from UV light also. Recently, the date seed oil was implemented

in the mayonnaise processing (Basuny and Al–Marzooq, 2011); therefore, it is as emerging basis of oil due to its economic value. The oil could be mined by means of organic diluents. The oxidative constancy of date seed oil was greatly higher than the of mostly used vegetable oils and comparable with olive oil. The date seed oil has a decent storage life and could be kept as safe for a comparatively prolonged extent (Besbes *et al*., 2005).

Certain researchers have recommended that the utilization of date seed powder in animal diets (Hussein *et al*., 1998; Al-Farsi and Lee, 2011). The date seeds could be a novel carbohydrate base for animal feed. The studies found that fishes fed with date seeds were expressing constructive growth performance and lamb were stating higher growth rate with more carcass weight. The seeds are considered as a source of poultry feed in addition. Middle East are the prime yielder of dates; therefore, application of date seeds could offer a possible substitute to the traditional feeds used in the poultry manufacturing. This will help to reduce imports of raw materials. Poultry fed with date seeds had similar yield of number of eggs and weight of eggs with the birds fed with control feed. It was also reported that date seed can subsidise absolutely to the poultry (Hossain *et al*., 2014).

The date seeds can be employed for the preparation of porous carbon (Salman *et al*., 2011) due to the solid cellular structure and less porosity. The seeds could be used as an adsorbent to remove the organic and inorganic impurities from aqueous solution (Hossain *et al.,* 2014). This is achieved due to the presence of cellulose and phenolic compounds present in the date seed. Due to the generation of dyes such as methyl red methyl orange, industries use large volumes of water. As a result, considerable amounts of colored waste water are engendered and have to remove the color from the waste water by using date seed powder. It will absorb the color due to the great external areas and suitable pore size. Therefore, it can adsorb huge numbers of dye molecules. Therefore, the powder can be utilized in the integrated waste management system (Chan *et al*. 2008).

Activated carbon can also be produced using date pits (Abdulkarim and Al-Rub, 2004) and compared with the commercial granular activated carbon (GAC) by Belhachemi *et al*. in 2014. Alternatively, Azeem *et al*. (2016) reported that there is the possibility to produce biodiesel from date pits, which are implemented as a filler in terms of various polymer and building constituents. A date seed–polyester composite thermal insulation material was developed by Abu-Jdayil *et al* (2019). Particularly, addition of date pits to the polyester decreased its thermal conductivity and the prepared composites revealed a lowest water retention percentage. Addition to that, date palm fibers are helped to reduce the compressive strength of the complex and decreases the weight.

Several researchers are interested to produce the charcoal from date seed bio char (Ayanoglu and Aksoy, 2015). To activate carbon from date seed, pyrolysis is used (Hussain *et al*., 2014). Activated carbon is important in the removal of various types of contaminants including heavy metals, dyes, phenolic composites, pesticides, and other impurities (Ahmad *et al*., 2012). Therefore, the seed is used as water filter medium as well. Activated carbon from the date seed is used as adsorbents and it can be formed by the chemical reaction with phosphoric acid (Girgis and El–Hendawy, 2002).

Meat and meat stuffs are vulnerable to spoilage. The industrial techniques during formulation upsurge the reduction of quality, which causes changes in overall quality. Meat and meat items are profoundly helpless to quality disintegration. The innovative

techniques during handling increment the danger of crumbling, which causes changes in colour, texture, flavour, and nutritional quality. During the meat processing, it will undergo the oxidation and microbial contamination easily. The oxidation and contamination can be reduced by adding antioxidants and antimicrobials. Consequently, the safety, sensory quality and consumer acceptability of the product will be enhanced. For this reason, several researches are conducted to find out the importance of the natural source of antioxidants and antimicrobials (Lamas *et al.,* 2016). The seed are expressed to be a good source of compounds with antioxidant (Habib and Ibrahim, 2011) and anti-bacterial properties (Perveen *et al.*, 2012). Therefore, they can be used for maintaining meat safety and quality, extending shelf life. Therefore, the date seed is applicable to maintain the food quality instead of using chemical preservatives.

Conclusion

The date fruits are having a sweet taste and fleshy mouth feel and provide excellent source of nutrients which influence in the human health. They contain high nutrient value compete with other common fruits. Similarly, the seed also is one of the prominent agro wastes of the date industries, finds its application in diet-based therapies due to its rich phyto-chemistry. Further, the date seeds are rich in dietary fiber, phenolic compounds and antioxidant activity, therefore, it could be used in many food products as the functional ingredient. Thus, the probable usages of date seed in diverse industries are auspicious. The fruits and seeds are not only valuable to the industrialized peoples but also, many positive and potential benefits of them is an appropriate sustenance for the public belonging to the poverty-stricken areas of the world.

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