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Enhancement of Functional Properties of Dairy Products by Date Fruits

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A COMPREHENSIVE review on date fruit for improving functional properties of dairy producrs, overview of properties, nutrition value, dairy products and functionality is provided. . Fruits are rich sources of carbohydrates, dietary fibers, certain essential vitamins and minerals. Phytochemical investigations have revealed that the fruits contain anthocyanins, phenolics, sterols, carotenoids, procyanidins and flavonoids, compounds known to possess multiple beneficial effects. Date pits are also an excellent source of dietary fiber and contain considerable amounts of minerals, lipids and protein. In addition to its dietary use, the dates are of medicinal use and are used to treat a variety of ailments in the various traditional systems of medicine. Preclinical studies have shown that the date fruits possess free radical scavenging, antioxidant, antimutagenic, antimicrobial, anti-inflammatory, gastroprotective, hepatoprotective, nephroprotective, anticancer and immunostimulant activities. Date palm products were used in the manufacture of some dairy products as date juice milk, Fermented dairy products and ice cream.

Introduction

Palm date is a rich source of carbohydrates, most of which is in the form of simple sugars. According to the United States Department of Agriculture (USDA) National Nutrient Database, a 100g serving of dates provides almost 75g of carbohydrates, which accounts for 18% of the daily value for carbohydrates. About 85% of total carbohydrate in dates is present in the form of simple sugars. The sugar content of date fruit of a particular variety might vary significantly with cultivar, soil, climatic conditions, and fruit maturity stage. The date sugars contain glucose, fructose, and sucrose, although the presence of sucrose is minimal or negligible for most of the date varieties, and the ratio of glucose to fructose is almost equal.

Date proteins were found to be rich in acidic amino acids and poor in sulfur containing amino acids such as methionine and cysteine. Within the same stage of maturation, the amino acid content varies significantly. Amino acids content increased in dried varieties mainly due to water reduction (Auda et al. 1976).

Al-Hooti et al. (1997) reported that dates contain high levels of protein compared to most other fruits. The highest content is observed during Kimri phase (5.5-6.4%), which gradually decreases to 2-2.5% during the Tamar stage. The flesh of date also contains 0.2-0.5% oil, while the seeds contain 7.7-9.7% oil.

Ahmed et al. (1995) isolated proteins from various date cultivars from different countries (Oman, Saudi Arabia, Iran, and USA) by phosphate- buffered saline (PBS) extraction and those proteins were analyzed by sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE). Dates contained a number of proteins with molecular weights ranging from 12,000 to 72,000 Dalton; however, most date cultivars contained two prominent bands appearing at 30,000 and 72,000 Dalton. Sequential extraction of date pulps showed that most date proteins were water-soluble albumins. At the early stage, green dates contained very little protein which increased rapidly at later stages in maturation. Dates from Saudi Arabia, Oman, and Iran were similar in their protein profiles since they contained similar complex mixtures of proteins in the molecular weight range of 12,000-72,000 Dalton. A date variety from the USA contained very little protein with a simple protein profile containing one major band appearing at 30,000 Dalton.

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Date pulp contains vitamins such as riboflavin, thiamine, biotin, folic acid, and ascorbic acid that are essential for the body. Dates are rich in B-complex vitamins, such as thiamine (Bi), riboflavin (B2), niacin (B3), pantothenic acid (B5), pyridoxine (B6), and folate (B9) and vitamin K (Al-Farsi and Lee 2008a). It is worth mentioning that some vitamins (B3, B5, B6, and B9) are found in higher concentrations in dates than some common fruits like apple, orange, and berries. The niacin content is very high and it varies between 1.27 and 1.61 mg/100 g. Quantitative analysis of water-soluble vitamins (B1, B2, B3, B5, B6, B9, B12) showed a significant variation within the different cultivars and the developing stages of date fruit (Aslam et al. 2011). Vitamins B1, B3, B5, B6 are highest in mature stages; however, vitamins B2, B9, B12 have been detected in immature fruit. Vitamin C content is found to be very low in dates.

