Archives of Agriculture Sciences Journal
Print ISSN: 2535-1680
Online ISSN: 2535-1699

ARCHIVES OF AGRICULTURE SCIENCES JOURNAL

Volume 5, Issue 1, 2022, Pages 88–103

Available online at www.agricuta.edu.eg

DOI: https://dx.doi.org/10.21608/aasj.2022.236578

The physicochemical and functional properties of red grape and peanut skin powders

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Abstract

Processing of fruits, vegetables, and oilseeds results in high amounts of by-products. The purpose of this study is to investigate the physicochemical and techno-functional properties of grape (GS) and peanut skin (PS) by-products. Moisture, protein, fat, fiber, ash and carbohydrate of GS and PS powders were (7.37 and 2.34%), (6.76 and 5.59%), (2.55 and 20.68%), (12.91 and 14.19%), (6.62 and 1.87%) and (63.79 and 55.33%), respectively. Total phenolic compounds (TPC), flavonoids and antioxidant activity (DPPH radical scavenging) of GS and PS powders were (41.60 and 212.21 mg GE⁄gm d.w.), (3.99 and 16.83 mg quercetin equivalent⁄gm d.w.) and (10.88 and 63.30%), respectively. Both GS and PS powders had remarkable color attributes with promising role as a food natural colorant. GS powder has reddish–purple color with *L** (lightness) value by (46.93), *a** (redness) value (7.64), and *b**(yellowness) value (6.87). While PS powder color ranging from light brown to deep red, with values of *L**, *a** and *b** were (60.83, 9.23 and 16.77), respectively. Functional properties of the GS and PS powders (mesh 60 = 0.25 mm), both powders exhibited bulk density (0.999 and 0.457 g/ml), water absorption index (2.87 and 4.02 g/g), water solubility index (0.51 and 0.08 %), oil absorption index (1.50 and 1.70 ml/g) and swelling index (1.06 and 1.20 ml/g) for GS and PS powder respectively. Considering these results, it's clear that the GS and PS powders can provide an inexpensive source of dietary fibers and polyphenols for use as functional ingredients in foods or dietary supplements. Moreover, they had distinguished techno-functional properties. Such findings could introduce/valorize the GS and PS powders to play technological and health promoting desirable roles in many food products.

Keywords: by-products, red grape skin, peanut skin, dietary fiber, phenolic compounds, antioxidant activity.

