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Technological feasibility of preparing spaghetti enriched with some by-products of food industry in Egypt

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Abstract

In this study, feasibility of using dry orange albedo, guava seed powder and tomato peel powder as a by-wastes from food industry, as a starting raw material to produce dietary fiber powders of producing spaghetti were replaced with wheat flour 72% extraction (WF72% ext.) At 5, 10, 15 and 20%,5, 10, and 20, 10, 20, 30 and 20% respectively the chemical analysis as (crude proteins, ash, crude fibers, fat and moisture)and mineral analysis {potassium (K), calcium (Ca), sodium (Na), phosphor (P), iron (Fe) and Zink (Zn)}.were done for raw materials and all samples spaghetti showed the best in sensory evaluation(15% dry orange albedo, 10% guava seed powder and 30% tomato peel powder. The pest rheological tests. Cooking quality properties (Firmness-Weight gain % - Volume gain% - Cooking loss %) were done.

Keywords: Wheat flour 72% –dietary fibers - dry orange albedo, guava seed powder and tomato peel powder-cooking quality- rheological properties.

Introduction

Dietary fiber appear to be at significantly lower risk for developing coronary heart disease, stroke, hypertension, diabetes, obesity and certain gastrointestinal diseases. Increasing fiber intake lowers blood pressure and serum cholesterol levels. Increased intake of soluble fiber improves glycaemia and insulin sensitivity in non-diabetic and diabetic individuals. Fiber replacementation in obese individuals significantly enhances weight loss. Increased fiber intake benefits a number of gastrointestinal disorders including the following: gastro esophageal reflux disease, duodenal ulcer, diverticulitis, constipation, and hemorrhoids. Prebiotic fibers appear to enhance immune function. Dietary fiber intake provides similar benefits for children as for adults. The recommended dietary fiber intakes for children and adults are 14 g/1000 kcal. More effective communication and consumer education is required to enhance fiber consumption from foods or supplements,**Angelica Bianca *et al.,* (2015)**

El Adly and Asma(2009) found that wheat flour (72% extraction) contained 11.40% crude protein, 0.54% ash, and0.66%.crude fibers.

Abd-El-Hady (2012) showed that of wheat flour 72% ext. contained moisture 11.32% protein0.78%ash 10.32%, fibers 0.65%fat0.755 and 88.32%total carbohydrates.

Babiker *et al.,* (2013) found that of wheat flour contained moisture 11.65% protein12.05%, fiber 1.65%, ash 1.47%, fat 1.81% and88.02% total carbohydrates

Bedeir, (2004) using Brabender Farinograph and Extensograph instruments to determining the rheological properties of wheat flour (72% extraction). He found that, Farinograph parameters were 56.9, 1.0, 1.5, 3.0 and 105 for water absorption (%), arrival time (min.), dough development time (min.), dough stability time (min.) and degree of softening (B.U), respectively. Also, he found that, Extensograph parameters for 420, 125, 3.36 and 48 for dough resistance to extension (B.U), dough extensibility (mm), proportional number and energy (cm^2), respectively.

The albedo is chemical composition moisture and nitrogen free extract contents (15.00 % and 78.22 %) respectively, the moisture and nitrogen level high while with the lowest protein, ash and lipid contents Flavonoids were mildly detected in all extracts except the hydroethanolic albedo extract **Oikeh*et al.,*** (**2012)**

Ferndez-Ginés*et al.,* (2003) evaluated the proximate composition of Dry orang albedo and stated that its high fiber content albedo could be considered as a potential fiber source

Albedo is a white spongy and cellulosic tissue which is the principal component, albedo is rich dietary fibers that it's had a better quality than other sources of dietary fibers due to the presence of associated bioactive compounds and functional such (Flavonoids and V.C) addition antioxidant properties, which may exert higher heath promoting effects than the dietary fiber itself, **Tao *et al.,* (2009).**

Norshazila *et al.,(*2010) found that, guava seed wastes have high antioxidant potential, because they are rich in compounds that can delay oxidation and also, **Packer *et al.,* (2010)** concluded that guava seed extracts are effective in retarding lipid oxidation in processed chicken meat at concentration of 60 mg total phenolic compounds/kg of meat.

El-Safy*et al.,* (2012) used guava seeds as anreplacemental source of fiber in cooks.

Abdeldaiem*,et al.,* (2014)and **Ayman (2015**) reported comical composition of guava seeds for their moisture, crude protein, total lipid, crude fiber, ash and total carbohydrate 8.8, 7.49, 11.39, 63.45and 7.22% successively and also he noticed that guava seeds contain on natural antioxidants their effects on human health with a lower risk of cardiovascular disease and cancer.

Thuaytong *et al.*, (2011) found guava seeds contain antioxidant activity was ascorbic acid, garlic acid, equivalents, catechincinnamyl alcohol, ethyl benzoate, ß-caryophyllene, (E)-3-hexenyl acetate, α-bisaboleneand bioactive compounds with beneficial physiological and metabolic properties.

Fontanari*et al.*,(2008) found the value of 67/100g for total dietary fiber for guava seed .it obtained on new products based on fibers.

Giovannucci*et al.*, (2002)reported comical composition of tomato peel waste contains on a dry basis 95.9 g lipid, 175.6g crude protein, 495.3 g crude fiber, 36.4 g ash, 405.4 g insoluble fiber and total carbohydrates590.7 g per kilo-gram of residue).

Alvarado *et al.* (2001) reported comical composition of tomato peel waste contains on a dry basis 95.9 g lipid, 175.6g crude protein, 495.3 g crude fiber, 36.4 g ash, 405.4 g insoluble fiber and 590.7 g total carbohydrates per kilo-gram of residue. It has been pro-posed that the use of tomato waste as feed for poultry may be a way of reducing the cost of feeding poultry and help to alleviate the problem of solid waste

Kaur*et al.*, (2008) reported that the peel part of tomato peel waste contains up to five times more than the pulp (on wet basis)where attracted considerable attention for its possible role in disease prevention but its high moisture levels and susceptibility to microbial spoilage make the storage and processing of this material quite problematic.