Also, dates contain essential minerals, for example, potassium, which is essential for muscle contractions and helps to control heart rate and blood pressure (Al-Shahib and Marshall 2002). One hundred grams of date contains 696 mg of potassium, 90 mg of iron, 362 mg of copper, and 90 mg of magnesium, which are essential for bone growth. Also, copper is needed for the production of red blood cells. The significantly high potassium and low sodium contents in dates are optimum for people suffering from hypertension (Appel et al., 1997). In comparison with other dried fruits (as per USDA National nutrient database), 100 g dates contain on average of 0.8 mg selenium, 0.3 mg copper, 864 mg potassium, and 43 mg magnesium (USDA 2007). It is noted that the data reported by USDA is for fruit grown in the US, hence variations are expected for fruit grown in other countries. Moreover, often times, variations in data reported are due to varietals and maturity differences. Nonetheless, dates are regarded as a good source of these minerals. A 100-g consumption of dates provides over 15% of the daily Recommended Dietary Allowance (RDA) to Adequate Intakes (AI) of selenium, copper, potassium, and magnesium (Al-Farsi and Lee 2008a); moderate concentrations of manganese, iron, phosphorus, and calcium, per 100 g of dates, provide over 7% of the daily RDA/AI. The pulps are rich in iron, calcium, cobalt, copper, fluorine, magnesium, manganese, potassium, phosphorus, sodium, copper, sulfur, boron, selenium, and zinc**.** In many date varieties, potassium can be found at a concentration as high as 0.9% in the flesh while it is as high as 0.5% in some pits/seeds. Other minerals and salts that are found in various proportions include boron, calcium, cobalt, manganese, phosphorus, and zinc. Additionally, the seeds also contain aluminum, cadmium, chloride, lead and sulfur in various proportions (Al-Farsi et al., 2005a and Ali-Mohamed & Khamis, 2004).

According to Al Hadrami (2003) the date fruit contains fluorine, which is proven to protect against tooth decay. Also, selenium has many functions in the human body; it can prevent cancer and stimulate the immune system. Dates are a good source of iron and can correct iron deficiencies and anemia. In addition to being a rich source of carbohydrates, dietary fibers, some essential vitamins, and minerals, dates are also rich in a variety of phytochemicals, for example, phenolics, sterols, carotenoids, anthocyanins, procyanidins, and flavonoids. Even date pits are an excellent source of phytochemicals besides dietary fiber, minerals, lipids, and protein. In addition to their pharmacological properties, phytochemicals also contribute to nutritional and sensorial properties of dates. Phytochemicals in fruits have been shown to possess significant antioxidant capacities that may be associated with lower incidence and lower mortality rates of degenerative diseases in human (Baliga et al., 2011 and Vayalil, 2012).

The carotenoid degradation is probably due primarily to the loss of moisture during maturation, and is probably unrelated to the gradual darkening of the ripening fruits (Gross et al., 1983).

According to USDA National Nutrient Database for Standard reference, Release 19 (USDA 2007) the total carotenoids in Deglet Nour and Medjhool are 81 mg/100 g (6.0 mg of p-carotene and 25.0 mg of lutein plus zeaxanthin) and 112 mg/100 g (89.0 mg of p-carotene and 23.0 mg of lutein together with zeaxanthin), respectively. The carotenoid composition and the provitamin A value of three Algerian date varieties (Deglet Nour, Hamraya, and Tantebouchte) at three different ripening stages showed that the major carotenoid pigment present in dates was lutein followed by β-carotene. Interestingly, the carotenoid content of the fruit decreased significantly during ripening from the Khalal to the Tamar stage. The β-carotene content was reported to be 6.4,3.3 and 2.5 mg/100 g for

Deglet-Nour, Hamraya and Tantebouchte dates, respectively, while that of the lutein was 156, 28, and 33.6 mg/100 g, respectively (Boudries et al., 2007).

Al-Farsi et al. (2005b) reported that, anthocyanin have been detected in various fresh date cultivars and their concentration ranged between 0.87 and 1.5 mg/100 g; generally, there was a direct correlation between the levels of anthocyanin and the fruit color, anthocyanin are detected only in fresh dates, indicating that they may be destroyed in sun-dried fruit.

The presence of procyanidins in date fruits has been reported in the literature. Chemical analysis of acetone-water-acetic acid-extracted procyanidins indicated that the procyanidin existed as higher molecular weight polymers, unde camers through heptade camers, (Hong et al., 2006).