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1. Introduction

Processing of fruits, vegetables, and oilseeds results in high amounts of waste materials such as peels, seeds, stones, and oilseed meals. Plant waste is prone to microbial spoilage; therefore, drying is necessary before further exploitation. The cost of drying, storage, and transport poses additional economical limitations to waste utilization. Therefore, agro-industrial waste often is utilized as feed or fertilizer (Gouw *et al*., 2017). Such waste products are high in dietary fiber, polyphenols, tocopherol, carotenoids, and so on (Lucera *et al*., 2018). Fruit and vegetable wastes offer strong potential as a functional additive to many food products, which reduces the use of artificial food additives by replacing them with natural additives extracted from plant wastes (Majerska *et al*., 2019). Processing of grapes (*Vitis vinifera*) produces approximately 20% of the weight of grapes processed as grape pomace. Grape skins (peels) are the major component of grape pomaces accounting for about half of its mass (Mendes *et al*., 2013). Grape skin contains high amounts of anthocyanins and tannins with a higher polymerization degree and a lower amount of gallates (Walker *et al*., 2014). Grape byproducts are recognized as a source of polyphenolic compounds, the amount depending on the grape variety, the processing conditions, and the extraction method (Iuga and Mironeasa, 2020). Protocatechuic and gallic acid are the most dominant hydroxybenzoic derivative acids present in grapes skins. Chlorogenic acid is detected in skins from red varieties (Di Lecce *et al*., 2014). Anthocyanins are class of phenolics mainly found in the grape skins, malvidin-3-O-glucoside is the most valuable anthocyanin found in grape skins, followed by peonidin-3-O-glucoside. Quercetin derivatives are also present in white and red grape skins (Ky *et al*., 2014). Groundnut (*Arachis hypogaea* L.) is popularly known as peanut. It is a herbaceous annual legume belongs to the family Fabaceae (*Leguminosae*), and it is the third most important oilseed crop in the world and cultivated in tropical and subtropical regions (Toomer, 2018). Peanut contains an average skin content of 2.6%. Dry blanching is the most used practice to separate skins from peanut kernels. Blanching temperatures can range from 94°C to 175°C. During heat treatment, the brown peanut color that is formed increases due to sugar amino acid reactions, Millard browning, with subsequent production of melanoidins, therefore, heat increases the antioxidant capacity of peanut skins (Sobolev and Cole, 2004). Over 0.74 million metric tons of peanut skins are produced annually worldwide as a by-product of the peanut processing industry**.** Usually, only a little peanut skin is utilized to extract polyphenolic compounds or make the cattle feed, most of the skins are as the wastes of peanut processing industry and discarded (Sobolev and Cole, 2004). Peanut skin contains 12% protein, 16% fat, and 72% carbohydrates providing approximately 140–150 mg/g dry skin of total phenolic compounds. The predominate phenolic compounds found within peanut skin include catechins and procyanidins as highly active antioxidants (Toomer, 2018). Peanut skins can provide an inexpensive source of polyphenols for use as functional ingredients in foods or dietary supplements and make a positive contribution to the nation's health (Zhao *et al*., 2012). Flavonoids found in peanut skin grape seeds and are major components that have been demonstrated to have multiple human health benefits, such as lower LDL level of serum/liver, inhibition of LDL oxidation thus preventing cardiovascular diseases, protection of DNA from free radical attack leading to lower the risk of cancer, inhibition of the release of histamine thereby preventing inflammation (Yu *et al*., 2005). Therefore, this work was aimed to studding the physicochemical and functional properties of red grape and peanut skin powders.

2. Materials and methods

2.1 Materials

2.1.1 Grape pomace

Flame seedless red grapes pomace (*Vitis vinifera*) was obtained from a local fruit juice, pulp and concentrate factory (Al-Shams Agro Group - Wadi Al-Molak, Al-Tal Al-Kaber, Ismailia, Egypt).

2.1.2 Peanut skin

Virginia type peanut (*Arachis hypogaea*) skin (seed testa) was obtained from a local processing plant (Green Valley, Saleheyah Al Gadidah, Ismailia, Egypt).

2.2 Methods

2.2.1 Preparation of grape skin powder (GS)

Grape skins were uniformly spread in a thin layer upon stainless steel trays. The drying process was carried out in a convective dryer (WT-binder, Type F115, Germany) at drying air temperature (45 ºC) for 24 hours. Dried grape skin flakes were finely milled by grinder (Moulinex Blender model, LM2421, France), then sieved through mesh 60 (0.25 mm). The dried grape skin (GS) powder was kept in sealed polyethylene bags and stored at -18 ºC until used (Pedroza *et al*., 2011).

2.2.2 Preparation of peanut skin powder (PS)

The roasted kernels (roasted at 165 ºC for 15 minutes) were mechanically peeled. Peanut skins were mechanically separated and finely milled using a grinder, then sieved through mesh 60 (0.25 mm). The dried peanut skin (PS) powder was kept in sealed polyethylene bags and stored at -18 ºC until used (Yu *et al*., 2005).

2.2.3 Chemical analysis

Moisture, crude protein, fat, crude fiber, and ash contents of samples were determined according to the methods described in the AOAC (2005). Carbohydrates were calculated by difference.

2.2.4 Functional properties of grape skin (GS) and peanut skin (PS) powders

Bulk density (BD), water absorption index (WAI), water solubility index (WSI), oil absorption index (OAI), swelling index (SI), foaming capacity (FC) and foam stability of the GS and PS powders were determined according to the method of Mokhtar *et al*. (2018).