Accordingly, the purpose of this work was carried out to evaluate some properties of fiber obtained from dry orange albedo,guava seed powder and tomato peel powder by-products, in order to use them as a dietary fibers source in the enrichment of spaghetti. The obtained spaghetti were evaluated chemical composition, physically and organoliptically.

Materials and Methods

3.1. Materials:

Wheat flour of 72% ext. was obtained from South Cairo Flours Mills Company, Cairo, Egypt.

dry orange albedo, guava seed powder and tomato peel powder:

Were obtained from Kaha Company (Kaha, Kaluobia, Egypt).

Preparation of spaghetti:

Spaghetti samples were prepared from wheat flour 72% ext., water 35% and salt 1%. Each sample was blended with different substitution level dray orange albedo (5, 10,15and 20%), guava seed powder (5, 10 and 15%), tomato peelpowder (10, 20, 30and 40) as wheat flour weight. The mixture of ingredients was placed in a mixing bowl (Kitchen Aid Mixer) and mixed at speed 1 for 2 min., water was added and mixing was continued at speed 1 for 4 min., followed by mixing at speed 2until the dough stiffened. The dough was rounded (shape to ball). Covered with plastic wrap, allowed to rest about 30 min., hand kneaded for about 1 min and sheeted with wooden rolling pin to about 1.5 cm. thickness. The sheet of dough was passed through a- pasta machine (Ampia, TipoLusso, Model 150 and Italy). Spaghetti was cut into strips 5mm wide, the spaghetti was dried to 6.50% moisture in oven at 65Cº for one day, cooled at room temperature and the produced spaghetti was packed in polyethylene bag until tested cooking qualities of spaghetti under investigation namely optimum cooking time, spaghetti cooking weight and cooking loss were released by the method of (**Dexter *et al.*,1983)**.

3.2 Methods:

3. 2.1. Moisture, fat, ash, crude fiber, crude protein and essential minerals were determined according to **(A.O.A.C.2005).** A total carbohydrate was calculated by difference. Total calories, calculated according to **Kerolles (1986).**

E= Energy as calories per 100gms.

3.2.2. Determination of rheological properties:

Rheological properties of the dough's were determined using Farinograph and Extensograph according to **A.A.C.C. (2005).**

3.2.3.Dtermination of cooking quality of spahetti:

The methods describeed**by Park *et al.* (2004) and Baik*et al*. (2003)** were used to evaluate the cooking quality of instant pasta samples. Twenty five grams of noodles samples were transferred into pasta laboratory cooker containing 250 ml. of hot water 95Cº. After cooking for 10,15 and 20 min, the samples were washed by cooling water thoroughly with distilled water and allowed to drain for 2 min. Three measurements were conducted on the cooked pasta as follows:

3.2.4. Weight increase (%):

This value was calculated as follows:

Weight increase =

$$\frac{\text{Weight of cooked sample - weight of uncooked sample}}{\text{weight of uncooked sample}}$$

Volume increase %(Swelling%):

This value was calculated as follows:

Volume increase =

$$\frac{\text{Volume of cooked sample - Volume of uncooked volume of uncooked sample}}{\text{weight of uncooked sample}} \times 100$$

3.2.6. Cooking loss % (Total soluble solids, T.S.S):

Residue was determined by weighing the solid materials in cooking water after drying in an oven at 130C° over night to a constant weight. Results were recorded as follows:

$$\text{Cooking loss \%} = \frac{\text{Weight of residues in cooking water}}{\text{Weight of uncooked sample}} \times 100$$

3.3. Sensory evaluation:-

For Sensory evaluation ten trained panelists from food Technology Research Institute members was use to examine and score of different parameters of organoleptic properties of the final products including Appearance (20) color (20), Tenderness (25) flavor (20), Stickiness (15) Overall acceptability (100) according to **A.O.A.C. (2005)**

3.4. Statistical analysis:-

Using of the statistical analysis system "SAS" **(SAS Institute Inc., 1999).**

Result and Discussion

4.1. Chemical composition of raw materials used in the preparation of spaghetti

Wheat flour:

Table (1): show comical composition of WF72%ext. for their moisture, crude protein, total lipid, crude fiber, ash and total carbohydrate 11.8, 12.59, 1.54, 0.8, 0.58 and 84.49% respectively.

The protein and total carbohydrate the higher value (12.59, 84.49%) while ash and total lipid the lower value (0.58, 0.8%) the moisture content of WF 72%ext. was 11.8%. This result is in similar with that **Bilgicli *et al.* (2006) and Bilgicli and Ibanoglu (2007)** who's reported that the WF72% ext. was contents of 10.62% protein, 12.30% moisture, 0.61%ash, and 1.00%fat

Dry orange albedo

In Table (1) show comical composition of orange albedo for their moisture, crude protein, total lipid, crude fiber, ash and total carbohydrate 9.8, 4.4, 058, 17.01, 3.4 and 64.81% successively.

There results in agreement with **Fernandez-Gines *et al.*,(2004)** where found albedo high content fiber were (17.91) and ash was (2.99),fat was (0.90) and total carbohydrates was 55.24% respectively. And nearly the results were agreement **Manal** and **Hend *(*2014)** proved that of dry orange albedo contained protein 4.24%, fiber 9.13%ash 2.20%fat 6.41%, moisture 13.19 and total carbohydrates64.83%.

Osfor *et al.*,(2013)who indicated the comical composition of orange albedo for their moisture, crude protein, total lipid, crude fiber, and ash 19.9, 7.26, 0.2, 9.92, and 2.3 consecutively he observed comical composition of orange albedo was rich in dietary fibers 9.92 dry weight basis

Guava seed powder

Values of **Table** (1) denoted comical composition of guava seeds for their moisture, crude protein, total lipid, crude fiber, ash and total carbohydrate 7.42, 7.74, 15.88, 63.37 and 4.65% consecutively.**El-Safy*et al.*, (2012) and Marquina *et al.*, (2008)** used guava seeds as an additional source of fiber in cookies,guava seeds had the highest amount of crude fiber (64.00%) soguava seeds could be considered as a good source of dietary fiber

Fontanari *et al.*, (2008) obtained the protein value of 8.2 % when studying protein from guava seed.