Phenolic compounds are one of the most important bioactive materials and are characterized as potent antioxidants and free radical scavengers which can act as hydrogen donors, reducing agents, metal chelators and singlet oxygen quenchers (Yen et al., 1993). Phenolic acids and their consumption have increased recently due to potential health benefits.

Antioxidants, medical properties and health benefits of date fruits:

Date has been considered as a source of antioxidants. Antioxidants inhibit oxidative mechanisms that lead to do generative diseases such as heart disease, brain dysfunction and arthritis (Prior et al. 1999). Dates are reported to have antitumor activity, antimutagenic properties, and can lower the rate of cancers, especially pancreatic cancer and activate immune system and regulate the role of antibiotics (Ishurd and Kennedy 2005, Vayalil 2002). An aqueous extract of date flesh has potent free radical scavenging activity of reactive oxygen species like superoxide and hydroxyl radicals. The same extract also showed a strong inhibitory effect on in vitro macromolecular damages such as lipid peroxidation and protein oxidation.

Mansouri et al. (2005); Al-Farsi et al. (2007) and Al-Turki et al. (2010), studied the fruits of different date palm cultivars have different total phenolics content and antioxidant activity. The antioxidant properties of date fruits vary depending on their content of phenolic components and vitamins C and E, carotenoids and flavonoids. Sun-dried dates grown in Oman (cv. Fard, Khasab, and Khalas) were found to be a good source of antioxidant constituents including selenium (0.356 to 0.528 mg/100g), total antioxidants (8,212-12,543 mlmol Trolox equiv/g), carotenoids (0.92-2.91 mg/100 g), and phenolics (217-343 mg of ferulic acid equiv/100 g). These results suggest that all date varieties can serve as a good source of natural antioxidants and could potentially be considered as a functional food or functional food ingredient

A total of 80 volatile compounds have been detected in date fruits which included 20 esters, 19 alcohols, 10 terpenes, 13 aldehydes, 6 ketones, 12 hydrocarbons, and 1 lactone (Arem et al. 2011). The identified compounds accounted for 90.7-99.6% of the total aroma profile. The number of aromatic compounds differed according to the maturation stage and to the fruit kind. Other compounds (2-propanol, isoamyl alcohol, phenylethyl alcohol, isoamyl acetate, etc.) have also been identified in Tunisian dates. Each volatile compound was characterized by an odor threshold (varying from a few ppb to several ppm). Alcohols, aldehydes, ketones, and terpenes were responsible for the citrus, floral, and fruity characteristics of date aroma (Richard 1992). Two straight chain aldehydes, nonanal and decanal were suggested to be responsible for the fresh and slightly green notes of dates (Crouzet 1992). Terpene or aliphatic alcohols are characterized by herbaceous, fruity, citrus, floral and fungal odors (Richard 1992).

In traditional medicine, the use of date fruit is recommended for treatment of liver diseases and to be consumed by pregnant women before and after delivery (Al-Mamary et al. 2010). Although date fruit is admired for its nutritional and pharmacological properties by the natives of Middle East and northern Africa, it is still hardly recognized in the west due to the lack of sufficient scientific documentation (Vayalil 2012).

In vitro study of the aqueous extract of palm date fruits showed antioxidative and antimutagenic properties (Vayalil 2002). On the other hand, in vivo studies (Al-Qarawi et al. 2004, Bastway et al. 2008) have shown that the ethologic and aqueous date extracts had hepatoprotective effects when they are fed to rats, in which acute hepatotoxicity was induced by carbon tetrachloride and thioacetamide, respectively. A number of other health benefits of dates consumption are reported in the literature: e.g., anticancer activity (Sun et al. 2002), effect on immume response (Pur 2000,

Al-Chramawindi, 2007), anti-ulcer activity (Al-Qarawi et al., 2005), antimicrobial activity (Sabah et al., 2007), anti- hyperlipidemic activity (Al-Maiman 2005, Rock et al., 2009), and positive effect on reproductive system (Ali et al., 1999, Bahmanpour et al., 2006). However, date fruit is still poorly studied in relation to their total phenolic and total polyphenolic compounds, and consequently their antioxidant activity. Owing to its high nutritive values and potential health promoting activities, date fruit may be considered as an emerging and potential candidate for the development of health-promoting foods.

