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Utilization of green pumpkin in processing some nutritional products

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Abstract

This study aimed to utilize green pumpkin in processing some traditional products. A raw leaves and fruits pumpkin were obtained from Horticulture Research Institute. Food technology practices such as making of jam, budding, pickles and cooking of the leaves and fruittoperformed in these pumpkin products. To assess the impact of food technology practices on some chemical and biological characteristics of pumpkin as well as antioxidant activity. For this purpose, some parameters such as sensory evaluation, chemical composition, macro andmicro-nutrients content, antioxidant activity, antimicrobial activity, phenolic acid compounds and flavonoid compounds of pumpkin were determined in these samples. The important obtained results were summarized as follows:

The total acceptability of pumpkin products took the descending order: apricot + pumpkin jam (1 : 1) > pumpkin pickles >pumpkin budding. The highest value of potassium, calcium, sodium, Iron and zinc were realized by pumpkin fruits pickles. Total phenols and total flavonoid as well as caroteins and chlorophyll A and B wereachieved higher values in pumpkin leaves than those obtained in pumpkin fruits. Higher values of antimicrobial activity were realized by pumpkin leaves than realized in pumpkin fruits against *Bacillus ceries* and *Salmonella cyphimurium*. On the other hand, pumpkin fruits achieved more pronounced values of antimicrobial activity than those achieved in pumpkin leaves against *Escherichia coli* and *Staphylococcus aurous*.

It was found that the major compound of phenolic acid in pumpkin leavesandfruits was pyrogallol. Moreover, the major compound of flavonoid in pumpkin leaves as mg/100g was Hespirtin (33.39), followed by Hespirdin (28.91). However, Hespirdin (60.81) was the major compound of flavonoid in raw pumpkin fruit, followed by Quercetrin (23. 35).Therefore concluded using the pumpkin leaves and fruit in food technology practices to utilizing of them in health.

Introduction

Cucurbitacea have been known for almost 10,000 years. They can be used for multiple purposes, they are suitable for human and animal consumption, their nutritional and dietetic values are high – all these account for their widespread popularity. The usefulness of pumpkin was appreciated in all ages and accordingly it was regarded important not only as a food crop. Today shelled pumpkin seed has become widely known as a medicinal and functionally health-preserving food crop ***(Madai , 2008).***

Lagenaria siceraria (Mol.) Standl. (bottle gourd), of the family ucurbitaceae, is a climbing perennial plant widely cultivated as a vegetable crop in ropical countries, such as India, Japan and Thailand. Fruits of which are widely used in Ayurveda and other folk medicines traditionally used for its cardioprotective, cardiotonic, general tonic, diuretic, aphrodisiac, antidote to certain poisons and scorpion strings, alternative purgative, cooling effects.It cures pain, ulcers and fever and used for pectoral cough, asthma and other bronchial disorders-especially syrup prepared from the tender fruits. The fruit is reported to contain the triterepeniode cucurbitacins B, D, G, H and 22-deoxy cucurbitacin “the bitter principle of cucurbitaceae”,two sterols i.e. fucosterol and mpesterol, aer penebyonolic acid *Lagenaria siceraria* is a well-known plant used in the Indian system of medicine, besides which folklore medicine also claims its uses especially in cardiac and hepatic diseases, ulcer, etc. *L. ceraria*fruit is cultivated in India, Japan, Sri Lanka, China, Thailand for its vegetable use. This fruit is the source of ‘Dudhi Bhopala Juice’, which is used as a supplement to the treatment of cardiac diseases**(*Upaganlawar and Ramchandran, 2009).***The fruits are edible and considered as a good source of vitamin C, β-carotene, vitamin B-complex, pectin and also contain highest choline level – a lipotropic factor ***(Rahman, 2003)*.**

Lagenaria siceraria (Molina) Standl.is a vegetable food also used as a traditional medicine. It is reported to have immunomodulatory, hepatoprotective, cardioprotective, antioxidant, anti-stress and adaptogenic, antihyperlipidemic, analgesic, and anti-inflammatory properties. A novel protein, Lagenin, isolated from seeds is reported to have antitumor, antiviral, antiproliferative, and anti-HIV activities. The consumption of bottle gourd can be considered to improve human health ***(Irfan Ahmad 2011).***

Fruits are reported to contain more soluble dietary fibers than insoluble cellulose fibers ***(Ghuleetal., 2006).***The fruits are considered as good source of vitamin C, β-carotene, vitamin B-complex, pectin and also contain highest choline level-a lipotropic factor***(Duke ,2006).***