Tomato peel powder

As shown in **Table** (1) chemical composition of tomato peel powder contain (on dry weight basis) 9.92% crude protein, 4.24% ash, 2.55 %the fat, 52.67% crude fiber and 20.59% total carbohydrate respectively. **Knoblich *et al*. (2005)** stated that comical composition contained tomato peels powder10.08% protein, 5.64% ash and fibers 40.94% **Arafa and Salaw (2009)** found that tomato peel contained 11.6% fat 60.4% crude fiber, 1.20%, total carbohydrate and 8.00%protein

Table 1. Chemical composition of raw materials used in the experimental spaghetti. (*on dry weight basis)

Raw material	Moisture	Crude proteins	Crude fibers	Ash	Fat	Total carbohydrates
wheat flour72% ext.	11.8±0.9^{a}	12.59±0.34^{d}	0.8±0.1^{d}	0.58±0.06^{c}	1.54±0.2^{a}	84.49±1.56^{a}
Dry orange albedo	9.8±0.45^{b}	4.4±0.5^{d}	17.01±0.99^{c}	3.40±0.4^{b}	0.58±0.02^{a}	64.81±2.01^{b}
Guava seeds Powder	7.72±0.48^{c}	7.74±0.16^{c}	63.37±3.3^{a}	0.94±0.05^{c}	15.88±1.8^{a}	4.65±0.26^{c}
Tomato peel powder	10..02±0.^{b}	9.92±0.67^{a}	52.63±1^{a}	4.24±0.5^{a}	2.55±0^{a}	20.59±1.21^{b}
LSD	19.884	25.028	39.161	64.806	0.938	0.289

* Mean of triplicate determination ± standard deviation. .
** Calculated by difference.
*** Values with different superscripts in every column are significantly different (P>0.05).
****LSD =least significant difference.
WF= wheat flour, (A) DO.A= dry orange albedo, (B) G.SP guava seed power and(C) TPP Tomato peel power

4.2. Minerals content of raw materials:

Table (2) shown the predominant first major mineral element in WF 72%ext.wasessential elements in wheat flour were arranged as follows K (116.1 mg/100g), Ca (19.8mg/100g), Na (4.01mg/100g), Fe (1.22 mg/100g) and Zn (0.80 mg/100g).

WF72%ext. had the lowest content and the no richest source for K (344.00, 323.40 and 317.00 mg/ 100g) by guava seeds, tomato peels and dry orang albedo respectively. **Arshad *et al.* (2007**) found that WF72%ext.contain K 125 mg/ 100g, Ca 12.94 mg/100gand Fe 0.3 mg/100g, mg/100g

In dry orang albedo, the predominant first major mineral element was also calcium (594 mg/100g).Essential elements in dry orang albedo, arranged in a decreasing order of abundance, were as follows: Zn (1.48 mg/100g), Fe (9.90 mg/100g),Na (39.60 mg/100g) and K (317 mg/100g).This result is in agreement with **Doweidar, (2001).** Reported that the albedo content of Ca (28.4 mg/100g) and Na (51.7 mg/100g) in the rind is higher than that of the fruit pulp. It also presents a significant content of iron (1.5 mg/100g) enabling its utilization as mineral source.

In the predominant first major mineral element was also Ca (392.00mg/100g), K (344.00 mg/100g), Na (315.56 mg/100g), P (210.70 mg/100g) Fe (31.05 mg/100g) and Zn (9.90 mg/100g. Essential elements in guava seed powder, arranged in an increasing

El-kassas(2004) found that the minerals content of guava seed powder were (mg/100g sample)Ca425.8, Fe 31.5 1, and Zn 10.79, respectively.

Essential elements in tomato peel powder arranged, in increasing order of abundance, were as follows: P (362.00 mg/100g),K (323.4 mg/100g), Na (322.00 mg/100g), Ca (142.10 mg/100g), Zn (10.80 mg/100g) and Fe (4.50 mg/100g).**Arafa and Salaw (2009**) found that the P, K, Na and Ca are the major element in tomato peel powder. Where their values were 540, 630, 822 and 345 mg/100g respectively but the Fe, and Zn are the mojer elements respectively.

Table 2. Minerals content of raw materials which with used in prepare spaghetti.

Raw material	Macro elements				Micro elements	
	K	Ca	Na	P	Fe	Zn
Wheatflour72% ext.	116.1±4.2^C	19.8±1.38^d	4.06±1.3^b	44.14±1.38^c	1.22±0.05^d	0.80±0.04^d
Dry Orange albedo	317±11.37^b	594±12.87^a	39.6±1.43^b	69.30±2.5^c	9.90±0.26^b	1.48±0.05^c
Guava seeds powder	344±12.4^a	392±14.06^b	315.56±2.34^a	210.70±1.8^b	31.05±0.95^a	9.9±0.26^b
Tomato peel powder	323.4±12.6^b	142.10±2.3^b	322±7.1^a	362±22.4^b	4.50±0.19^c	10.8±018^a
LSD	19.884	25.028	39.161	64.806	0.938	0.289

* Mean of triplicate determination ± standard deviation.

** Calculated by difference.

*** Values with different superscripts in every column are significantly different (P>0.05).

****LSD =least significant difference. K= potassium, Ca= calcium, Na= Sodium, P= Phosphor, Fe = Iron and Zn=Zinc

Sensory evaluation of spaghetti replacement with various wastes:

Spaghetti replacement with dry orange albedo:

The samples of spaghetti were evaluated organoleptic by ten panelists for their appearance, color, flavor, tenderness and stickiness where scoured and their mean values were statistically analyzed using analysis of variance and least significant difference (LSD), as presented in **Tables** (3).

The data presented in **Tables** (3.4and 5) showed that there were no significant differences in appearance between control sample and those blends which containing 5, 10, 15 and 20% dry orange albedo

The data presented in **Table** (3) showed that there were no significant differences between control sample and these blends which containing 15% dry orange albedo. After that there were significant differences in color among spaghetti sample with 5, 10, 15 and 20% of dry orange albedo and control sample.

The change in color may be due to the phenolic compounds and fibers, with present in dry orange albedo, data indicated that there were significant differences in flavor among spaghetti control sample and those blends which containing 5, 10, 15 and 20% dry orange albedo, also no significant differences stickiness among spaghetti control sample and those blends which containing 5, 10, 15 and 20% dry orange albedo.Finally the overall acceptability score were increased by adding dry orange albedo (expect at 20%).

