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Utilization of Some Fruits and Vegetables Juices to Produce Syrup (Dibis) as New Products

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Abstract: The use of high fructose corn syrup (HFCS) as a sweetener has increased in recent years, therefore, the use of natural sweeteners as well as sucrose is an interesting area for food industry. Fruits and vegetables are important components for human diet. In this context, consumption of fruits and vegetables as phytochemical is gaining considerable importance as safeguard to maintain human health, due to presence of bioactive components, in addition to beneficial roles in human physiology such as (wholly prickly pear, persimmon and pumpkin). Processing of such materials into syrup (dibis) (non-purified) could be applied to utilize for their nutraceutical properties compared to (dates dibis) control. It is noteworthy that prickly pear, persimmon and pumpkin had very short season is in the market and they easily spoiled, that the process making syrup (dibis) of them is considered as one of the important methods for preservation and subsequently, utilized at any time of the year hence, added value as well as produce new products. Results had shown that, ash contents in all samples and were matching with the values in Egyptian Standard. There were observed significant differences at $p \leq 0.05$ among the samples in their minerals content compared to the control. The pumpkin dibis had its minerals content as that of the control. It was observed that, dibis of persimmon is rich in both of zinc and iron as that of control. It could be observed that, all produced dibis samples recorded the high antioxidant activity compared to the control (dibis dates) which was the lowest (25.80%). On the other hand, it could be that from data there are significantly differences ($p \leq .0.05$) of their total antioxidant activity among samples, however, persimmon dibis was the superior. It was noticed that, dibis of persimmon, pumpkin and wholly prickly pear had developed the sensory properties and subsequently increased the palatability (very good) compared to (dibis) of dates (control) which is a thick sugary liquid extracted from dates, while dibis was produced from fruits / vegetables juice had contained about (68-78%) total soluble solids in the concentrated form, which accounts (12.18- 19.99%) less sugar content.

Key words: Syrup (dibis) · New Products · Wholly Prickly Pear (*Opuntiaficus-indica*) · Pumpkin (*Cucurbita pepo*) · Persimmon (*Diospyros khaki-'fuyu'*) · Antioxidants · Minerals

INTRODUCTION

Persimmon is prominent for its nutrition. The fruit is comprising 80.30% water, 0.58 % protein, 0.19 % total lipids, 18.60% total carbohydrates and some minerals (magnesium, iron, zinc, copper, manganese, etc.) and up to 1.48 g and 7.5 mg total dietary fibers and ascorbic acid respectively) [1-3]. Investigation showed that persimmon also contributes in calcium and potassium availability. Sugars content (12.5 g/100 g) are higher in persimmon than other extensively consumed fruits such as apple, peach, pear and orange [4]. Among sugars, sucrose and its monomers (glucose and fructose) are bountiful [5, 6]. The positive impact of persimmon is providing protection against memory impairment with aging due to presence of oligomericproanthocyanidins [7]. These bioactive components can reduce the DNA damage caused by various genotoxic factors [8]. These results suggested that, persimmon syrup can be used for both the treatment of diabetics and healthy people due to its beneficial effects on blood glucose level [9]. Pumpkins are produced in high yields in comparison with other vegetables and they are rated for the simple production technology [10]. The breeders have already created shrubby type of pumpkin plants. Cucurbita maxima is cultivated for flesh and seeds for human nutrition, either for direct