Pumpkin fruits are sweet when ripe with yellow or orange flesh rich in β-carotene, a precursor of vitamin A. Pumpkin is a rich source of functional food components like vitamins, minerals and dietary fibers. Pumpkin can profitably be converted into a variety of value added products such as jam, jelly, marmalade, candy, puree, sauce, chutney, pickle and halwa. Pumpkin flour could be used to supplement cereal flours in bakery products, soups, instant noodles and natural colouringagent in pasta and flour mixes. 1,1-diphenyl-2-picryl-hydrazyl (DPPH) test was used for determination of the radical scavenging activity. Within the group of volatile compounds, the dominant component in the fruit was heneicosane (46.5%), followed by benzaldehyde, tricosane, eicosane and pentacosane. Mostly represented of the leaf were (46.2%), nonadecane, benzaldehyde, as well as terpenes (*E*)-β-damascone and (*E*)-β-ionone. Among the volatiles of the seed, heptadecane (22.3%), etradecane, octadecane, hexadecane, tridecane and benzaldehyde were the most abundant ***(Difco- Manual ,1998).***

Aim of this investigation :

Green pumpkin as for as leaves and fruits contain important of vitamin , phenol, minerals and many of bioactive constants, whereasthis study aimed to utilize of green pumpkin (leaves and fruits) in processing some traditional products of health to assess the impact of food technology practices on some chemical and biological characteristics of pumpkin as well as antioxidant and antimicrobial activities .

Materials and Methods

Materials:

Plant materials

Fruits and leaves of green pumpkin (*Lagenaria siceraria L.)* were collected from the Horticulture Research Institute (HRI) in Egypt and wash, cut into small spices and oven dried at 50ºC over night. All raw material used for processing of pumpkin products brought of local market.

Methods:

Preparation of new pumpkin products as cooked leaves,pickles,pumpkinfruits jam ,pumpkin fruits Jam Apricot + pumpkin fruits Jam (1:1), Pumpkin fruits buddingand cooked pumpkin fruits are illustrated in **Table (1).**

Sensory evaluation

Sensory evaluation of samples were evaluated by 10panelists. Sensory characteristics of samples; appearance, color , odor, texture, taste, and overall acceptability were evaluated according to ***Worrasinchaiet al.(2006).***

Chemical composition such as moisture, ash content, crude protein, crude fiber, total lipidand mineral content of fruits and leaves of green pumpkin and its products were determined according to the methods of ***A.O.A.C. (2005).***

In vitroantioxidant study:

Total phenolics and flavonoids were determined according to the method described by **(*Singleton and Slinkard,1977).*** Carotenoids were determined as described by***Wettstein (1957)*** .Chlorophyll content (A and B) in the powdered dried of fruits and leaves of green pumpkinand its productswere determined according to the method described by ***(Arnon ,1949).***

Separation and identification of chemical components of the extracted dried powdered of fruits and leaves of green pumpkin by HPLC:

HPLC Agilent 1200 series equipped with quaternary pump, Auto sampler, column compartments ET at 35°C, malti wavelength detector set at 330nm, 280nm for detection of flavonoid compounds and phenolic compounds, degasser, column used for fractionation Zorbax OD. 4.6x250mm and the flow rate of mobile phase during run was 1 ml/min.

HPLC analysis of phenolic compounds :

The phenolic compounds of the powdered dried of fruits and leaves of green pumpkin and its products in methanolic extract were fractionated and identified by HPLC according to the method described by ***Goupyet al. (1999).***

HPLC analysis of flavonoid compounds :

Flavonoid compounds of the powdered dried of fruits and leaves of green pumpkinand its products in methanolic extract according to the method described by ***Mattilaet al. (2000).***

Antimicrobial activity:

Used media for antimicrobial activity :

The Mueller Hinton, sabouraudagar media and Nutrient broth were used in the disc diffusion technique for antibacterial assays according to ***Difco- Manual (1998).***The antimicrobial activity of fruits and leaves of green pumpkin methanolic extracts were determined by the disk diffusion methods***(Bauer et al., 1966).***

Bacterial strain :

Four bacterial strains of significant importance were used to test the antibacterial properties of fruits and leaves of green pumpkin extracts. Two of them were gram positive (*Bacillus cereus ATCC6538* and *Staphylococcus aureus ATCC25923)* and the others were gram negative (*E. coli ATCC25922* and *Salmonella typhimurium ATCC9027).* The cultures of strains used in this study were obtained from microbiological Resources Centre (MIRCEN), Faculty of Agriculture, Ain Shams University, and Cairo, Egypt. Bacterial strains were inoculated into Mueller Hinton broth (Difco) and incubated at 37°C for 24 h. The cultures were subjected to three successive 24 h. transfers before use. All cultures were adjusted to 106 CFU per ml .

Disk diffusion assay:

Five milliliter of Muller Hinton agar was placed into 10 mL petridishes and 0.1 mL of the active cultures was spread over the plate using a sterile glassspreader in order to get a uniform microbial growth for all plates ***(Bauer et al., 1966).***

Microbiological assays:

Microbiological analysis of green pumpkin products were analyzed by microbiological tests including bacteria and yeast &mold, at zero time ,4,8 days for (cooking pumpkin) and at zero time,6,12 month for (jams & pickles) of storage at refrigerator 5ºC and room temperature 25ºC respectively . All analyses were determined according to***A.O.A.C (2000).***

Statistical analysis

The obtained data were exposed analysis of variance. Duncan's Multiple range tests at ($p \leq 0.05$) level was used to compare between means. The analysis was carried out using the PRO-ANOVA procedure of Statistical Analysis System (SAS, 1996).

