Preparing Quick and Healthy Juice by Using Some Dried Fruits

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ABSTRACT

Fruits and vegetables are rich sources of phytochemicals, in addition to other components that may act synergistically with phytochemicals to contribute to the nutritional and health benefits of these food commodities. The present study aimed to evaluat 6 types of fruits Plum (*Prunus*)**,** green apple (*Malus domestica*), Bananas (*Musa acuminate)*, Kiwi fruit (*Actinidia deliciosa)*, Strawberry (*Fragaria*,), and Goldenberry (*Physalis peruviana)* for preparing natural juice formula in dried forms and compared to artificial juice (Tang). This study evaluation included estimates of total sugar, crude fiber, ash, rehydration, minerals, flavonoids, iso-flavon and phenolic of formulas under study. Results showed that natural formula had high levels of sugars, fiber and ash content. Rehydration caused significant increases in the weight of dried fruits ranged from 1.62 to 4.54 weight /time. The prepared formula had high levels of K (37.288), Fe (262.815) and Zn (81.018) mg/100g. The predominant phenolics of the prepared formula are pyrogallol, cholrogenic acid, catechol and benzoic acid meanwhile flavonoids is naregin and rotein. The results showed also that the prepared formula had high levels of vitamins B (Nicotinic acid 47.54, B6 19.51, folic acid 7.06, B12 61.08 and Riboflavin 14.15 mg/100g) and C (5.27 mg/100g) respectively. Fat soluble vitamins K, D, A and E, β-carotein were considerable amounts. Sensory evaluations showed that taste and flavor more acceptable than artificial juices.

Key words: Flavonoids, Iso-Flavon, Minerals, Phenolic, and Rehydration.

INTRODUCTION

Phytochemicals antioxidant especially the phenolics found in fruits and vegetables, have been proposed as the major bioactive compounds providing the health benefits associated with diets rich in plant-foods (**Alonos, et. al 2016**). These compounds are known as secondary plants metabolites and have a biological property such as antioxidant activity, antimicrobial effects, modulation of detoxification enzymes. These are more than thousand known and many unknown phytochemical (**Velavan , *et al.,* 2007).** The majority of the active antioxidant constituents are flavonoids, isoflavones, flavones, anthocyanins, coumarins, lignans, catechins, and isocatechins. In addition to the above compounds found in natural foods, vitamins C and E, beta-carotene, and tocopherol are known to possess antioxidant potential (**Prior 2003).**

Many of fruits and vegetables appear to be good sources of phytochemicals like Bananas (*Musa SP.*) are an excellent source of potassium. Potassium can be found in a variety of fruits, vegetables, and even meats, however, a single banana provides you with 23% of the potassium that you need on a daily basis (**Kumar, *et al.,* 2012)**. Kiwi fruit (*Actinidia deliciosa*) contains high amount of pectic polysaccharides and dietary fiber (**Ansell et al., 2011**), which has been found to improve immune system and relieve chronic constipation (**Dupriet et al., 2010**). It is possible that, the kiwifruit could confer prebiotic effects on intestinal microbes.

Golden berry (physalis peruvianal L.) is a solanaaceous plant native to tropical South America. Since the characteristics of the fresh fruit of golden berry are little known, its valorization and use are impaired. The fruit's bioactive compounds at two stages of maturity, start and end of maturity, are evaluated, with differentiating colors between green-yellow and orange for two sizes of the fruit. The ratio between sugars and acids increased from the beginning to the end of maturity (**Licodiedoff et al., 2013**). The main benefits associated with golden

berries are its nutritional composition and bioactive components (**Hassanien, 2011**). In addition, they are an excellent source of pro-vitamin A, vitamin C, Fe, and some of the vitamin B-complex (**Salazar et al., 2008**).

Strawberries contain many important dietary components including vitamins, minerals, folate, and fiber, and are a rich source of phytochemical compounds mostly represented by polyphenols. Although strawberry phenolic compounds are best known for their antioxidant and anti-inflammatory actions, recent research has shown that their bioactivities extend to many other pathways as well (**Francesca et al., 2012**).