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consumption or for preparation of other foods such as syrups, jellies, jams and purees. This vegetable can be processed in different ways. It can be baked, frozen, dried, crystallized, marinated or lyophilized. The fruits of pumpkins have a lot of biologically active compounds: vitamin C, vitamin E, minerals, pectins and carotenoids. The beneficial influences of carotenoids on human health have proven by many researchers. In the human body carotenoids keep same chemical reactivity as in plants - catching free radicals and active atomic oxygen. Carotenoids also potentially play an important role in human health by acting as biological antioxidants, protecting cell and tissues from the damaging effects of free radicals and singlet oxygen [11]. The protective role of xanthophyll pigments lutein and zeaxanthin have been recently added to the list of potentially beneficial nutrients for coronary heart diseases and stroke, cataract and macular degeneration [12]. In China, Yugoslavia, Argentina, India, Mexico, Brazil and America, pumpkins are utilized in the pharmaceutical industry [13]. The fruits of cactus pear, a plant spread over the Mediterranean and other warm areas of the planet, are characterized by phytochemicals such as betalains [14], unique pigments poorly represented among edible vegetables. Beneficial properties of these fruits have recently emerged. The previous report showed that twoweeks supplementation with Sicilian cactus pear fruits decreased the level of plasma markers of oxidative stress and of lipid hydroperoxides of circulating low-density lipoprotein (LDL) in healthy humans, an effect which has appeared independent of the consumption of vitamin C with the fruit [15]. Betanin and indicaxanthin, the betalain pigments occurring in the cactus pear fruit, long known as safe foodcolorants have recently been investigated as antioxidant compounds.There are insignificant variations in the chemical composition of the fruit of Opuntias (prickly pear) of different colours [16-18]. The studies explored macroelements and mineral components of Opuntias of different colours: Green, purple and orange fruit were considered with pulp of the same colour. The variations in content of some of the minerals in the fruits can be attributed to their different origins those used for (*O. ficus-indica*) with pH in the region of 6.0 or more. The specifications of date syrup vary according to the date species, the extraction method and the temperature used. It is rich incalories, vitamins, various mineral elements, high nutritiousfoods and one natural energy source due to its high contentof sugars, which make up approximately 85% of totalsolids, as well as high potassium and low sodium content, which makes it desirable as food for people with highblood pressure problems who are advised by doctors toconsume foods with low-sodium content [19].

Thus, the current study investigates, a return to healthy dietary, through its beneficial nutrients. Further protective phytochemical relevant potentials of phenolic phytochemicals were confirmed in select important some fruits and vegetables juice such as (Pumpkin, persimmon and wholly prickly pear) which would be used in syrup (dibis) form to use as a replacement of sucrose in food products.

MATERIALS AND METHODS

Materials: All raw materials used in these experimentswere prepared from a farm near Giza Governorate as fresh for both of vegetable and fruitin (summer /winter) season (2018) included: Pumpkin (*Cucurbita maxima*), Wholly prickly pear [*Opuntiaficusindica* (L.) *Mill*] and Persimmon (*Diospyros kaki-'fuyu'*) Asia/Japanese species. Commercial dibis (Dates dibis)was purchased from local supermarkets in Giza, Egypt, for comparison.

Methods

Preparation of Extracts: Persimmon, wholly prickly pear and pumpkin, were washed and squeeze. Wholly prickly pear and Persimmon were mixed inblender and the other form for pumpkin was prepared in juice by using a carrot juicer. Each of the previously juices were filtered with milk cloth.

Preparation of Syrup (Dibis): Juice and sugar were mixed (1:1), then the mixture were put on a quiet flame and by waterbath, after the completion of melting sugar, was added lemon juice(6gm weight) and (0.2gm) citric acid, were added and then left for 5 hrs., where it was enough to form syrup(dibis), then poured in a clean and sterile Pyrex jars. Put it directly in the refrigerator to pasteurizeand stored in good place until the analyses were carried out.Citric acid was added to lower down the browning reaction by lowering the pH and acidulent reaction.

Physico-Chemical Characteristics: The physicochemical analyses of samples were determined according to the methods AOAC [20]. Analyses including (moisture, ash, total sugar, reducing sugars, pH, TSS and

minerals contents). However, non-reducing sugars were determined by subtracting the reducing sugars from total sugars.

Antioxidants Activity (DPPH –Radical Scavenging Activity): Anti-oxidant activity was determined by DPPH method according by Brand - Williams [21].

Non-Enzymatic Browning [Color Index at 420 nm)]: The increase in absorbance of a sample extract at 440 nm is taken as a measure of non-enzymatic browning. The color also is measured at 420nm. Extract, 4-5 gm of sample with 100ml of 60% alcohol for 12 hr. and filter. For sample containing chlorophyll, shake the alcoholic extract with three lots of 50 ml benzene. If the filtrate is not clear, will be refilled using filter aid. Measure the color at 440nm using 60% aqueous alcohol as blank, according to Ranganna [22].