Results and Discussion

Sensory evaluation of pumpkin products.

The results in **Table (2)** cleared that sensory evaluation of pumpkin as affected by food technology practices. The highest significant difference was achieved in color of pumpkin pickles, followed by apricot pumpkin jam (1 : 1) as well as pumpkin budding. Although the lowest one was observed in cooked pumpkin leaves.
On the other hand, the maximum significant difference of odor was realized in both pumpkinpickles and apricot + pumpkin jam (1 : 1), followed by pumpkin budding pumpkin jam.While, the highest score of texture was achieved in each apricot + pumpkin jam (1 : 1) and pumpkin budding, followed by pumpkin jam and cooked pumpkin fruits.

The total acceptability of pumpkin productstook the descending order: apricot + pumpkin in jam (1 : 1) > pumpkin pickles > pumpkin budding> cookedpumpkin fruits and pumpkin jam >cooked pumpkin leaves.

Chemical composition of pumpkin and the products:

The obtained results in **Table (3)** revealed that higher contents of Ash, and protein were achieved in cooked pumpkin leaves over those obtained in raw pumpkin leaves. Although raw pumpkin leaves realized higher values of carbohydrates than obtained in cooked pumpkin leaves. On the other hand, the effect of valuefood technology practiceson chemical composition of pumpkin fruits appeared that the maximum value of ash was resulted in cooked pumpkin leaves, followed by raw pumpkin leaves and cooked pumpkin fruits, The highest value of fat was occurred in pumpkin budding, followed by cooked pumpkin fruits.

The optimum value offiberwere realized in raw pumpkin fruits as well as pumpkin fruits pickles. Additionally, the maximum value of protein was obtained by cooked pumpkin fruits and pumpkin fruits pickles, **Table(3)**. On the other hands, pumpkin fruits budding achieved the highest value of carbohydrates, followed by pumpkin fruits Jam and apricot + pumpkin fruits Jam (1:1). However, the lowest one was obtained by cooked pumpkin leaves.

Macro and micro-nutrients of pumpkin(mg/100g) as affected by food technology practices:

The result in **Table (4)** cleared that higher values of potassium and calcium contents were realized by pumpkin fruits pickles, followed by raw fruits pumpkin. However, the lowest value of potassium and calcium were achieved by pumpkin fruitsbudding. On the other hand, pumpkin fruits pickles gave the highestvalue of sodium. While, pumpkin fruits budding achieved the least one. Whereas, the maximum values of iron and zinc were obtained by pumpkin fruits pickles. But, pumpkin fruits budding achieved the minimum values of Fe and Zn.

Adversely, the highest value of Selinium (Se) was achieved by pumpkin fruits budding. While, the lowest one was obtained by pumpkin fruits pickles. These results are an accordance with the obtained by ***Dhimanet al., (2009).***

Antioxidant activity of pumpkin products as effected by food technology practices:

The obtained results in **Table (5)** revealed that antioxidant activity of pumpkin, e.i, total phenols, total flavonoids, caroteins and chlorophyll contents of pumpkin are illustrated in Table (5). It was found that total phenols obtained inpumpkin leaves was higher than those obtained in pumpkin fruits. On the other hand the maximum value of total phenols was achieved in raw pumpkin fruits, followed by pumpkin fruits budding. While, the lowest one achieved in pumpkin fruit jam.

Similarly, total flavonoid values realized in pumpkin leaves were more pronounced than those obtained in pumpkin fruits. Additionally, cooked pumpkin fruits achieved highest value of total flavonoids, followed by pumpkin fruits pickles. However, the lowest one was achieved in pumpkin fruits jam. The results in **Table (5)** also displayed that the highest values of caroteins were achieved by each of raw pumpkin leaves, raw pumpkin fruits as well as pumpkin fruits pickles. However, pumpkin fruits budding had the lowest one. Concerning chlorophyll A, B, Data in **Table (5)** revealed that raw pumpkin leaves gave the maximum values of chlorophyll A and B followed by raw pumpkin fruits. Although, pumpkin fruits pickles as well as cooked pumpkin fruits achieved the lowest content ofchlorophyll A and B. These results are an agreement with those obtained by ***(Rahman, 2003 and Irfan Ahmad 2011).***

Phenolic acid compounds of pumpkin products (mg/g) as affected by food technology practices:

Data in **Table (6)** appeared the phenolic compounds of pumpkin leaves and fruits as affected by food technology practices. The results showed that raw leaves of pumpkin achieved as mg/100g, Pyrogallol (809.5), Caffeine (286.2), Catechin (200,1), Alpha-cumaric (188.4), Salicylic (183.3), 3,4,5 Methox (222.9), Caffeic (145.07) Oleuropein (101.77), 3-Hdroxytyrosol (80.5), P-Benzoic (71.32), Chlorogenic (59.26), Cumaric (34.94), P-cumaric (34.36) and Vanillic (32.06). While, raw fruits of pumpkin realized Pyrogallet (320.15), catechin (111.97), 3, 4, 5 Methexy (53.04), 3-Hdroxy tyrosol (47.81), Oleuropein (38.21), Caffeine (35.96), Alpha-cumaric (34.75), chlorogenic (33.22), Salicylic (30.07) and P-oH-Benzoic (28.67).