2.2.5 pH determination

pH values of GS and PS powders were determined by using a Jenway pH meter (Jenway 3010; Jenway Ltd., Essex, UK). According to the method of Bozkurt (2006).

2.2.6 Instrumental color measurement

The measurement of (CIE) color values *L** (lightness), *a** (redness) and *b** (yellowness) of GS and PS powders were measured using a color reader CR-10 (Konica Minolta, Inc., Osaka, Japan). according to the CIE LAB system (Muñoz-Arrieta *et al*., 2021).

2.2.7 Extraction and determination of total phenolics (TP)

Total phenolics of GS and PS powders were extracted and determined according to the Folin – Ciocalteu method (Beres *et al*., 2016).

2.2.8 Determination of antioxidant activity

Antioxidant activity of GS and PS powders were determined by 2, 2-diphenyl-1-picrylhydrazyl (DPPH) method according to Hamed *et al*. (2019).

2.2.9 Determination of flavonoids content

Flavonoids contents of GS and PS powders were determined according to the reported method (Hamed *et al*., 2019).

3. Results and Discussion

3.1 3.1. Chemical composition of grape and peanut skins powder

Table (1) shows the chemical composition of dried GS and PS powders. The data shows that moisture content of grape skin powder is 7.37%, which on the line with the findings of Tseng and Zhao (2012) who reported that the moisture content of dried grape pomace was ranged between 4.40 and 7.65% for two varieties of grapes. Also, these results were consistent with that reported by De Torres *et al*. (2010) who reported that moisture content of grape skin powder 5.1 and 5.4% in grape skins dehydrated at oven 60 ˚C and freeze dried, respectively (de Torres *et al*., 2010). similarly, Samah *et al*. (2012) reported that moisture content of dried grape peels was 7.28 g/100 g. The data presented in table (2) also shows that, the moisture content of peanut skin (PS) is 2.34%. These results are in agreement with Muñoz-Arrieta *et al*. (2021) who reported that low moisture content (9.71 to 11.0 %) of spanish, valencia, and virginia type peanut skins, make it a non-perishable by-product. Regarding protein content, the results show that GS is containing 6.76% protein which is comparable with that reported by Maurer *et al*. (2019) who found that the protein content of dried grape peels was (6.1 g/100 g) and Samah *et al*. (2012) who claimed that grape skin is containing 6.9 g protein /100 g. But the protein content which reported in this research is lower than that found by Kuchtová *et al*. (2018) who reported that protein content of grape skin is 8.41 g/100 g. On the other hand, Table (1) shows that PS powder is containing lower protein content that reported for GS (5.59 g/ 100g). Such findings coincides with that obtained by De Camargo *et al*. (2014) who found that the protein content in peanut skins was (4.66 g/ 100g), while, other authors reported higher levels of protein for peanut skin since, Muñoz-Arrieta *et al*. (2021) reported protein for peanut skins ranged from 8.88 to 12.7 g/ 100g, while Sulieman *et al*. (2014) reported that protein content of peanut skin is 9.2 g/ 100g. similarly, Nepote *et al*. (2002) found high levels of protein content in the peanut skins (12.32 g/ 100g). Also, Table (1) show that GS powder has fat content (2.55 g/100 g), which is slightly lower than those recorded by Maurer *et al*. (2019) who denoted that lipid content of grape peels powder was (3.6 g/ 100g), but it is higher than that reported by Kuchtová *et al*. (2018) who mentioned that protein content of grape skin powder was 1.04 g/ 100g.

Table (1): Chemical composition of Grape and Peanut skin powders (means ± S.D).