The widespread and growing intake of apples and apple juice/products and their rich phytochemical profile suggest their important potential to affect the health of the populations consuming them**. (Dianne, 2011).** Apples are among the most frequently consumed fruits, and human and animal studies on apple may help to clarify the effect of this fruit on CVD risk markers (**Jensen *et al.*, 2009).**

The nutritional, phytochemical, antioxidant and antibacterial activity of dried plum (*Prunus domestica*) have health benefits. The nutritional composition of plum showed it has an energy source with low fat content. Protein and dietary fiber content obtained were 3.80% and 2.79% respectively. It was contain a moderate source of minerals like magnesium, calcium, iron as well as other nutrients. The phytochemical analysis of the dried fruit revealed it to be a good source of total phenolic and flavonoids (**Mehta *et al.*, 2014**).

The aim of the current investigation was to evaluate the natural dried juice used as a natural source provide body by minerals, antioxidant, vitamins and comparing these formula with commercial products buying in the market. Also, study was to assess the bioactive compounds which protect body from diseases.

MATERIALS AND METHODS

1-Materials:

Fresh fruits included Plum (*Prunus- Prunus domestica*)**,** green apple (*Malus domestica*), Bananas (*Musa acuminate)*, Kiwi fruit (*Actinidia deliciosa)*, Strawberry (*Fragaria* × *ananassa* 'Gariguette), and Goldenberry (*Physalis peruviana)* were purchased from a local market in Giza (Egypt). Tang powder were purchased from a local market in Giza (Egypt)

2- Methods:

2-1-Preparation of Dried Fruits: The Plum, green apple, Bananas, Kiwi, Strawberry, and Physalis were washed and then drying well on tissue paper.

2-2-Drying Process and Preparation of Natural Juice Formula:

The fruits were sliced (0.8-1.0 cm.) with sharp stainless steel knife. The fruit slices were dried in an electric air draught oven (Fisher Scientific) at 50ºC for overnight. The dried samples were ground in an electric grinder (Broun Model 1021), passed through a 150µm mesh sieve, packed in cellophane pouches and storage at room-temperature (25°C±2) for further analysis according to (**Siham et al., 2004)**. The dried fruits prepared mixed in equal amounts, to produce the juice formula. The formula ratio was showed in Table (1).

Ingredients of Natural Juice Formula:

*Formula Juice: The dried fruits for preparation of natural juice contain (16.67%) for each kind of fruits.

Natural Juice was prepared by adding 10g of dried fruit to200ml water, the mixture was blended by blender.

Ingredients of Artificial Commercial Formula:

Table (1) Ingredients of Different Flavours in The Commercial Products.

Type of Artificial Juice.	Ingrediants
***Berry (eltot)**	* Natural sugars- citric acid- flavor of berry resample natural - sodium citrate- Calcium triphosphate- cellulose gum- matlto-dextrine- healthy color (**122:151).**
***Green apple**	*Natural sugars- citric acid- flavor of green apple resample natural- sodium citrate- Calcium triphosphate- cellulose gum- matlto-dextrine- healthy color (**102:133).**
***Pineapple kiwi and lemon**	*Sugar-citric acid- aspartame- calcium triphosphate – blue bright color- tatanium dioxid- guar gum- maltodextrin- trtazine- kiwi and pineapple artificial flavor- - lemon natural flavor- sodium citrate- vitamin C- acidity organized.
***Strawberry and water melon**	*Sugar-citric acid- aspartame- salt- calcium triphosphate- potasium sulphate- red aro- tatanium dioxid- guar gum- sodium triphosphate- maltodextrin- strawberry and water melon artificial flavor- sodium citrate- vitamin C- acidity organized.

•**Control:** The artificial juice was bought from market; the formula used in our investigation have different flavours and color. The formula of each was prepared by mixing equal amounts of each of the four types chosen under studying. The constituent of each formula were recorded in **Table (1)**.