However, pumpkin fruits pickles achieved Pyrogallol (169,09), Chlorogenic (59.92), Salicylic (58.20), P-oH-Benzoic (49,07), Oleuropein (36.77), Caffeine (34.87), Protocotchouic (31.79), Ferulic (36.63) and Ellagic (24.66). The results in **Table (6)** revealed that pumpkin fruits jam obtained that Pyrogallol (77.95), Catechin (34.08) Caffeine (14.15), Chlorogenic (10.95), Salicylict (7.07), Oleuropein (6.47), P-oH-Benzoic (7.96), Caffeic (5.55), 3-Horoxytyrosol (5.58)and Gallic (5.02) While, (apricot + pumpkin) Jam contained Pyrogallol (110.46), Iso-Ferulic (60.72), Oleuropein (34.02), Catechin (23.41), Caffeine (12.38),3-Hdrexytyrosol(12.16), 4-Aminobenzoic (8.33), Alpha-cumaric (7.82).

Whereas the major phenolic acid compound of pumpkin budding was Pyrogallol (35.03), it followed by protocatchouic (5.79) and Oleuropein (2.72). On the other hand, cooked pumpkin fruitachieved Pyrogallol (102.04), Caffeine (8.99), Catechin (7.89), chlorogenic (5.88), Oleuropein (6.98), Caffeic (4.48), Protocatchouic (4.29), Alpha-cumaric (4.12) and Salicylic (15.27). From the obtained results, it was noticed that the major compound of phenolic acid in pumpkin raw leaves and fruits were Pyrogallol, followed by Catechin.

Flavonoid compounds of pumpkin products (mg/g) as effected by food technology practices.

Data in **Table (7)** cleared flavonoid compounds of pumpkin leaves and fruits as affected by food technology practices.

It was found that the major compound of flavonoid in pumpkin raw leaves as mg/g was Hespirtin (33.39) followed by Hespirdin (28.91) and Apegenin (26.95) While, cooked leaves of pumpkin contained Hespirdin (43.15), Quercetrin (14,92), Rutin (7.86), Kaempterol (7.68), Naringin (7.15) and Hespirtin (3.47). On the other hand, the major compound of flavonoid in pumpkin raw fruits was Hespirdin(60,81), follows by Quercetrin (23.35), Hespirtin (17.6), Quercitin (11.07), Rutin (5.48) and Naringin (5.47). It was noticed that food technology practices markedly affected on flavonoid compounds of pumpkin. Therefore, the major compound offlavonoid of pumpkin pickles was Hespirdin (21.66),followed byQuercetrin (16.41), Quercitin (8.61), Naringin (4.09), Hespirtin (2.967) and Apegenin (2.05).

Similarly, the major compound of flavonoid in pumpkin Jam, (apricot & pumpkin) Jam and pumpkin budding were Hespirdin (19.09), Hespirolin (45.56) and Hespirdin (38.4) mg/g, respectively. Whereas, it followed by Quercetrin (16.35), Quercetrin (19.62) and Quercetrin (10.5) mg/g and followed by Rutin (4.9), Rutin (6.9) and Rutin (7.9) mg/g in pumpkin Jam, (apricot + pumpkin) Jam and pumpkin budding, respectively, Table(7). In this respect, the highest flavonoid compound of cooked pumpkin fruits was Hespirdin (52.85) mg/g, followed by Quercetrin (14.59), Rutin (6.56) and Naringin (3.15) mg/g. From aforementioned results, it could be concluded that pumpkin leaves and fruits can be considered as antimicrobial andantioxidant. Because pumpkin leaves and fruits included total phenols total falvonoids, caroteins, chlorophyll A and B. Moreover, it contained potassium, calcium, iron and zinc. For these reasons we can be recommended to utilize pumpkin products such as cooked pumpkin leaves, pumpkin fruit pickles, pumpkin fruit jam and/or pumpkin fruit budding.

Antimicrobial activity of pumpkinfruits and leaves.

Antimicrobial activity of pumpkin was performed against four bacteria strains,e.i., Bacillus ceries, Escherichia coli, Staphylococcus aurous and Salmonella cyphimurium. The results in **Table (8)** cleared that pumpkin leaves extracted by methanol had higher values of antimicrobial activity than pumpkin fruits extracted by methanol against Bacillus ceries as compared with methanol control.