Carbohydrate foods when consumed in isoglucidic or isoenergetic amounts have different glycemic potential and insulinemic response (Vayalil 2012). Carbohydrates or carbohydrate foods are classified based on their glycemic responses which are termed as the glycemic index (GI). An extension of the GI concept is the glycemic load (GL). The GL value incorporates the amount of digestible carbohydrates in a serving in order to better gauge the impact of a diet on postprandial glucose response (Wolever et al., 1991). There are various factors that influence the GI value of date fruit. It depends on the type of component sugars (*e.g.,* glucose, fructose, sucrose, or sorbitol), the physical form of the carbohydrate (*e.g.,* particle size), the nature of the food item (fat, protein, and fiber content), and the modification of the food (*e.g.,* food processing, extent of hydration) (Wolever et al., 1991, Augustin et al., 2002 and Jenkins et al., 1981).

Few studies have been carried out to test the glycimic index (GI) of date fruits. However, the calculated GI values are inconsistent and sometimes are contradictory (Vayalil, 2012). Miller et al. (2002, 2003) found the GI value ranged between 31 and 50 in normal subjects depending in one variety where the value dropped (ranging from 29 to 47) when the fruit was consumed either alone or as mixed meals (Miller et al. 2003; Denyer and Dickinson, 2005). An international database of GI and GI/GL reported that the GI of Australian dried dates was 103, which was significantly higher than reported for dates from some other countries (Denyer and Dickinson, 2005). More recently, the GI of different varieties of dates from Oman was reported to range from 47.6 to 57.7 (Ali et al., 2009).

Phenolic are well known for their powerful antioxidant properties and health benefits. Mansouri et al. (2005) investigated the content and nature of the phenolics of ripening dates produced by seven cultivars and assessed their antioxidant activity. Total phenolic content ranged from 2.5 to 8.4 mg gallic acid equivalents per 100 g of dates. The evaluation of the antioxidant activity revealed an antiradical efficiency of 0.08-0.22. A significant correlation (R2 = 0.975) was established between phenolic contents and the antiradical efficiency among all cultivars tested.

In other studies, dates were found to be a high source of antioxidant constituents, total antioxidants (8,212-12,543 mmol of Trolox equivalents/g), and phenolics (217-343 mg of ferulic acid equivalents/100 g). Biglari et al. (2008) analyzed the antioxidant activities using three different methods, The authors concluded that there is strong potential use of dates as an antioxidant functional food.

Other health benefits also are attributed to phenolic, giving a added value to dates and increasing an interest in them as functional food and nutraceuticals. Al-Farsi et al. (2007) reported that the compositional and functional characteristics of date fruits, syrups, and their by-products, such as press cake and seed, make them a good source of natural antioxidants and could potentially be used directly as functional food or incorporated as an ingredient in functional food.

Phytosterols are lipid-like complexes of unsaturated alcohols. They are closely- related in terms of their structure to animal cholesterol but have an extra ethyl group on the side chain. Unlike cholesterol, phytosterols are beneficial to human health. They are thought to be involved in lowering the blood levels of low-density lipoprotein LDL, the so-called bad cholesterol. Phytosterols are also involved in blocking the absorption of dietary cholesterol into the bloodstream and in inhibiting the reabsorption of cholesterol from bile acids in the digestive process, thus reducing the amount of cholesterol returned to the bloodstream. Other health benefits may include positive effects for patients with autoimmune diseases. For instance, phytosterols were shown to reduce inflammation and suppress over-reactive immune systems in patients suffering from rheumatoid arthritis. In addition, the use of concentrated extracts of phytosterols has been shown to be effective against certain forms of cancer (i.e. prostate) and to enhance the insulin production of pancreatic cells (Al-Turki et al., 2010).