3- Chemical Analysis of Natural Dried Fruits Formula:

Moisture content, protein, ash, crude fiber, ether extract and colour index were determined in the raw material according to the method of (**AOAC 2010)** and the carbohydrate contents were calculated by difference. Vitamins were determined according to (**Batifoulier *et al.*, 2005)**, (**Pyka and Sliwiok 2001), (Tomãs *et al.*, 2007) and (Romeu *et al.*, 2006)**. Flavonoid compounds were extracted according to the method described by (**Mattila 2000**). The supernatant was collected in vials for injection into a HPLC instrument (Hewlett Packecd, Series 1050) composed of a C18 hypersil BDS column with a particles size of 5 µm. Separation was carried out with methanol and

actonitrile as the mobile phase, using a flow rate of 1 ml/min. Quantification of the flavonoid compounds was carried out using a standard flavonoid calibration curve. Phenol compounds were determined as (**Goupy et al 1999)** methods.

4-Reconstitution of dried Fruits Juice:

Reconstitution of dried fruits juice dried described according to the method (**Von Loesecke 1955)** as following: 10 g the tested dry material samples were placed in 600 ml pyrex beaker, 80 to 150 ml distillated water were added, covered with a watch glass, placed on electric heater, as boiled for 5 min., removed from the heater and dumped into a 75 min., Buchner funnel which was covered with a coarsely porous filter paper. Suction was gently applied and drained with careful stirring for one min., or until the drip from the funnel has almost stopped. Samples were removed from the funnel and a weighted calculation was made to express in terms of "Reconstitution ration".

$$\text{Reconstitution ratio} = \frac{\text{The drained weight of the reconstitution sample(WR).}}{\text{The origin weight of the dehydration sample (WD).}} \times 100$$

5- Evaluations of Dried Juice Formula:

The quality attributes (taste, color, flavor, acceptability and texture) for natural juice compared with artificial juice Tang control. The suggested formula was evaluated for their sensory characteristics by ten panelists from the staff of the Processing food tec. Inst. Special food Research Dep., Agric. Res. Center, Giza. 100 ml of tested juice and commercial juice were served in cup with three-digit random numbers. The judges were asked to score the tested natural juices acceptability was giving numerical scores (10) to each of their attributes. The qualities were scored on a scale (1 to 10), according to (**Watts *et al.*, 1989).**

6-Statistical Analysis:

Analysis of data: Data Collected were subjected to the analysis of variance **(SAS, 2002)**. Mean separation were done where there was significant differences using Duncan multiple range test procedure as described in the SAS soft ware. Significance was accepted at $P<0.05$.

RESULTS AND DISCUSSION

Chemical composition of natural formula is presented in **Table (2)**. Data indicated that, the natural formula contain total sugar 80.44%, reducing sugar(42.39%) and non- reducing sugar (38.03%), pH (3.83), total acidity (0.708%), total solids (90%) also, both of the crude fiber and

ash content were (8.22% and 4.3mg/100g) respectively, These results are in agreement with that reported by (**Cvetković *et al*., 2009), as well as** colors index (420nm) for both of natural dried fruits juice and artificial dried fruits juice were (.09 and 6.76) respectively.,.The findings show that, the dried fruits formula covered with the same amount of color given by colors added to the artificial juice hence we must resort to natural dried fruits, this result is nearly similar to the mentioned by www.crispygreen.com "stated that, food manufacturing plants use dried fruits in various sauces,soups, marinades, garmishes, pudding, and food for infants and children as well as ingredients in prepared food, dried fruit juices, purees and pastes impart sensory and functional characteristics to recipes.

Table (2) Chemical Composition of Natural Some Dried Fruits Formula for Quick Juice.

Constituents	Content %
Reducing Sugar	42.39%
Non- Reducing Sugar	38.05%
Total Sugar	80.44%
pH	3.83
Fibers	8.22%
Colors Index (420nm). **Dried Nat., fruits juice.** **Tang juice.**	 5.09 6.76
Total Acidity (as citric acid) %	0.708%
Total solids	90%
Ash	4.3 mg/100g

Rehydration of fruits was recorded in **Table (3)**. The results showed that, there were pronounced increment in rehydration ratio of the various dehydrated fruits. Rehydration process caused significant increases in the weight of dried fruits. The percentage of increasements varied from (0.379 to 0.269). This increase was gradually and significantly increased with increasing the time of rehydration. From plum, the weight increased significantly from 0.379(at the begeing of the experiment) to (0.427, 0.492,0.540,0. 574,631,and 2.970, respectively., after 30, 45, 60, 75, and 90 sec., of rehydration process respectively. The weights of apple, banana, kiwi, strawberry and physalis at the end of rehydration process were about (6.09, 6.55 , 7.93, 7.07, and 6.02) time as high as in dried fruits at the begin of the experiment. The results agreement with **(Taiwo and Adeyemi., 2009)** and **(Tamás Antal 2010).** Cearly from fig (1)., the fruit, which the fastest recovery that may help fast for melting juice components quick preparation such as Physalis followed by banana.