In agreement to the obtained results were confirmed by those obtained by **Abd el slam *etal.,(*2005).**

Spaghetti replacement with guava seeds powder:

The data presented in **Table** (3) showed that there were no significant differences in appearance and stickiness between control sample and these blends among spaghetti control sample and those bleds which containing 5, 10 and 15% guava seeds flour and no significant differences between control sample and these blends which containing 10% guava seeds flour. After that there were significant differences in color among spaghetti sample with 5, 10 and 15% of guava seeds flour and control sample.

The change in color may be due to fibers. On the other hand were significant differences in flavor among spaghetti control sample and those blends which containing 5, 10 and 15% guava seeds flour and the overall acceptability score were increased by adding guava seeds flour (expect at 15%).In agreement to the obtained results were confirmed by those obtained by **Haiat (2012) and Ahmed *et al.*, (2011).**

Spaghetti replacement with tomato peels powder:

The data presented in **Table**(3) showed that there were no significant differences in appearance, stickiness and color between control sample and these blends among spaghetti control sample and those blends which containing 10, 20, 30 and 40% spaghetti supplemented with tomato peel powder. The change in color may be due to the phenolic compounds, and were significant differences in flavor among spaghetti control sample and those blends which containing 10, 20, 30 and 40% spaghetti replaemented with tomato peel powder. Finally the overall acceptability score were increased by adding tomato peel powder (expect at 40%). In agreement to the obtained results were confirmed by those obtained by **Marwa (2013).**We choose three samples which were had highest numbers in sensory attribute value as to meak the rheological properties for this sample.

Table 3. Effect of replacing extraction with some product wastes (A, B, C) on sensory evaluation test on spaghetti cooking properties

(A)

Treatment	Appearance (20)	Color (20)	Tenderne(25)	Flavor(20)	Stickiness(15)	Overall accptability (100)
Control wheat 72%	17.9^{ab}±0.1	17.^{ab}±1.0	22.7^{ab}±0.7	17.8^{ab}±0.2	13^{ab}±0.5	94.2^{b}±0.2
Dry orange albedo 5%	17.8^{ab}±0.2	17.5^{b}±0.5	21.9^{b}±1.1	17.4^{b}±0.4	12.8^{b}±0.2	93.9^{b}±1.1
` Dry orange albedo10%`	17.2^{b}±0.2	17.7^{c}±0.3	21.8^{b}±0.2	17.5^{b}±0.5	12.9^{b}±1.1	94.6^{b}±0.6
Dry orange albedo 15%	18.6^{a}±0.6	18.7^{a}±0.6	23.1^{a}±0.9±0.9	18.7^{a}±0.7	13.8^{a}±0.2	97.0^{a}±2.0
Dry orange albedo 20%	13.5^{c}±1.5	13.3^{c}±0.7	20.6^{c}±0.4	13.7^{c}±0.3	11.1^{c}±0.9	93.3^{c}±1.3
LSD	1.014	0.934	1.039	1.012	0.817	1.334

(B)

Treatment	Appearance (20)	Color (20)	Tenderne(25)	Flavor(20)	Stickiness(15)	Overall accptability (100)
Control wheat 72%	17.9^{ab}±0.1	17.5^{b}±0.5	22.7^{ab}±0.7	17.4^{b}±0.6	13^{ab}±0.5	94.2^{b}±0.2
Guava seeds5%	17.8^{a}±0.2	18.7^{a}±0.4	21.9^{b}±0.6	18.4^{a}±0.4	12.8^{b}±0.2	93.9^{b}±1.1
Guava seeds 10%	15.0^{b}	17.7^{b}±0.7	23.1^{a}±0.3	17.5^{b}±0.5	13.8^{a}±0.8	97^{a}±1.0
Guava seeds15%	17.8^{a}±0.8	17.5^{b}±0.5	21.8^{b}±0.8	17.4^{b}±0.6	12.8^{b}±0.8	94.0^{b}±3.0
LSD	0.966	0.936	1.0412	1.009	0.802	1.176

(C)

Treatment	Appearance (20)	Color (20)	Tenderne(25)	Flavor(20)	Stickiness(15)	Overall acceptability (100)
Control wheat 72%	17.9^{ab}±0.1	17.^{ab}±1.0	22.7^{ab}±0.7	17.8^{ab}±0.2	13^{ab}±0.5	94.2^{b}±0.2
Tomato peels 10%	17.8^{ab}±0.8	17.5^{b}±0.5	21.9^{b}±0.1	17.4^{b}±0.4	12.8^{b}±1.2	93.9^{b}±0.1
Tomato peels 20%	17.2^{b}±0.8	17.7^{b}±0.7	21.9^{b}±1.1	16.9^{b}±0.1	12.5^{b}±0.5	94.2^{b}±0.8
Tomato peels 30%	18.6^{a}±0.6	18.7^{a}±0.3	23.1^{a}±1.1	18.6^{a}±1.6	13.8^{a}±0.2	97.0^{a}±1.0
Tomato peels 40%	13.3^{c}±0.3	13.3^{c}±1.3	20.6^{c}±0.4	13.7^{b}±0.7	11.1^{c}±0.9	93.3^{b}±1.7
LSD	1.028	0.935	1.004	1.808	0,817	1.344

* Values * Mean of triplicate determination ± standard deviation.

** Calculated by difference.

*** Values with different superscripts in every column are significantly different (P>0.05).

****LSD =least significant difference.

WF= wheat flour, (A) DO.A= dry orange albedo, (B) G.S Pguava seed power and(C) TPP Tomato peel power

Rheological properties of baked dough:

Brabender farinograph dough properties:

The results presented in **Table** (4) showed the effect of adding 15% of dry orange albedo,10% guava seed powder and 30%of tomato peel powder to wheat flour on Farinograph parameters i.e., water absorption (%), dough development time (min.), dough stability time (min.), and degree of softening (B.U).