Determination of Syrup (Dibis) Consistency/ The Purity: A Brookfield Digital Rheometer, Model DV- □ Ultra with Rheocals v3.1 software (on an IBM computer for automated control and data acquisition) was utilized to evaluate the rheological properties of the syrup (Wholly Prickly Pear, Pumpkin, Persimmon) spreads. The sample was placed in small sample adapter, the spindle No., HA -07 was used. A thermostatic water bath provided with the instrument was used to regulate sample temperature. Apparent viscosity was evaluated at room temperature (25 ±3°C) which correspond to rotational speed of 10 rpm, by Brookfield manual [23]. The purity degree of syrup (dibis) was calculated according to Egyptian Standards [24] date debis.

$$\text{The Purity Ratio (\%)} = \frac{\text{Total Sugars}}{\text{Total Solids}} \times 100$$

Sensory Evaluations of Syrup (Dibis): For the sensory evaluated simple hedonic scale was used in order to evaluate the first impression, the aspect, the quality attributes (color, taste, flavor, texture, appearance and overall palatability of the samples of dibis compared to dates dibis (control). Using suggested was evaluated for their sensory characteristics by ten panelists from the Staff of the Processing Crops, Research Dep., Agric. Res. Center, Giza. Palatability is giving numerical scores to each of their attributes from 10 panelists. The products were organoleptically judged by groups of panelists. The quality was scored on a scale (1 to 10). The following scale was applied to all samples for color, taste, flavor, Texture, Appearance and overall palatability as follows: Excellent = (10), Very good = (8-9), Palatable = (6-7) and Unpalatable. = (0-5), according to Watts *et al.* [25].

Statistical Analysis: The obtained data were statisticallyanalyzed by Analysis of Variance method using General Liner Model (GLM) procedure according to Sendecor and Cochran [26]. Means were separated using Duncan's test at a degree of significance ($P \leq 0.05$). Statistical analyses were made using the producer of the SAS software system program SAS, [27]. Statistical Analysis System. User's Guide: Statistics, SAS Institute Inc, Gary, N ., USA.

RESULTS AND DISCUSSION

In this investigation, the efficacy of syrup (dibis) for some fruits / vegetable such as (wholly prickly pear, pumpkin and persimmon) as nutraceutical supplement was demonstrated. Syrups are fruits / vegetable concentrate juiceswere used as a common ingredients in the preparation of typical foods and particularly in bakery products and pastries. *In vitro* assays were performed to determine the amount of nutraceutical ingredients, such as antioxidants, minerals, soluble sugars content, ash and moisture content, to clearly show the efficacy of the syrup as added value of new products and thus, the applicability as a nutraceutical. It could be that, persimmon syrup (dibis) can be used for both the treatment of diabetics and healthy people due to its beneficial effects on blood glucose level by its rich polyphenolic compounds which is one of antioxidants (non-purified) persimmon syrup(dibis), according to Yoo *et al.* [9]. The data presented in Table (1), demonstrate that the highest value of totals of sugars were(24.22%) for control syrup (dibis dates) followed by (23.34%) for dibis pumpkin sample, whereas it was observed that, the lowest values in both of samples (dibis wholly prickly pear) followed by (dibis persimmon), on the other hand, it was noticed that, the highest value in reducing sugars were belong to wholly prickly pear dibis (19.99%), followed by persimmon) dibis (16.98%) and then, control sample (dibis dates) (15.14%), however, the less one is dibis of pumpkin. On the other hand, non- reducing sugars of dibis samples were less except dibis pumpkin sample, where it was (11.16%) and clear significant differences between them Gamal, *et al*. [28]. It is noted that, pH value is low in all samples under study including control between (3.6 - 4.1) and the less one samples was dibis (wholly prickly pear) was (3.4) for this reason, it was found that, the ratios of non-reducing sugars are significantly lower than reducing sugars,

Table 1: Main Physical Parameters and Chemical Composition of Syrup(dibis) Products Samples on (dry weight basis)