Table (3) Water Absorption of The Dried Fruits Formulae for Juice Preparation.

Weight of Fruits/ 15 Sec. / Absorption time for fruits.	Plum	Apple	Banana	Kiwi	Strawberry	Golden berry
15 Sec	0.379	0.473	0.316	0.540	0.642	0.269
30 sec	0.427	0.603	0.352	0.663	0.773	0.280
45 sec	0.492	0.683	0.375	0.764	0.853	0.297
60 sec	0.540	0.749	0.411	0.855	0.918	0.316
75 sec	0.574	0.776	0.420	0.890	0.934	0.324
90 sec	0.631	0.823	0.440	0.909	0.963	0.344
Reconstitution Ratio max. time.	2.97	2.88	2.07	4.28	4.54	1.62

At Room Temperatures (25±2ºC).

Minerals are elements that originate in the soil and cannot be created by living organism, such as plants, animals and humans need minerals in order to be healthy. Minerals from plants sources may also vary from place to place according to the soil location and composition in which plants was grown. The minerals contents in dried fruit formula were given in **Table (4**). The results obtained showed that, the formula contains a high amounts of K (37.288 mg/100g), Fe (262.815 mg/100g), and Zn (81.018mg/100g), and considerable amounts of Mg (8.645 mg/100g), Na (9.090 mg/100g), Ca (9.722mg/100g) and Mn (10.078g/100g). The results agreement with (**Mehta *et al.*, 2014)** who found that dried plums was contain a moderate source of minerals like magnesium, calcium, iron as well as other nutrients. **Rodríguez and Rodríguez (2007)** reported that the fruit of *Physalis peruviana* contains Phosphorus, Iron, Potassium and Zinc. **Oseni (2011)** found that apple contain calcium, iron, potassium, sodium and phosphorus were high ratio. **Ho, *et al.*, (2012)** reported that banana pseudo-stem had levels of sodium (Na), potassium (K), calcium (Ca), magnesium (Mg) and phosphorus (P) were higher than those of iron (Fe), zinc (Zn) and manganese (Mn). Minerals play an important role in maintaining proper function and good health in the human body **(Bhat *et al.*, 2010)**.

Table (4) Mineral Content of Dried Fruits for Natural Formula (mg/100g).

Minerals.	Mg	Na	K	Fe	Ca	Zn	Mn
Fruit Formula.	8.645	9.090	37.288	262.815	9.722	81.018	10.078

Flavonoids and phenols fraction of dried fruits were recorded in **Table (5).** Several flavonoids were indentified in the natural fruits formula. These included (Narengin, ,Rutin, Hisperdin, Rosmarinic, Quercetrin, Quercetin, Narenginin, Kampferol, Hispertin , Apegnin, and

7-OH flavones). The quantities of the identified compounds are expressed in mg/100g of dry sample. The predominant flavonoids of formula are Narengin (10.84), Rutin (8.162), and Hisperdin(2.79) mg/100g. Moderate amounts (1.706, 1.276 and 0.796 mg/100g) of Rosmarinic ,Quercetin ,and Quercetrin were detected for the natural fruits formula. The formula had low concentrate of Narenginin, Kampferol, Hispertin ,Apegnin, and 7-OH flavones (0.231,0.202,0.115,0.470, and 0.452) respectively.,. **Jeanelle and Rui (2012)** reported that, apples have been very strong antioxidant activity, inhibit cancer cell proliferation, decrease lipid oxidation, and lower cholesterol. Also, apples contain a variety of phytochemicals, including quercetin, catechin, phloridzin and chlorogenic acid, all of which are strong antioxidants**.** Antioxidant containing food products have great demand as nutracuticals in current market. Phenolic acids and flavonoids as antioxidants are preferred due to their preventive and therapeutic nature (**Williamson and Manach 2005)**.