Component (%)	GS	PS
Moisture	7.37 ±0.142	2.34 ±0.268
Protein	6.76 ±0.075	5.59 ±0.040
Fat	2.55 ±0.966	20.68 ±0.155
Fiber	12.91 ±0.220	14.19 ±0.291
Ash	6.62 ±0.541	1.87 ±0.196
Carbohydrates*	63.79	55.33

*Carbohydrates calculated by difference. Values are means ± SD of three replicates.

On contrary, peanut skin powder was exhibit a very high level of fat content (20.68%). These results are higher than that reported by Nepote *et al*. (2002) who demonstrated that fat content in PS powder was 16.60 g/ 100 g. But Muñoz-Arrieta *et al*. (2021) was reported that fat content in PS ranged from 9.59 to 10.2 g/100 g. The high level of fat in PS powder could be attributed to the absorption of peanut oil from the peanut kernel seed by the peanut skin. According to Mohebpour (2021) during the process of roasting, oils contained within peanuts migrate to the surface of the seed. In peanut roasting, soluble proteins and amino acids are changed as a result of moisture losses and form Millard derivatives, including pyrroles and furans which may contribute to the increased in total phenolic compounds of roasted samples (Yanagimoto *et al*., 2002). The data also show that GS had high level of fiber 12.91%, which is in a good agreement with result (13.28 g/100 g) obtained by Oprea *et al*. (2018), and higher than (7.33 g/ 100 g) which obtained by Samah *et al*. (2012). The same trend was observed for PS which exhibit high level of fiber 14.19%. Also, PS contained low levels of ash (1.87%), but grape skin powder contained a high level (6.62%). In the works of De Camargo *et al*. (2014) and Nepote *et al*. (2002) were reported that the peanut skins (PS) have ash content by (2.89 and 2.83 g/ 100 g) respectively. Whereas Sulieman *et al*. (2014) stated that the PS contains high content of ash (9.42 g/ 100 g). Regarding, ash content GS powder ash content was showed high ash content (6.62 g/100 g), which is close related with results obtained by Maurer *et al*. (2019) who reported that, the ash content of GS powder is 6.1 %, while, Kuchtová *et al*. (2018) recorded that, the ash content of grape peel powder is 6.4%. Similarly, Mildner-Szkudlarz *et al*. (2011) indicated that grape skin powder is containing 6.78 g/100g ash. On the other hand, peanut skin powder exhibited lower ash content 1.87% which in agree with the finding of Nepote *et al*. (2002) who found that ash content of peanut skin is 2.83 g/ 100g. Muñoz-Arrieta *et al*. (2021) found that the levels of ash in PS ranged from (2.07 to 2.13 g/ 100g d.w.). GS and PS powders had high levels of carbohydrates (63.79 and 55.33% respectively). These results agreed with Oprea *et al*. (2018) who found that the grape skin flour contains 58.07 g/100 g carbohydrates. While Nepote *et al*. (2002) found that carbohydrates content of peanut skin is 69.8 g/ 100 g.

3.2 Total phenolic compounds, flavonoids and antioxidant activity

Table (2) shows the total phenolic and flavonoids content of grape skin. The data shows that total phenolic content of grape skin powder is 41.60 mg GAE/g. These findings agree with that of Lavelli *et al*. (2017) who demonstrated that the total phenolic content of grape skins (Barbera variety) was (43.9 g GAE/kg), also, Spigno and De Faveri (2007) obtained polyphenols yield at 42.5 mg/g GAE in Barbera red grape pomace. In contrary, the obtained results were higher than that recorded by Mildner-Szkudlarz *et al*. (2013**)** who denoted that the TPC of white grape skins was (31.22 g GAE/kg), and those obtained (36.25 and 34.9 mg GAE/g DM) (Llobera and Cañellas, 2008; Makris *et al*., 2007) in grape skin powder. On the other hand, the current result is lower than the result obtained from (Mildner-Szkudlarz *et al*., 2011). Also, Gülcü *et al*. (2019) investigated the use of grape skins as a source of phenolic compounds in sourdough and found that the total phenolic compounds content was (58.9 mg GAE/g). Table (2) also shows that PS contains high level of total phenolic compounds (TPC) (212.21 mg GAE/g), which is higher than that reported by Nepote *et al*. (2002) who found that peanut skin contains (114.8 mg TPC/g).