Data in Table (8) also displayed that higher values of antimicrobial activity were obtained in methanol pumpkin fruits over those obtained in methanol pumpkin leaves against Escherichia coli as compared with methanol control.Similarly, methanol pumpkin fruits realized more pronounced values of antimicrobial activity against *Staphylococcus* aurous than realized in methanol pumpkin leaves.

On the other hand, methanol pumpkin leaves achieved higher antimicrobial values than those obtained in methanol pumpkin Fruits against *Salmonella cyphimurium.*

Microbiology effect of pumpkin products as affected by food technology practices:

The obtained results in **Table (9a)** revealed that the highest value of total bacteria was achieved by cooked pumpkin Leaves at zero time, after 4 and 8 days. Concerning the total yeast and mold, data in Table (9a) cleared that the maximum count of yeast and mold was obtained by cooked leaves at zero time. However, after 4 and 8 days, cooked pumpkin fruits achieved the maximum count of yeast and mold.

Data in **Table (9b)** revealed that the highest value of total bacteria was achieved by pumpkin fruit pickles at zero time. While, after 6 and 12 months, pumpkin fruit jam realized the optimum value of total bacteria. Regarding the total count of yeast and mold, the results in Table (9b) appeared that the maximum total count of yeast and mold was achieved by pumpkin fruit pickles at zero time and also after band 12 months.

Conclusion

The green pumpkin (leaves and fruits) have a high antioxidant and antimicrobial activities , and the pumpkin products have a stabile of micro and macro-nutrients , therefore concluded using pumpkin (leaves and fruit) in food technology practices to utilizing of them in health.

Table (1):Recipes of pumpkin products :

Products / Recipes	Cooked leaves	Pumpkin fruits pickles	Pumpkin fruits Jam	Apricot + pumpkin fruits Jam (1:1)	Pumpkin fruits budding	Cooked Pumpkin fruits
Green pumpkin leaves	400 gm					
Green pumpkin fruits		1000 gm	1000	500	100 gm	1000 gm
Apricot				500		
Sugar			1250	1250	200 gm	
Limon Juice (citric acid)		50 ml	60 ml	60 ml		
Salt	20 gm	80 gm				20 gm
Tomato						500 gm
Chiken soup	1000 ml					500 ml
Onion						80 gm
Black paper						3 gm
Corn oil						10 gm
Buffalo fat	20 gm					20 gm
Garlic	10 gm	10 gm				
Acetic acid		40 ml				
Buffalo Milk					1000 ml	
Starch					100 gm	

Table (2): Sensory evaluation of pumpkin products as affected by food technology practices**.**

Task	Productive kind	Taste	Color	Odor	Texture	Appearance	Total acceptability
Leaves	Cooked pumpkin	20.0 ^{A}	17.0 ^{D}	18.0 ^{C}	18.0 ^{C}	18.0 ^{B}	91.0 ^{E}
Fruits	Pumpkin pickles	20.0 ^{A}	20.0 ^{A}	20.0 ^{A}	18.0 ^{C}	20.0 ^{A}	98.0 ^{B}
	Pumpkin Jam	20.0 ^{A}	18.0 ^{C}	19.0 ^{B}	19.0 ^{B}	20.0 ^{A}	96.0 ^{D}
	Apricot pumpkin Jam (1:1)	20.0 ^{A}	19.0 ^{B}	20.0 ^{A}	20.0 ^{A}	20.0 ^{A}	99.0 ^{A}
	Pumpkin budding	19.0 ^{B}	19.0 ^{B}	19.0 ^{B}	20.0 ^{A}	20.0 ^{A}	97.0 ^{C}
	Cooked Pumpkin	20.0 ^{A}	18.0 ^{C}	19.0 ^{B}	19.0 ^{B}	20.0 ^{A}	96.0 ^{D}

Values followed by the same letters within the same coloum were not significantly different at 0.05 level

Table (3): Chemical composition of pumpkinproducts as affected by food technology practices (%) .

Task	Productive kind	Moisture	Ash	Fat	Fiber	Protein
Leaves	Raw pumpkin	10.69 C	16.20 B	2.67 E	11.57 B	5.25 D
	Cooked pumpkin	12.14 C	19.69 A	5.73 C	10.99 C	15.63 B
Fruits	Raw pumpkin	15.05 B	3.17 E	3.70 D	14.71 A	16.25 B
	Pumpkin pickles	17.89 B	5.96 D	3.80 D	14.92 A	17.50 A
	Pumpkin Jam	16.85 B	3.17 E	2.83 D	8.58 D	12.19 C
	Apricot + pumpkin Jam (1:1)	19.85 A	1.93 F	4.52 C	8.27 D	11.83 C
	Pumpkin budding	9.47 E	0.35 G	8.86 A	1.60 E	4.19 E
	Cooked pumpkin	10.26 D	10.65 C	6.43 B	10.98 C	18.75 A

Values followed by the same letters within the same coloum were not significantly different at 0.05 level.