Phenol fractions showed high amounts of Salycilic acid (197.425 mg/100g), Pyrogallol (186.226 mg/100g), Benzoic acid (170.472 mg/100g), Catechol (120.894 mg/100g), and Cholrogenic acid (109.236 mg/100g), while containing a moderate amounts of Catechin, P-OH benzoic acid, and Epicatechinm and a considerable amounts of Gallic acid, 4-amino benzoic acid, Protocatechuic acid, Caffein, Caffeic acid, Vanillic acid, Ferulic acid, Iso-Ferulic, Ellagic acid, Alpha-Coumaric, and 3,4,5-methoxy-cinnamic. Also formula containing a little amounts of Cinnamic acid. These results are agreement with (**Fereidoon *et al.*, 2008)** proved that, Plant-based foods and food ingredients provide a wide range of phytochemicals and antioxidants that render their beneficial health effects through a number of mechanisms.

Table (5) Flavonoids and Phenols Compound Fraction of Dried Fruits Formula on (mg/100g).

Flavonoid compounds	**(mg/100g)**	Phenol compounds	**(mg/100g)**
Narengin	**10.844**	**Gallic acid**	**7.033**
Rutin	**8.162**	Pyrogallol	**186.226**
Hisperdin	**2.791**	4-amino benzoic acid	**11.216**
Rosmarinic	**1.706**	**Protocatechuic acid**	**24.242**
Quercetrin	**0.796**	**Catechin**	**61.984**
Quercetin	**1.276**	**Cholrogenic acid**	**109.236**
Narenginin	**0.231**	**Catechol**	**120.894**
Kampferol	**0.202**	**Epicatechin**	**57.129**
Hispertin	**0.115**	**Caffein**	**20.503**

Apegnin	**0.470**	**P-OH benzoic acid**	**86.801**
7-OH flavone	**0.452**	**Caffeic acid**	**15.985**
		Vanillic acid	**27.535**
		Ferulic acid	**8.7435**
		Iso-Ferulic	**8.281**
		Ellagic acid	**28.832**
		Alpha-Coumaric	**3.030**
		Benzoic acid	**170.472**
		Salycilic acid	**197.425**
		3,4,5-methoxy-cinnamic	**26.974**
		Cinnamic acid	**0.2675**

Vinson *et al.,* (2005) who suggested that, dried fruits should be a greater part of the diet as they are dense in phenol antioxidants and nutrients, most notably fiber. The health benefits of fruits and vegetables have, until recently, been attributed to antioxidant properties whereby excessive free radicals arising from normal metabolic processes are scavenged to prevent their damaging effects **Lister *et al.,* (2007)**.

The dried fruits formula under study was containing high amounts of different fat soluble, water soluble vitamins and β-carotein. The data are shown in **Table (6**), the fruits formula had a high amount of vitamin k (47.79 mg/100g) and β-carotein (4.452 mg/100g) and considerable amount of vitamin D (1.25 mg/100g), while containing a little amount of vitamins A and E. Water soluble vitamins were recorded a high quantity of vitamins C and B. Vitamins C recorded (5.27 mg /100g), and vitamin B analysis (Nicotinic acid, B6, folic acid, B12 and Riboflavin) recorded 47.54, 19.51, 7.06, 61.08, 14.13 mg/100g respectively. (**Puente *et al.,* 2011)** reported that *Physalis. peruviana L*. fruits is highly nutritious, having high levels of vitamins A and B. The main active components of vitamin A in fruits are α-carotene, β-carotene and β cryptoxanthin (**Fischer, *et al.,* 2000).**

Kiwi fruit contains high amounts of vitamin C, vitamin E and polyphenols may be beneficial in cardiovascular disease (**Asim** and **Aud, 2004**). Strawberries contain many important dietary components including vitamins, minerals, folate, and fiber, and are a rich source of phytochemical compounds mostly represented by polyphenols (**Giampieri, *et al.,* 2012)**. In addition, Bananas are also an excellent source of vitamins, including, vit A -which aids in healthy teeth, bones, soft tissue, and vit. B6 -increase aids in the body's immune system, promotes brain health, heart health, and vit. C -make aids in healing, growth of tissue, ligaments, and Vit.D, helps the body to absorb calcium (**Sun 2002).**

Table (6) Fat Soluble Vitamins / β-Carotene and Water Soluble Vitamins in the Natural Formula (mg/100).