	Parameters													
	Moisture Content. (%)		Total Solids (TS).		Total Soluble Solids (TSS). (Brix°)		pH		Viscosity (cp /10 rpm).			Total Sugars.	Reducing Sugars.	Non-Reducing
Samples	Dibis	Juice	Dibis	Juice	Dibis	Juice	Dibis	Juice	Dibis	Juice	Ash (%)	(%)	(%)	Sugars. (%)
**Control - (dibis dates).	20.79^{b}	85.94^{b}	79.21^{b}	14.06^{a}	75^{b}	17.0^{a}	3.9^{a}	6.6^{a}	1160^{b}	90^{d}	1.74^{a}	24.22^{a}	15.14^{c}	9.08^{b}
Dibis - Wholly Prickly Pear.	15.79^{c}	96.86^{a}	84.21^{a}	3.14^{b}	78^{a}	8.0^{c}	3.4^{b}	5.8^{b}	1790^{a}	370^{b}	0.18^{c}	21.61^{b}	19.99^{a}	1.62^{c}
Dibis – Pumpkin.	20.44^{b}	94.81^{a}	79.56^{b}	5.19^{b}	74.7^{b}	8.5^{c}	4.1^{a}	6.6^{a}	1110^{b}	120^{c}	0.44^{b}	23.34^{a}	12.18^{d}	11.16^{a}
Dibis – Persimmon.	23.60^{a}	87.94^{b}	76.40^{b}	12.06^{a}	68.6^{c}	12.5^{b}	3.6^{b}	5.3^{b}	1900^{a}	800^{a}	0.15^{c}	17.47^{c}	16.98^{b}	0.49^{d}

□ Means followed by different letters in the same column are significantly differences at $p \leq 0.05$.

* Control (Commercial Dibis Dates).*

where, these decrements may be due to conversion of non-reducing sugars to reducing sugars ones by acid hydrolysis in dibis samples [29]. Regarding the moisture content in dibis samples, it was observed that, the less one value had (15.79%) in dibis(wholly prickly pear) sample whereas total solids is high followed by the total soluble solids is less, but in fresh juice form of the same sample had the highest moisture content, while total soluble solids were the highest than total solids. The other dibis form samples for the both of (pumpkin and persimmon) were high moisture content as well control (dibis dates) sample and therefore are close in values (total solids and total soluble solids) between them. pH values were less in all samples dibis than their fresh juice form while the least one was wholly prickly pear dibis followed by the other. Concerning, the apparent viscosity (consistency) it was observed that, dibis persimmon sample gave the best one, followed by wholly prickly pear dibis, where their values were in the range of 1900 and 1790 cp, respectively as well the others were very close. It is noticed that, there is a strong relationship between the amount of sugars contained in the fruits (reducing sugars) and the degree of acidity pH, where is called (sweetness and acidity). The high concentration (reducing sugars) of (wholly prickly pear, persimmon and pumpkin) in their fruits had caused great pH reduction. These could be come from organic acids present in (wholly prickly pear, persimmon and pumpkin) fruit/vegetable or produced during processing. This characteristic is clear in both of dibis (wholly prickly pear and persimmon) samples were (19.99%, 16.98% reducing sugar) respectively *vs* values pH (3.4, 3.6) respectively. This trend was also seen for sucrose solutions [30]. Significant differences were observed among samples in concerning ash content and matching with the value in Egyptian Standard [24].

From Table (2) the findings ascertained that, there were clear significant differences among values antioxidative activity of samples where the highest one was (99.50%) in dibis (persimmon) sample followed by dibis (wholly prickly pear) had (90.44%), while the lowest was (71.51%) in dibis (pumpkin) sample, it could be observed that, all samples were the highest than control (dibs dates) which it was the lowest (25.80%) than the other samples under study according to Olga *et al.* [31] and Baskaran [32]. According to the results, dibis (syrup) had observed that, antioxidative activity among samples under study had a significantly differences at $p \leq 0.05$. Finally, the high benefits of this fruit derivative were in human nutrition and make this food product very interesting as an antioxidative activity nutraceutical [33]. The results of colors index at (420 nm) had explained that, there is no clear significantly differences ofsample compared to the control (dates dibis) sample. It could be mentioned that, the minerals content of control (dibis dates) were the highest in Ca, Mg, Na, K and P, followed by dibis pumpkin sample in (Ca, Na, K and P). It is clear that, the control followed by both of dibis persimmon and wholly prickly pear samples were rich in (Fe). On the other hand, the dibis of persimmon followed by the control were rich in (Zn) whereas the control sample was the highest one value in Mn (3.61ppm), as for wholly prickly pear dibis was the highest in Mg (105.69 ppm). Pumpkin, due to its bioactive constituents it is very important.