From the obtained data, it could be noticed that the water absorption increased from 58% for control sample to 66.0, 70.0 and 79.3% as a result to the addition of 15% of the albedo, 10% of guava seed powder and 30% tomato peel powder this finding could be attributed to the higher fiber content of the above mentioned waste. such data are in the same line with those of **Abd El-Moniem and Yassen (1993)** and **Haiat (2012)** reported that addition of guava seeds flour to wheat flour increased the water aborption in wheat flour 72% extraction. This increase due to high fiber contents.

It could be observed that the stability time of wheat flour control dough decreased from 16.5 min. to 5.00 as a result to addition of 15% of the albedo, 10% of guava seed powder and 30% tomato peel powder to dough's. This observation might be due to the higher fiber content for the above mentioned waste. The decrement in the stability time would indicate weakness in dough strength. This weakness of dough might be attributed to the dilution of wheat gluten as a result to addition of the aforementioned waste.

Marrow (2013) and Sogi *et al.*,(2002) found that farinograph test of wheat flour replacement with tomato peel powder increase in water absorption, time increased dough development time and time decreased dough stability and also it could be observed that tomato peels are rich in crude fiber and ash comparing with wheat flour, therefore, addition of tomato peel powder replacement of wheat flour will be increase the protein, crude fiber and ash content in the final product.

Brabender Extensograph dough properties:

Data presented in Table (4) showed the effect of adding 15% of dry orange albedo, 10% guava seed powder and 30%of tomato peel powder to wheat flour on extensograph parameters i.e. extensibility (mm), resistance to extension (B.U), proportional number and energy of dough (cm^2).

From the obtained data, it could be noticed that the extensibility of wheat flour dough decreased as a result of adding 10,15and 30 of the supplemented guava seeds, dry orange albedo and tomato peels to where they reached the 65,130 and 150 mm, respectively, compared to 180mm. for wheat flour control dough.

On the other hand, data showed that resulted in decreasing the resistance to extension values from 780 B.U in control dough sample to 440,105 and 120 B.U, respectively. This finding may be due to the effect of adding these waste on wheat gluten. Results also showed that the values for proportional number were slightly increased as a result of adding of 15% of dry orange albedo, 10% guava seeds and 30%of tomato peels to doughs of wheat flour (control sample). Concerning to the energy valued the control sample recorded the highest value (120cm^2), while doughs replacement with waste showed lower energy values indoughs. These findings are in general accordance to those reported by **Haiat (2012)** she found that the resistance to extension, proportional number and energy of dough were decreased.

Table 4. Barabender farinograph and extensograph properties of doughs used to prepare spaghetti from wheat flour. whenreplacing with different levels of with some processing wastes

Farinograph parameter				
Kind of supplementation to doughs	Water absorption (%)	Dough development (min.)	Dough stability (min.)	Dough weakening (B.U)
Control Sample (without supplementation)	58	2.5	16.5	15
WF+15%DOA	70	12	10	50
WF+10% GSP	66	12	8	30
WF+30% TPP	79.3	14	5	60
Extensograph parameter				
Dough mixture	Res.to Ext$(B.U)^2$	Extensibility	P.N	Energy
Control group(WF)	780	180	4.9	120
WF+15% DOA	105	130	10.4	40
WF+10% GSP	440	65	8.2	30
WF+30% TPP	120	150	6.7	56

Dry orange albedo (DOA) Guava seed powder (GSP)- -Tomato peel powder (TPP).
Res.to Ext $(B.U)^2$= resistance to Extenstion
P.N = proportional Number

Chemical constituents of spaghetti.

Spaghetti replacement with dry orange albedo:

In **Table**(5) show effect of replacing wheat flour 72% ext.by dry orange albedo was crude protein was decreased in orange albedo of spaghetti substitution at levels of 5, 10,15 and 20% was 12.06,11.56,11.25 and 10.48% respectively compared of spaghetti control was 12.46%. Ash and crude fibers content were increased 0.71,0.85,0.99 and 1.13% and. 1.6, 2.41, 3.22 and 4.03% consecutively compared with control 0.57 and 0.79%. Moisture and carbohydrates content was decreased in spaghetti from made of dry orange albedo substitution at all levels compared of spaghetti control. Regardless of level of substitution of WF 72% ext. by dry powdered orange albedo content of their resultant spaghetti to increase in fibers and ash but crude protein, crude fat and total carbohydrates decreased

These studied the effect of supplementing orange albedo on the chemical composition of Egyptian baked production and found that the dry powdered orange albedo layer contained high crude fibers. These results are well in line by those obtained by **Doweidar *et al.,* (2001) and Abd el slam *etal.,(*2005).**who studied the effect of replacementing dry powered orange albedo on the chemical composition of Egyptian baked products who found that the dry powered orange albedo layer contained high crude fibers.

Spaghetti replacement with guava Seed powder:

In **Table** (5) show Effect of replacing wheat flour 72% ext. by guava Seeds. Crude protein content was decreased in guava seed powder of spaghetti substitution at levels of 5, 10 and 15% successively in guava seeds from 72% ext.12.21, 11.99 and 11.75% successively compared of spaghetti control with 72% ext. 12.46. but ash, crude fats and crude fiber content were increased in guava seeds of spaghetti substitution at different levels of (0.58, 0.60 and 0.62%), (2.28, 2.99and 3.70) and (3.92, 7.03and 10.15%) respectively. compared of spaghetti control with 72% ext. 0.57, 1.57 and 0.79%.Moisture and carbohydrates content were decreased in spaghetti made of substitution at different levels of guava seed powder consecutively in (10.92, 10.73and 10.54) and (81.01, 77.39 and 73.74%) consecutively compared of spaghetti control with 72% ext. 11.1and 84.61%substitution, substituting of WF of 72% by guava seeds content of their resultant Regardless of level of spaghetti to increase in fibers, fat and ash but crude protein, and total carbohydrates decreased These results were agreement the **Ahmed *et al.,* (2011)**

Spaghetti replacement with tomato peels:

In **Table** (5) show effect of replacing wheat flour 72% ext. by tomato peels. Crude protein was decrease (12.20, 11.95,11.70 and 11.43%,) compared with control (12.46%). but ash, crude fibers and fat content were increased in tomato peel powder of spaghetti substitution at levels of 10,20,30and 40% consecutively in tomato peels from 72% ext.(0.93,1.34,1.67 and 2.04%),(5.97,11.16,16.36and 21.53%) and (1.66,1.77,1.86 and 1.96%) consecutively compared of spaghetti control with 72%ext.(0.57, 0.79and 1.57%).on the other hand moisture and carbohydrates content were decreased. Regardless of level of substitution, substituting of WF of 72% by tomato peels content of their resultant spaghetti to increase in fibers and ash, fat but crude protein and total carbohydrates decreased. These studied the effect of supplementing tomato peel powder on the chemical composition of spaghetti and found that tomato peels contained high crude fiber these results was agreement the **Sonja and Djilas (2010)**.