Fat Soluble Vitamins	(mg/100g)	Water Soluble Vitamins	(mg/100g)
Vit A	0.08	Vit C	5.27
Vit K	47.79	(Vit B Groups)	
Vit D	1.25	Nicotinic acid	47.54
Vit E	0.06	B6	19.51
β-Carotene	4.452	Folic acid	7.06
		B12	61.08
		Riboflavin	14.13

Sensory evaluations of dried natural formulas and Tang (control), natural juice formula under investigation were recorded in Table (7). The sensory evaluation results showed that no significant difference was observed between them in taste, color, acceptability, odor and texture . Also, the data showed fruits formula had higher score in taste, color ,flavor and texture than control. These results return to the content of formula which was natural and taste and flavor more acceptable.

Table (7) Organoleptic Test of Dried Fruits Juice Compared with Artifcial Juice.

Formulas No	Taste	Color	acceptability	Odor	Texture
Artificial juice (Control).	7.80 ± 0.35^{b}	7.70 ± 0.33^{c}	7.30 ± 0.33^{b}	7.40 ± 0.37^{c}	7.70 ± 0.33^{c}
Natural Dried Juice Formula.	8.20 ± 0.24^{b}	7.80 ± 0.20^{bc}	7.60 ± 0.22^{b}	7.80 ± 0.24^{bc}	7.90 ± 0.17^{bc}

***Each mean value, within the same column, followed by the same letter is not significantly different at 0.05 levels.**

Conclusion

The phytochemical analysis of the dried fruit revealed it being a good source of total phenolic and flavonoids. These compounds which found naturally in fruits protect body from free radical, improve immune system and also have health benefits.

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الملخص العربى

إعداد عصير صحي سريع التحضير من بعض الفواكه الجافة.

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الفاكهة والخضروات من المصادر الغنية بالمواد الفيتوكيميائية بالاضافة الى ذلك فهناك مواد أخرى تعززهذة المكونات ولها فوائدغذائية وصحية، فى هذه الدراسة المقدمة تم أستخدام 6 أنواع من الفاكهة مثل البرقوق، التفاح الاخضر، الموز، الكيوى، الفراولة، والحرنكش وذلك لتحضير عصير طبيعى فى صورة مجففة ومقارنتة بالعصير الصناعى (التانج) المتداول فى السوق.

أشتملت الدراسة على تقدير السكريات الكلية والالياف الكلية والرماد ومعدل التشرب والمحتوى من المعادن والفلافونيد والايزوفلافونيد والفينولات للمكون الطبيعى.

أظهرت النتائج ان المكون الطبيعى غنى بمحتواه من السكريات والالياف والرماد، وان معدل التشرب قد ازداد طرديا مع زيادة زمن التشرب،ومحتواه المعدنى كان مرتفع فى البوتاسيوم (37.288) والحديد (262.815) والزنك (81.018) مللى جرام/ 100جرام، بينما محتواه من عناصر الماغنسيوم والصوديوم والكالسيوم والمانجنيز كان بكمية معقولة، اما نتائج الفلافونيد كانت محتواها عالي فى كل من النيرنجين والروتين واما الفينولات والفلافينويد والايزوفلافنويد، والفيتامينات الذائبة فى الدهن مثل (E,D,K,A),β كاروتين كانت بكمية معقولة، بينما الفيتامينات الذائبة فى الماء فقد سجلت نسبة عالية وخاصة فيتامين VitC(5.27) مجموعة VitB منها حامض النيكوتنك (47.54)، B6 (19.51)،الفوليك (7.06)، B12 (61.08)، الريبوفلافين(14.15) مليجرام/100جم.

اما بالنسبة لاختبار التقييم الحسى فقد أظهرت النتائج أن كلا من الطعم والرائحه كان أفضل فى العصير المجفف الطبيعى عن العصير الصناعى.