Alpha-tocopherol (vitamin E) is often used orally to treat deficiencies, and in preventing cardiovascular diseases, diabetes and its

complications, and benign prostatic hyperplasia. This vitamin is also administered against angina, thrombophlebitis, intermittent claudication, hypertension, and to prevent ischemia-reperfusion injury after coronary artery bypass surgery. Alpha-tocopherol is claimed to reduce the risks of various cancers, Alzheimer's, and Parkinson's diseases and other dementias. Vitamin E is also used against allergies, asthma and other respiratory problems, as well as digestive or circulatory diseases. Additionally, vitamin E is used topically against dermatitis, aging skin, and granulomaannular and in preventing skin ulceration often caused as a consequence of chemotherapeutic drugs use (Fig. 1).

Use of date products in the manufacture of some dairy products

Date palm products were used in the manufacture of some dairy products. Yousif et al. (1996) used date syrup in the manufacture of date juice milk drink. Hamad et al. (1983) used date syrup as a sweetener in ice cream.

Fermented dairy products containing probiotic cultures are healthful. The ability of probiotic bacteria to support the immune system could be important to the elderly or other people with compromised immune function, especially children Parodi (1999). Yogurt is most often flavored with fruit preserves or other ingredients Potter and Hotchkiss (1995). Flavored yogurts are made by adding fruit concentrates or flavors to cultured milk before or after incubation (Keating and White 1990). Dates are of higher nutritional value and do not need the addition of sugar or colors and flavors, compared to other fruits.

Hashim (2001) studied the characteristics and acceptability of yogurt containing date palm products. Results indicated that addition of 10-20% of date paste with or without 5% date syrup did not affect yogurt acidity, protein or fat contents, but increased total solids significantly. Also, addition of 15% date paste with 5% date syrup provided yogurt with desired sensory quality.

Hashim et al. (2009) investigated the effect of fortification with date fibers on quality& yoghurt**.** Fortification of fresh yogurt with 1.5%, 3.0% and 4.5% date fiber did not cause significant changes in yogurt acidity, although the pH was increased. Yogurt fortified with date fiber had firmer texture (higher hardness values) and darker color. Sensory ratings and acceptability of yogurt decreased significantly when date fibers increased to 4.5%. Fortifying yogurt with 3% date fibers produced acceptable yogurt with beneficial health effects.

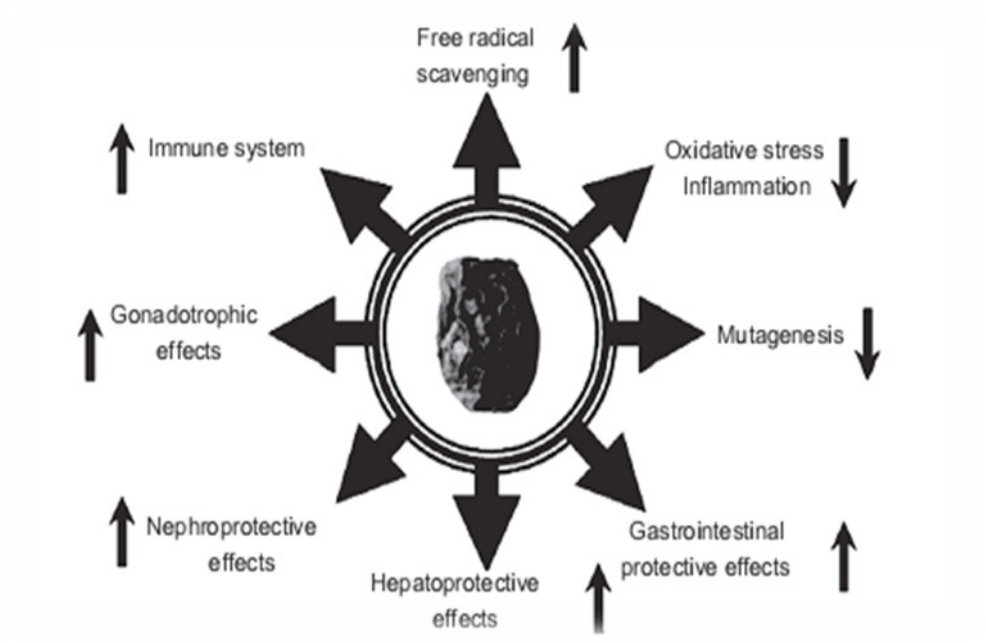

Fig. 1. Pharmacological activities of date fruit (arrow up= increase, arrow down= decrease) . Source: Baliga et al., (2011). Reproduced with permission from Elsevier.