Table (4): Macro and micro - nutrients of pumpkin products as affected by food technology practices (mg /100 g).

Task	Productive kind	Potassium (K)	Calcium (Ca)	Sodium (Na)	Iron (Fe)	Zinc (Zn)	Selienium (Se)
Leaves	Raw pumpkin	270.0 C	15.6 A	100.0 E	0.25 A	0.006 D	0.006 B
	Cooked pumpkin	320.0 B	1.32 B	380.0 C	0.17 B	0.017 A	0.0023 D
Fruits	Raw pumpkin	330.0 B	1.84 B	200.0 D	0.25 A	0.006 D	0.002 D
	Pumpkin pickles	490.0 A	10.09 A	850.0 A	0.29 A	0.022 A	0.002 D
	Pumpkin Jam	65.0 E	0.73 C	20.0 G	0.13 B	0.013 B	0.0025 D
	Apricot + pumpkin Jam (1:1)	120.0 D	2.08 B	580.0 B	0.15 B	0.008 C	0.003 C
	Pumpkin budding	40.0 F	0.608 C	20.0 G	0.13 B	0.0058 E	0.0077 A
	Cooked pumpkin	130.0 D	1.22 B	120.0 F	0.18 B	0.011 B	0.0000

Values followed by the same letters within the same coloum were not significantly different at 0.05 level.

Table (5): Antioxidant activity of pumpkin products as affected by Food technology practices (mg/g).

Task	Productive kind	Total Phenols	Total Flavonoids	Caroteins	Cholorophl A	Cholorophl B
Leaves	Raw pumpkin	4.97 A	2.06 A	0.07 A	0.197 A	0.25 A
	Cooked pumpkin	5.53 A	2.46 A	0.002 B	0.005 C	0.004 C
Fruits	Raw pumpkin	2.95 B	1.06 B	0.03 A	0.007 B	0.015 B
	Pumpkin pickles	2.06 B	1.31 B	0.024 A	0.001 D	0.002 C
	Pumpkin Jam	1.40 C	0.96 C	0.0079 B	0.008 B	0.006 C
	Apricot+pumpkin Jam (1:1)	2.30 B	1.064 B	0.003 B	0.007 B	0.002 C
	Pumpkin budding	2.70 B	1.07 B	0.001 B	0.004 C	0.002 C
	Cooked pumpkin	1.90 C	1.80 B	0.01 A	0.001 D	0.002 C

Values followed by the same letters within the same coloum were not significantly different at 0.05 level.

Table (6): Phenolic acid compounds of pumpkin products (mg/g)as affected by food technology practices.

Task	Row leaves	Cooked leaves	Row fruits	Pumpkin fruits pickles	Pumpkin Jam	Apricot+ pumpkin Jam	Pumpkin budding	Cooked pumpkin fruits
Gallic	6.23	8.39	8.79	27.35	5.02	6.53	1.59	22.15
Pyrogallol	809.52	118.34	320.15	169.09	77.95	110.46	35.03	102.04
4-Aminobenzoic	25.47	9.45	19.92	25.61	1.70	8.83	0.61	1.02
3-Hdroxytyrosol	80.50	17.94	47.81	18.57	5.58	12.16	3.39	3.83
Prootocatchouic	29.95	4.68	25.67	31.79	-	1.53	5.79	4.29
Catechin	200.11	43.91	111.97	20.26	34.08	23.41	0.86	7.89
Chlorogenic	59.26	15.81	33.22	59.92	10.95	6.73	0.56	5.88
Caffeine	286.21	8.47	35.96	34.87	14.15	12.38	1.08	8.99
P-oH-Benzoic	71.32	4.79	28.67	49.07	7.96	1.95	0.58	2.03
Caffeic	145.07	29.22	18.16	23.34	5.55	6.03	0.33	4.48
Vanillic	32.06	2.12	9.07	23.52	0.70	1.40	0.29	0.35
P-Cumaric	34.36	1.36	18.32	23.75	2.44	1.56	0.09	0.55
Ferulic	26.44	1.02	2.56	36.63	0.82	4.58	0.51	1.08
Iso – Ferulic	9.78	0.81	1.50	4.71	0.29	60.72	1.63	0.55
Ellagic	29.63	1.36	22.46	24.66	0.53	0.87	0.01	3.20
Oleuropein	101.77	1.02	38.21	36.77	6.47	34.02	2.72	6.98
Alpha– Cumaric	188.43	1.36	34.75	2.69	0.07	7.82	0.51	4.12
Benzoiic	2.82	0.55	0.30	-	-	-	0.52	0.31
Salicylic	183.33	27.96	30.07	58.20	7.07	-	0.14	15.27
3,4,5,Methoxy	222.89	13.86	53.04	11.36	2.34	0.01	0.00	10.28
Cumarin	34.94	2.55	8.18	24.32	-	-	0.10	1.31
Cinammic	5.85	0.61	0.62	1.96	0.25	1.30	-	0.18

Table (7) : Flavonoid compounds of pumpkin products (mg/g) as affected by food technology practices.