Table 5. Effect of replacing wheat flour with some some processing wastes (A, B, C)

Raw material	Moisture	Crude proteins	Crude fibers	Ash	Fat	Total carbohydrates
control (WF 72% ext.)	12.46±0.34[a]	0.57±0.03[d]	0.79±0.02[e]	1.57±0.02[a]	84.61±0.71[a]	11.1±0.4[a]
95%WF+ 5%DOA	12.06±0.03[a]	0.71±0.04[d]	1.6±0.3[d]	1.52±0.23[a]	84.11±1.61[a]	11.08±0.17[a]
90%WF+ 10%DO.A	11.56±0.94[c]	0.85±0.07[b]	2.41±0.19[c]	1.47±0.08[a]	83.71±0.81[a]	10.97±0.11[a]
85%WF+ 15%DOA	11.25±0.7[c]	0.99±0.03[b]	3.22±0.19[b]	1.42±0.4[a]	84.25±1.51[a]	10.9±0.4[a]
80%WF+20%DOA	10.48±0.62[c]	1.13±0.17[a]	4.03±0.06[a]	1.38±0.02[a]	82.62±0.24[a]	10.86±0.6[a]
LSD	0.9776	0.157	0..3317	0.3817	1.8432	0.6966

(B)

Raw material	Moisture	Crude proteins	Crude fibers	Ash	Fat	Total carbohydrates
control (WF 72% ext.)	12.46±0.34[a]	0.57±0.03[d]	0.79±0.02[e]	1.57±0.02[a]	84.61±0.71[a]	11.1±0.4[a]
95%WF+ 5%GS P	12.21±0.16[a]	0.58±0.01[a]	3.92±0.08[c]	2.28±0.12[c]	81.01±0.51[b]	10.92±0.13[a]

90%WF+ 10% GS P	11.99±0.26[ab]	0.6±0.05[a]	7.03±0.47[b]	2.99±0.06[b]	77.39±0.8[c]	10.73±0.48[a]
85%%WF+ 15% GS P	11.75±0.3[b]	0.62±0.05[a]	10.15±0.35[a]	3.7±0.3[a]	73.78±1.28[d]	10.54±0.19[a]
LSD	0.5146	0.0731	0.5571	0.31	0.6269	1.6465

(C)

Raw material	Moisture	Crude proteins	Crude fibers	Ash	Fat	Total carbohydrates
Control (WF 72% ext.)	12.46±0.34[a]	0.57±0.03[d]	0.79±0.02[e]	1.57±0.02[a]	84.61±0.71[a]	11.1±0.4[a]
90%(WF+ 10%TP P	12.20±0.7[a]	0.93±0.18[a]	5.97±0.28[d]	1.66±0.04[c]	79.25±0.77[b]	10.99±0.26[a]
80%(WF+ 20%T P P	11.95±0.3[ab]	1.34±0.16[a]	11.16±0.39[c]	1.77±0.03[ac]	73.78±0.32[c]	10.88±0.11[a]
70%(WF+ 30%TP P	11.70±0.25[ab]	1.67±0.12[a]	16.36±0.54[b]	1.86±0.14[ab]	68.41±0.49[d]	10.78±0.21[a]
60%(WF+40%TP P	11.43±0.62[ab]	2.04±0.3[a]	21.53±0.47[a]	1.96±0.29[a]	63.04±1.46[e]	10.67±0.17[a]
LSD	0.866	0.8248	0.7015	0.2656	1.5375	0.455

* Mean of triplicate determination ± standard deviation. .
** Calculated by difference.
*** Values with different superscripts in every column are significantly different (P>0.05).
****LSD =least significant difference.
WF 72% ext.= wheat flour 72% extraction , (A) DO.A= dry orange albedo, (B) GSPguava seed power and(C)TPP Tomato peel power

Minerals content of spaghetti replacement with dry orange albedo, guava seed powder and tomato peel powder:

Spaghetti replacement with dry orange albedo:

In **Table** show (6) effect of replacing wheat flour 72% ext. by dry orange albedo substitution level 5,10,15 and 20% respectively resulted in increasing of concentrations of macro element K, Ca, Na,P and increasing of concentrations of micro element Fe, Zn.

(K, Ca, Na, P) constituted the major essential major element in dry orange albedo substituted at 5,10,15 and 20% , in spaghetti prepared form WF 72% ext. (125, 135,145.3 and 155.4), (45.82,77.4.105.76 and 134.48), (5.67,7.56,9.34 and 11.12) and (44.97 , 46.26 , 47.53 and 48.82)Successively in spaghetti, compared of spaghetti control with 72%ext.(115.00, 19.60,4.01 and 43.70) of concentrations of macro element higher K, Ca, Na and Palso increased in concentrations of micro element Fe, Zn to all samples.

These results are well in line. **Abd el slam *etal.,(*2005).** who noticed dry orange albedo at levels of 5, 10,and 15 % replacing wheat flour 72% ext. to product paste that the observed increase in the minerals content of their corresponding prepared paste

Spaghetti replacement with guava seed powder:

Table (6): show effect of replacing WF 72% ext. by guava seed powder. The inclusion of guava seed powder prepared spaghetti, regardless of its substitution level 5, 10 and15% respectively in from guava seedpowder72% ext. resulted in increasing of concentrations of macro element K, Ca, Na and P increasing of concentrations of micro element(Fe) constituted the major essential major element in guava seed powder substituted at 5,10 and15% in spaghetti, prepared form WF 72% ext. on the other hand(Zn) constituted lower concentrations

In agreement to the obtained results were confirmed by those obtained by **Ahmed *et al.,* (2011)** noticed that the minerals such as calcium, potassium, iron, and zinc are considered as essential elements to human in guava seeds flour. The inclusion of guava seeds in spaghetti, regardless of its substitution level 1, 2,3 and 4% respectively in from guava seeds72% ext.