Gad et al. (2010) used date fruit as a part of water (v/v) used in reconstituting skimmed milk powder in processing yogurt with 14% total solids. Results showed that yogurt enriched with 10% dates had a significant sweetness, recorded the highest antioxidant values, higher in HCl- soluble minerals and folate concentration compared to plain yogurt. It could be concluded that numerous health benefits beyond its nutritional value have been associated with consuming yogurt enriched with 10% date fruit.

Al-jasass et al. (2010) produced date flavored probiotic stirred yogurt from both fresh cow milk and reconstituted whole milk powder as follows. Moreover it was noted that the addition of date syrup to the probiotic yogurt enhanced the bifidobacterial count of the product of all treatments and improved their survival during the cool storage period up to 10 days .This could be explained on the basis that date syrup may contain some micronutrients, such as vitamins and minerals, which might enhance the growth of bifidobacteria. Meanwhile the viable bifidobacterial count for the product of all treatments was higher than the minimum concentration of probiotic required for beneficial effect up to the end of the storage period. The results also indicated that the resultant date flavored probiotic yogurt from all treatments contained viable numbers of bifidobacteria more than the minimum number reported by above studies.

El-Naggar and Abd El-Tawab (2012) carried out a study to select the best method of date syrup extraction. Different methods have been used to extract and concentrate the date syrup ''Dibs''. Minced date flesh of Saidy variety was extracted twice using minced flesh at a water rate of 1:2 at 70 ℃ for 30 min using microwave, rotary evaporator and water bath and concentrated in a rotary evaporator and microwave. Apparently, use of microwave method for extraction and concentration of date syrup had a significant ($p < 0.05$) difference higher in the content of moisture, protein, total sugars, dietary fiber, total phenolics, hydroxy methyl furfural and ash, but it had no significant ($p<0.05$) difference in insoluble solids and fat content. Also studied the organoleptic evaluation of zabady and biogarde, prepared with dibs are correlated with the chemical characteristics and microbiological tests. Results could be concluded that the caloric values of fermented milk products with 2% Dibs attained the highest values, actually 65.62 and 64.78 K Cal/100 g for zabady and bio garde respectively. Total solids, S.N., T.A. and ash contents were gradually increased during storage periods. Also, zabady and biogarde with 2% dibs were found to be rich in all essential amino acids excluding lysine, histidine, threonine, and leucine + isoleucine.

Keshtkaran et al. (2013) formulated a flavored milk beverage using date syrup for flavoring the product and gum tragacanth to obtain an acceptable mouth feel. Steady shear and dynamic oscillatory rheological properties of the samples contained 3 concentrations (0,0.1,0.2and 0.3%, wt/wt) of 2 types of gum tragacanth (*Astragalus gossypinus* and *Astragalus rahensis*) which at 3°C, were studied. Particle size distribution and colorimetric assays were determined by laser diffractometry and using reflection spectrometer, respectively. Sensory analysis was performed with 25 semi trained panelists, using a 5-point hedonic scale. The results showed that viscoelastic properties, flow behavior parameters, particle size, and color parameters (L*, a*, and b*, where L* represents lightness, a* represents the edness/greenness quality of the color, and b* represents the yellowness and blueness quality of the colors) were significantly affected by the concentration of the gum tragacanth and the severity of this effect was influenced by the type of a. The use of appropriate type and concentration of gum tragacanth in date milk formulation can improve the texture and mouth feel by affecting on particle size and the flow behavior of this product.

Al-Otaibi et al. (2013) evaluated the growth and survival of two probiotic bacteria, *Lactobacillus acidophilus* La-5 and *Bifidobacetrium lactis* Bb-12 in milk with different concentrations of dips during fermentation. The *L. acidophilus* count increased gradually in all the samples up to 12 h of incubation. Later on, the bacterial counts decreased after 24 h of incubation in all the treatments containing dips. However, the count of *B. lactis* did not change significantly after 6 h. incubation for all the samples while it decreased significantly after 12 and 24h incubation in the samples containing 10 and 15% dips while it increased in the control until 12h. and decreased after 24 hr incubation. Besides, an inverse relationship was observed between the dips concentration and the growth rate of both the probiotic bacteria. Subsequently, the acidity of milk increased in the control while it decreased with increasing the dips concentrations and the

pH values. The results indicated that both the probiotic bacteria *B. lactis* and L. acidophilus can remain viable with count of 10^6 cfu / ml) in presence of dips concentration up to 20% during fermentation except for the treatment with 20% dips in the presence of *B. lactis* after the 24h. The study results showed an excellent potential for incorporating the dips in other probiotic dairy products.