Task	Row leaves	Cooked leaves	Row fruits	Pumpkin fruits pickles	Pumpkin Jam	Apricot+ pumpkin Jam	Pumpkin budding	Cooked pumpkin fruits
Naringin	7.197	7.150	5.470	4.090	5.270	4.830	4.120	3.150
Rutin	2.830	7.860	5.480	1.740	4.900	6.900	7.900	6.560
Hespirdin	28.910	43.150	60.810	21.660	19.090	45.560	38.400	52.850
Quercetrin	12.530	14.920	23.350	16.410	16.350	19.620	10.500	14.590
Quercitin	9.370	1.380	11.070	8.610	0.270	1.030	0.680	0.233
Hespirtin	33.390	3.470	17.600	2.967	0.037	1.780	0.085	1.080
Kaempterol	11.140	7.680	1.250	1.275	0.057	2.640	0.035	0.485
Apegenin	26.950	0.389	1.780	2.050	0.317	0.438	0.160	0.102
Naringenin	2.207	0.159	0.420	0.443	0.085	0.037	0.068	0.127

Table (8): Antibacterial activity (mm) of pumpkin fruits and leaves.

Bacteria / samples	Bacillus ceries (B)	Escherichia coli (E)	Staphylococcus auraus(St)	Salmonella cyphimurium(S)
Extract of methanol pumpkin fruits	0.77	1.47	0.77	0.63
Extract of methanol pumpkin leaves	1.75	1.30	0.45	1.10
Methanol control	0.63	1.55	0.65	0.50
Water control	-	-	-	-

B = Bacillus ceriesATEC 33018

St = Staphylococcus auraus DSU 2023

E = Escherichia coli ATCC 69337

S = Salmonella cyphimurium ATCC14028

Table (9-a) : Microbiology effect of pumpkin products as affected by food technology practices

Time / products	Zero time		After 4 days		After 8 days	
	B (1-2) day	Y (3-5)day	B (1-2) day	Y (3-5)day	B (1-2)day	Y (3-5)day
Cooked leaves	2.079	1.602	4.977	2.00	5.00	3.00
Cooked Pumpkin fruits	1.602	1.477	2.756	2.415	3.00	5.477/
Pumpkin fruits budding	1.477	Nil	2.643	1.00	4.431	4.431

Table (9-b): Microbiology effect of pumpkin products as affected by food technology practices

Time / Products	Zero time		After 6 months		After 12 months	
	B (1-2) day	Y (3-5)day	B (1-2) day	Y (3-5)day	B (1-2) day	Y (3-5)day
Pumpkin fruits pickles	4.653	2.819	1.00	3.00	Nil	3.301
Pumpkin fruits Jam	1.00	Nil	1.845	1.602	1.903	2.00
Apricot + pumpkin fruits Jam (1:1)	Nil	Nil	1.00	1.00	1.00	2.699

B = total count of bacteria by Log

Y = = total count of yeast and mold by Log

References

AOAC (2000).

Official Methods of Analysis.16th ed. Association of Official Analytical Chemists International,Arlington, Virginia, U.S.A.

AOAC (2005).

Official Methods of Analysis of the Association of Official Analysis Chemists Revision 1, International 18th Ed. Washington D.C, U.S.A.

Arnon, D I . (1949).

Copper enzymes in isolated chloroplasts.Plantphysio; 24:1-15.

Bauer, A.W.; Kirby, W. M.; Sherris, J.C. and Turck, M. (1966).

Antibiotic susceptibility testing by a standardized single disk method.AmJ.Clinical Pathology, 45:493-496.

Dhiman,1. A. K., Sharma K.D. and SurekhaAttri (2009).

Functional constituents and processing of pumpkin: J Food SciTechnol , 46(5), 411-417.

Difco- Manual (1998).

Culture Media and Ingredients, Dehydrated. 11th Ed. Pub. Difco Lab., Division of Becton Dickinson and Company. Sparks, Maryland, USA.

Duke J.A. (2006).

Handbook of Medicinal Herbs, CRC press, Washington D. C, 114.

Ghule B.V., Ghante M.H., Saoji A.N.andYeole P.G.(2006).
Indian Journal of Experimental Biology; 44:905-909.

Goupy, P.; M. Hugues, P. Biovin, and M.J. Amiot, (1999).
Antioxidant composition and activity of barley (Hordeumvulgare) and maltextracts and isolated phenolic compounds. J. Sci. Food Agric., 79: 1625-1634.

Irfan Ahmad, Md. Irshad, and M. Moshahid A. Rizvi(2011).
Nutritional and Medicinal Potential of Lagenariasiceraria . Department of Biosciences, JamiaMilliaIslamia (Central University), New Delhi, India. Natural.Jávor (eds.), Ajövőélelmiszereiésazegészség, Center-Print Debrece, 198-202, ISBN 978-963-9732-36-0.