Spaghetti replacement with tomato peels:

Table (6): show effect of replacing WF 72% ext. by tomato peels. The inclusion of tomato peel powder in spaghetti, regardless of its substitution level 10,20,30 and40% respectively. Resulted in increasing of concentrations of macro and micro element K, Ca, Na and P and Fe, Zn Compared with WF 72% ext.K(135.8,156.6,176.9and198.2mg/100g),Ca(31.82 ,44.10,56.36and68.60mg/100g),Na(35.80,67.60,99.4 0and131.202mg/100g) and P (75.53,107.36, 139.19and 171.022mg/100g) respectively compared of spaghetti control with 72% ext. and micro element Fe (1.53, 1.86, 2.19 and 2.52 mg/100g) and Zn (1.79, 2.79, 3.79 and 5.06 mg/100g)these results were agreement by **Martinez *et al,*. (2002).**

Cooking quality properties:

Spaghetti replacement with dry orang albedo:

In addition values for the cooking quality properties were increased by the increasing level of substitution where weight gain reached 190, 195, 210 and 281% respectively. In the spaghetti with substitution dry orange albedo. Volume gain were also increased to 198, 204, 214 and 216%., respectively.

Similarly, cooking loos values were increased: 7.07, 7.4, 7.6and 10.1% compared with control (182, 190 and 6.80%) respectively The results for cooking quality are agreement with by those obtained by **Abd el slam *etal.,(*2005).**who reported that replacing of orange albedo layer at different levels increased volume, possibly because of its higher content in crude fibers.

The inclusion and substitution of wheat flour by orange albedo flour at levels of 5.10, 15and 20% increased firmness values by increasing level of substitution where it reached 2.13, 2.17, 2.25and 2.99kg/cm^2 compared with control in spaghetti 1.45 kg/cm^2

Cooking loos was increased to 7.07, 7.4, 7.6and 10.1, respectively.

The results for cooking quality are agreement with by those obtained by Abd el **slam *et al.*(2005)**she reported that replacing of orange albedo layer at different levels increased volume, possibly because of its higher content in crude fibers.

Spaghetti replacement with guava seeds powder:

Table(6) show effect of adding different ratios from milled guava seed on spaghetti cooking properties that show cooking quality(Cooking loos %, volume gain %, weight gain % and firmness %) prepared from wheat flour 72% extraction substituted by different levels of some natural products (5,10,and 15%),increased firmness values by increasing level of substitution where it reached 2.5, 2.7, and 3kg/cm^2 in the 72% ext. Compared with control in spaghetti 1.45 kg/cm^2

In addition values for the cooking quality properties were increased by the inclusion and increasing level of substitution where weight gain reached 185, 190and 195% respectively In the 72% ext., volume gain were also increased to 195, 198 and 200% in the 72% ext. Group, respectively. Similarly, cooking loos values were increased 6, 7and 9.5% in the 72% ext. group, respectively

It was clear from the recorded data that increasing the addition level of guava seeds flour to wheat flour 72% ext. Used for preparing Spaghetti increased the absorbed water, so the volume gain was also increased of cooked spaghetti. In spite of that the resultant Spaghetti which containing 5, 10 and 15% guava seeds flour recorded good grade as cooking quality. In agreement to the obtained results were confirmed by those obtained by **Haiat *et al.*,(2012) and Ahmed *et al.*, (2011)**

Table 6. Effect of replacing wheat flour with some processing wastes

Raw material	Mineral concentration (mg/100 g)					
	Macro elements				Micro elements	
	K	Ca	Na	P	Fe	Zn
Wheat flour 72% exit	115 ± 2^{e}	19.6 ± 0.3^{e}	4.01 ± 0.07^{e}	43.70 ± 0.8^{a}	1.20 ± 0.2^{c}	0.79 ± 0.05^{a}
95%W.F+5% DOA	125 ± 4^{d}	45.82 ± 268^{d}	5.76 ± 0.49^{d}	44.97 ± 1.77^{a}	1.56 ± 0.34^{bc}	0.82 ± 0.07^{b}
90%W.F+10% DOA	135 ± 4^{c}	77.4 ± 2.2^{c}	7.56 ± 0.34^{c}	46.26 ± 1.76^{a}	2.08 ± 0.93^{ab}	0.87 ± 0.12^{b}
85%W.F+15% DOA	145.3 ± 1.2^{b}	105.76 ± 0.74^{b}	9.34 ± 0.16^{b}	47.53 ± 0.47^{a}	2.51 ± 0.24^{a}	0.89 ± 0.07^{b}
80%W.F+20% DOA	155.4 ± 4.8^{a}	134.48 ± 4.98^{a}	11.12 ± 1.37^{a}	48.82 ± 7.32^{a}	2.95 ± 0.86^{a}	0.92 ± 0.08^{b}
LSD	6.3273	4.9796	1.2239	6.3374	1.0827	0.1383
Guava seeds						
Wheat flour 72% exit	115 ± 2^{e}	19.6 ± 0.3^{e}	4.01 ± 0.07^{e}	43.70 ± 0.8^{a}	1.20 ± 0.2^{c}	0.79 ± 0.05^{a}
95%W.F+5% G.S P	126.45 ± 5.7^{c}	38.22 ± 5.72^{c}	19.64 ± 1.6^{c}	52.04 ± 3.76^{c}	2.7 ± 0.5^{c}	0.75 ± 0.03^{b}
90%W.F+10% G.S P	137.9 ± 1.4^{b}	56.82 ± 5.83^{b}	35.26 ± 0.46^{b}	62.58 ± 1.33^{b}	4.14 ± 0.36^{b}	0.71 ± 0.02^{ab}
85%W.F+15% G.S P	199.35 ± 6.85^{a}	75.46 ± 4.66^{a}	50.89 ± 3.61^{a}	68.75 ± 0.05^{a}	5.68 ± 0.22^{a}	0.67 ± 0.05^{c}
LSD	8.6956	8.8527	3.8481	4.5704	0.6177	0.0692
Tomato peels						
Wheat flour 72% exit	115 ± 2^{e}	19.6 ± 0.3^{e}	4.01 ± 0.07^{e}	43.70 ± 0.8^{a}	1.20 ± 0.2^{c}	0.79 ± 0.05^{a}
90%W.F+10% TP P	135.8 ± 3.9^{d}	31.82 ± 3.02^{d}	35.8 ± 3.2^{d}	75.53 ± 3.23^{d}	1.53 ± 0.03^{c}	1.79 ± 0.29^{d}
80%W.F+20% TP P	156.6 ± 3.3^{c}	44.10 ± 4.3^{c}	67.60 ± 2.9^{c}	107.36 ± 3.24^{c}	1.86 ± 0.42^{b}	2.79 ± 0.21^{c}
70%W.F+30% TP P	176.6 ± 0.9^{b}	56.36 ± 1.54^{b}	99.4 ± 0.8^{b}	139.19 ± 2.06^{b}	2.19 ± 0.06^{c}	3.79 ± 0.11^{b}
60%W.F+40% TP P	198.2 ± 4.3^{a}	68.6 ± 3.3^{a}	131.2 ± 3.2^{a}	171.02 ± 3.8^{a}	2.52 ± 0.38^{a}	5.06 ± 0.69^{a}
LSD	5.7184	5.2072	4.42216	5.0568	0.4658	0.6396