Hameed and Chandra (2014) tried to improve frozen yoghurt with best combination of date pulp and conducted with the possibility of developing a dairy product with health benefits beyond those of traditionally formulated for food providing benefit beyond nutrition. Total four combination of milk and date pulp (96:4, 94:6,92:8,90:10) was satisfactory blended to yoghurt cultures i.e. *Streptococcus salivarius* ssp. *thermophilus* NCDC074, and *Lactobacillus delbrueckii* ssp. *bulgaricus* MCDC009 following by incubation at 40℃ for 3-4 hours. Control frozen yoghurt mix was standardized to 5% milk fat, solid not fat 11%, sugar 12%, stabilizer and emulsifier 0.3%. Date pulp decreased fat, acidity, protein, moisture and increased total solid, Ash, carbohydrate, based on the statistical analysis data obtained from various parameters using different ratio of milk and date pulp.

Abdeen, 2015) improved the quality of probiotic Laban Rayeb produced from camel milk using date syrup (Dips) and stabilizers. Results show that flavouring the product with 6% Dips and using Lacta 515B at 0.75% significantly improved the quality of resultant product. Replacing sucrose with Dips and stage of sweeteners addition were evaluated frozen yogurt. Data indicated that addition of bifido cultures at the freezing stage, replacing sucrose with 50% Dips and addition of sweeteners after fermentation at the freezing stage were the most suitable conditions for producing good quality probiotic frozen yoghurt from camel milk.

Conclusions

Utilities of date fruits in dairy products improved function properties, yogurt enriched with 10% dates had a significant sweetness, recorded the highest antioxidant values, higher in HCl- soluble minerals and folate concentration compared to plain yogurt. It could be concluded that numerous health benefits beyond its nutritional value have been associated with consuming yogurt enriched with 10% date fruit. when date fibers increased to 4.5%. Fortifying yogurt with 3% date fibers produced acceptable yogurt with beneficial health effects. Zabady and biogarde with 2% dibs were found to be rich in all essential amino acids excluding lysine, histidine, threonine, and leucine + isoleucine. Date pulp decreased fat, acidity, protein, moisture and increased total solid, Ash, carbohydrate, based on the statistical analysis data obtained from various parameters using different ratio of milk and date pulp. Improve the quality of probiotic Laban Rayeb produced from camel milk using date syrup (Dips) and stabilizers. Results show that flavouring the product with 6% Dips and using Lacta 515B at 0.75% significantly improved the quality of resultant product. Replacing sucrose with Dips and stage of sweeteners addition were evaluated frozen yogurt. Data indicated that addition of bifido cultures at the freezing stage, replacing sucrose with 50% Dips and addition of sweeteners after fermentation at the freezing stage were the most suitable conditions for producing good quality probiotic frozen yoghurt from camel milk.

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تحسين الخواص الوظيفية للمنتجات اللبنية بفاكهة التمر

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تهدف هذه المرجعية الى مدى مساهمة فاكهة التمرفى تحسين الخواص الوظيفية للمنتجات اللبنية لاحتوائه العالى من الكربوهيدرات والالياف الغذائية واللفيتامينات والاملاح المعدنية وتحتوى ايضا على العديد من المركبات الحيوية مثل الانثوثيانين , والفينولات , والكاروتونيد , والبروسياندين , والفلافونيدات وترجع التأثيرات المفيدة للتمور لهذه المركبات , ولهذه المركبات لها تاثير كمضادات للاكسدة , الطفرات , السرطان ونمو الميكروبات والالتهابات وللتمور لها القدرة على حماية القناه الهضمية والكبد وتنشيط الجهاز المناعى. وتدخل منتجات التمور فى صناعة بعض المنتجات اللبنية منها حليب مطعم بعصير التمر , والمنتجات اللبنية المتخمرة والايس كريم.