Sensory evaluation test are in generally for the final guide to the quality from the consumer's point of view. From data presented in Table (3), it could be observed that overall score of dibis pumpkin sample was the best followed by samples both persimmon and wholly prickly pear. In general it could be observed that, all samples were highly palatability (very good) compared tocontrol

Table 2: Total Antioxidants Activity/ Minerals and Colors Index in Syrup (dibis) Products Sampleson (dry weight basis)

	Parameters									
			Main Minerals (mg/kg).							
Treatments	Antioxidative Activity. (DPPH %).	Colors Index (420nm).	Fe	Mn	Ca	Mg	Na	K	Zn	P
Control – (Dibs Dates)	25.80^{c}	2.559^{a}	12.04^{a}	3.61^{a}	521.71^{a}	273.50^{a}	270.09^{a}	3468.78^{a}	4.62^{b}	411.15^{a}
Dibis– Wholly Prickly Pear	90.44^{a}	0.129^{b}	5.26^{b}	0.88^{b}	131.42^{b}	105.69^{b}	110.15^{c}	619.74^{c}	1.67^{c}	55.36^{c}
Dibis– Pumpkin.	71.51^{b}	0.087^{b}	3.46^{b}	0.92^{b}	151.64^{b}	98.21^{b}	175.97^{b}	1664.53^{b}	1.73^{c}	173.32^{b}
Dibis– Persimmon.	99.50^{a}	0.052^{b}	6.56^{b}	0.53^{b}	104.35^{b}	55.16^{c}	113.72^{b}	434.84^{c}	6.68^{a}	122.38^{b}

*Means followed by different letters in the same column are significantly differences at $p \leq 0.05$

Table 3: Sensory Evaluation / Purity Ratio of Syrup (dibis) Products Samples

Samples	Appearance (10)	Color (10)	Flavor (10)	Texture (10)	Taste (10)	Overall Score(50)	Overall Palatability	The Purity Ratio (%)
Control (Dibis Dates).	8.0^{b}	7.9^{b}	7.4^{b}	7.6^{b}	7.8^{b}	34.7^{b}	G	30.58^{a}
Dibis Wholly Prickly Pear	8.7^{a}	8.5^{a}	8.8^{a}	8.4^{a}	8.9^{a}	43.3^{a}	V	25.66^{ab}
Dibis Pumpkin.	8.6^{a}	8.7^{a}	8.9^{a}	8.9^{a}	9.0^{a}	44.1^{a}	V	29.34^{a}
Dibis Persimmon.	8.6^{a}	8.5^{a}	8.8^{a}	8.9^{a}	8.9^{a}	43.7^{a}	V	22.87^{b}

*Means followed by different letters in the same column are significantly differences at $p \leq 0.05$

(dates dibis). It could be seen that, samples under study, there are no significantly differences at $p \leq 0.05$., compared to control. It is noticed that, processing forpersimmon, pumpkin and wholly prickly pear juices into dibis product had developed the sensory properties and increased theoverall palatability (very good) as product compared to control. Products have the color and taste characteristic and also the natural flavor hadrepresentative as innovate product, according to Safa Karaman, *et al*. [34]. From data in Table (3), itwasobserved that, the purity ratio of syrup (dibis pumpkin) sample had a value approximated to the value of the control (dibis date) where the purity ratio both of them was (30.58%, 29.34%) respectively. On the other hand, syrups (dibis wholly prickly pear and persimmon) samples were (25.66%, 22.87%) respectively and there are significantly differences at $p \leq 0.05$., compared to control.

CONCLUSION AND RECOMMENDATION

This study demonstrates that cactus, persimmon and pumpkin fruits /vegetable can be used as rawmaterials in the creation of natural sweeteners. Further studies should investigate the use of this syrup(dibis) in different products by replacing sucrose or other sweeteners. The composition and sensory evaluation of fruits/vegetable syrup (dibis) for all of (wholly prickly pear, persimmon and pumpkin) confirmed that, it was rich in sugar, minerals, antioxidants and high acceptability. It can be concluded that there is good potential and a possibility to produce syrup (dibis) from (cactus, persimmon and pumpkin) fruits/ vegetable for use as a replacementof sucrose in food products which they have the natural flavor representative and the color as well taste characteristicas the new product.

Thus, this study recommends, it has a high applied importance in producing products of importance in the field of food processing and the economy as well.

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