LSD =least significant difference.,WF 72% ext.= wheat flour 72% extraction , DOA= dry orange albedo, GS P guava seed power and TPP Tomato peel power. K= potassium, Ca= calcium, Na= Sodium, P= Phosphor,Fe= Iron and Zn = zinc

Spaghetti replacement with tomato peel powder:

Table (7) Effect of adding different ratio from milled tomato peel powder on spaghetti cooking properties show cooking quality (Cooking loos %, volume gain weight gain % , and firmness %) prepared from wheat flour 72% extraction substituted by different levels of some natural products (10,20,30 and40% in 10-12 min. The inclusion and substitution of wheat flour by tomato peel powder at different levels increased firmness values by increasing level of substitution where it reached 2.00,2.5,2.7and 3.00kg/cm^2 in the 72% ext. Compared WF72% ext. control in spaghetti 1.45 kg/cm^2

In addition values for the cooking quality properties were increased by the inclusion and increasing level of substitution where weight gain reached 185,190,196 and 205% respectively in the 72% ext.

Volume gain and weight gain were also increased to 193,197,209and 215% and 185,190,196 and 205% in the 72% ext. group, respectively

Similarly, cooking loos values were increased: 5, 5.9, 7.2 and 9% in the 72% ext. group, successively. These results were agreement **Marwa, (2013).**

Table 7. Effect of Adding different ratios from milled) with some product wastes

Parameter	cooking time in min	Firmness (kg/cm²)	Cooking quality properties		
			Weight gain (%)	Volume gain(%)	Cooking loss(%)
WF 72% ext	10 -12 min	1.45	182	190	4.7
95%W.F+5% DOA	10 -12 min	2.13	190	198	7.07
90%W.F+10% DOA	10 -12 min	2.17	195	204	7.4
85%W.F+15% DOA	10 - 12 min	2.25	210	214	7.6
80%W.F+20% DOA	10 - 12 min	2.99	281	286	10.1
Guava seeds					
WF 72% ext	10 -12 min	1.45	182	190	4.7
95%W.F+5% GS P	10 -12 min	2.5	185	195	6
90%W.F+10% GS P	10 -12 min	2.7	190	198	7
85%W.F+15% GS P	10 - 12 min	3	195	200	9.5
Tomato peel					
WF 72% ext	10 -12 min	1.45	182	190	4.7
90%W.F+10% TPP	10 -12 min	2.00	185	193	5
80%W.F+20% TPP	10 -12 min	2.5	190	197	5.9
70%W.F+30% TPP	10 - 12 min	2.7	196	209	7.2
60%W.F+40% TPP	10 - 12 min	3.00	205	215	9.00

WF 72% ext.= wheat flour 72% extraction , DO.A= dry orange albedo, G.SPguava seed power and TPP Tomato peel power

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الجدوى التكنولوجية لاعداد الاسباجتى الغنية ببعض المنتجات الثانوية للاغذية المصنعة فى مصر

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كلية الزراعة– مشتهر – قسم الصناعات الغذائية – جامعة بنها.

أجرى هذاالبحث بهدف إنتاج مكرونة اسباجتى مرتفعة في محتواها من الاليافحيث تم استخدام مخلفات التصتيع الغذائى المتبقى من مصانع الاغذية مثل مخلف البرتقال (الالبيدو) وبذو الجوافة وقشور الطماطم كمادة خام لانتاج الألياف الغذائية لتصنيع المكرونة وذلك باستخدام دقيق القمح أستخراج% 72 بنسب5% و١٠, ١٥%و٢٠%من البيدو البرتقال و ٥% و١٠% و١٥% من بذور الجوافة ١٠%و٢٠%و٣٠%و٤٠%من قشور الطماطم كما تم التحليل الكيماوى (البروتين الخام –الرماد– الألياف الخام – الدهن – الرطوبة) وتحليل المعادن (البوتاسيوم– الكالسيوم – الصوديوم – الكالسيوم – الحديد – الزنك) للمواد الخام و المكرونة المصنعة وأظهرت جميع النتائج للمكرونة الأسباجتى أن أفضل النسب من التقيم الحسى ١٥% فى البرتقال الخام(الالبيدو) و١٠% فى وبذو الجوافة و٣٠% فى قشور الطماطم وتم بعد ذلك أجراء الاختبارات الرويرلوجية على جهازى الفارينوجراف والاكستنسوجرافحيث لوحظ انه بزيادة النسبة المضافة من الالياف عند تصنيع المكرونة يزداد كل من نسبة الامتصاص للماء و زمن تطور العجينوضعف العجينة على العكس من يقل ثبات العجينة والرقم النسبى على تلك العينات المختارة وكذلك اجراء خصائص جودة الطبخ للعينات كلها (زيادة الوزن – زيادة فى الحجم – الفقد فى الطبخ– قوة القطع).