Madai H. (2008).
A funkcionálisélelmiszerekelőállítása, fogyasztásaéspiaca, [w:] J. Nagy, J. Schmidt, A.

Mattila, P.; J. Astola, and J. Kumpulainen, (2000).
Determination of flavonoids in plant material by HPLC with diode- array detections. J. Agric. Food Chem., 48: 5834-5841.

Upaganlawar, A.and Ramchandran B. (2009).
Bottle gourd (LAGENARIA SICERARIA)“A VEGETABLE FOOD FOR HUMAN HEALTH”- A COMPREHENSIVE REVIEW Pharmacologyonline Department of Pharmacy, Faculty of Technology and Engineering, The Maharaja Sayajirao University of Baroda 390 002, Gujarat1: 209-226.

Rahman A.S.H.(2003).
Bottle Gourd (Lagenariasiceraria)-a vegetable for good health .Natural Product Radiance 2(5): 249-250 (2003).

Singleton,V.L. and K .Slinkard,(1977).
Total phenol analysis: automation and comparison with manual methods. American Journal of Enology and Viticulture,28:49-55.

Wettstein, D.V. (1957).
Determination of carotenoids in plants. Experimenal Cell Res., 12, 427-430.

Worrasinchai, S.M. Suphantharika S.Pinjai P. Jamnong.(2006).
B- Glucan prepared from spent brewer's yeast as a fat replacer in mayonnaise. Food Hydrocolloids,20 (1):68-78.

الاستفادة من اليقطين الأخضر فى عمل بعض المنتجات الغذائية

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الملخص العربى

تم إحضار أوراق وثمار نبات اليقطين من معهد بحوث البساتين وتم تحليل أوراق وثمار اليقطين كيميائياً وتقدير محتواها الغذائي من العناصر الكبرى والصغرى ثم أجريت بعض عمليات التصنيع الغذائي مثل عمل المربى، المهلبية والمخلل والطهى لثمار اليقطين وعمل الطهى فقط لأوراق اليقطين و ذلك لدراسة الإستفادة منه فى عمل بعض الوجبات التغذوية.

ولقدتم إجراء بعض التحاليل مثل التقييم الحسي ، التركيب الكيماوي، المحتوى الغذائي من العناصر الكبرى والصغرى ، نشاط مضادات الأكسدة ، ومضادات النشاط الميكروبي، مركبات حمض الفينوليك، مركبات الفولفنيد للمنتجات التى تم تصنيعها باستخدام اوراق و ثمار اليقطين.

وفيما يلي أهم النتائج المتحصل عليها:
مدى تقبل المستهلكين (المحكمين) لمنتجات اليقطين الغذائية أخذ الترتيب التنازلي التالى:
أكثر القابلية كان لمربى اليقطين والمشمش بنسبة (١ : ١) > مخلل اليقطين > مهلبية اليقطين.

أعلى محتوى من عناصر البوتاسيوم، الكالسيوم، الصوديوم، الحديد، الزنك أمكن الحصول عليه باستخدام مخلل ثمار اليقطين كما وجد أن أوراق نبات اليقطين تحتوى على قيم أعلى من حمض الفينوليك الكلي، الفلافونيدات الكلية، الكاروتين، الكلوروفيل A & B من نظيرتها الموجودة في ثمار اليقطين.

أوراق نبات اليقطين أعطت أعلى القيم لنشاط مضادات النشاط الميكروبي (Antimicrobial) ضد بكتريا Bacillus ، Salmonella بالمقارنة بنظيرتها المتحصل عليها من ثمار اليقطين. ومن جهة أخرى فإن ثماراليقطين أعطت قيم اعلى لنشاط مضادات النشاط الميكروبي (Antimicrobial) ضد بكتريا Escherichia ، Staphlococcus مقارنة بنظيرتها المتحصل عليها من أوراق نبات اليقطين، وقد وجد أن المكون الرئيسي من مكونات حامض الفينوليك الموجودة في كل من أوراق وثمار اليقطين الخام هو Pyrogallol علاوة على ذلك فإن المكون الأساسي للفلافونيد Flavonoid الموجودة في أوراق اليقطين الخام هو Hespirtin و الذى تبلغ نسبته ٣٣,٣٩يليه Hespirdin الذى تبلغ نسبته ٢٨,٩١. و ايضا فإن Hespirdin (٦٠,٨١) هو المكون الأساسي لـ Flavonoid الموجودة في ثمار اليقطين الخام يليه Quercetrin الذى تبلغ نسبته ٢٣,٣٥ ملجم/١٠٠ جرام.

وعليه فأن هذة الدراسة توصى بالاستفادة من اوراق و ثمار اليقطين و ادخاله فى بعض الاغذية و ذلك لتغزيزها بالعناصر الغذائية النادره و كمضادات للاكسدة و الميكروبات.