Table (2): Total phenolic compounds (TPC), flavonoids and antioxidant activity (means ± S.D).

Component/Parameter	GS	PS
TPC (mg GE/gm d.w.)	41.60 ±1.024	212.21 ±5.60
Flavonoids (mg QE/ gm d.w.)	3.99 ±0.110	16.83 ±0.231
DPPH (%)	10.88 ±1.357	63.30 ±3.908

Values are means ± SD of three replicates.

Similarly, Yu *et al*. (2005) found that one-gram dry peanut skin contained (90-125 mg GAE/g) of total phenols. From Table (2), flavonoid content (FC) in GS and PS powders were (3.99 and 16.83 QE⁄ gm respectively). The obtained flavonoids content in GS powder was lower than those reported by Pasini Deolindo *et al*. (2019) and Guaita *et al*. (2021) (15.04 and 14.00 mg CE⁄g respectively), but it was higher than that denoted by Nile *et al*. (2013) which varied from (201.5 µg/g) to (462.7 µg/g) fresh weight. The illustrated flavonoid content for the PS powder (16.83 mg QE⁄gm) was in harmony with that determined by Braga *et al*. (2016) (16.14 mg QE⁄g d.w.). On the other hand, the observed findings for FC in PS powder were higher than that described by de Camargo *et al*. (2017) (4.959 µg/g d.w.). Moreover**,** Larrauri *et al*. (2016) was revealed that the flavonoid content in peanut skins ranged from **(**13.07 to 21.56 mg CE/g d.w.). Table (2) shows also the antioxidant activity determined by DPPH (2,2-Diphenyl-1-picrylhydrazyl) the most commonly used test in the evaluation of antioxidant activity, which can be attributed to its reduced cost in comparison to most methods and the simplicity and short required times. Both GS and PS exhibited remarkable antioxidant activity percent of 10.88 and 63.30%, respectively. In general, in this study, there was a positive correlation existed between TPC and DPPH scavenging assay. The obtained AOA result was comparable with that reported by Nile *et al*. (2013) who mentioned that the AOA of the grape extract (Ruby Seedless) for red grape skins was 12.5%. Also., the obtained AOA was higher than those highlighted in the research made by Deng *et al*. (2011) who examined the TPC in the skins of three varieties of red grapes (Cabernet Sauvignon, Merlot and Pinot Noir) and reported (21.4 to 26.7 mg GAE/g d.m.) with DPPH radical scavenging activity by (32.2 - 40.2 mg AAE/g d.m.), and higher than those reported by Hogan *et al*. (2010), (30.4 mg GAE/g), on the contrary, DPPH assay exhibited higher scavenging activity than percent reported here (66.1% vs 10.88%). Phenolic content of the PS powder (212.21 mg GAE/g d.w.) exhibited AOA by (63.30%), it was comparable to that phenolic content of PS powder (157.29 mg GAE /g d.w.) with AOA (68.49%) reported by Albergamo *et al*. (2021). Moreover, the obtained AOA for PS powder by (63.30%) had high scavenging activity for extraction of (20 mg/20 ml w/v) when compared with findings of Win *et al*. (2011) who reported AOA by (89.97%) for extraction of (2000 mg/ 20 ml w/v). Also., it was higher than those found by Munekata *et al*. (2016) for phenolic content (32.6 mg GAE/g d.w.) with AOA (64.50%) assayed in (3000 mg/ 30 ml w/v) ethanolic extract.

3.3 Physical properties of peanut and grape skins powder

Regarding to the pH values introduced in Table (3), results indicated that GS had lower pH value (3.95) as compared to that of PS (4.95). Similar results were obtained by Demirkol and Tarakci (2018) who reported that the pH values of grape (*Vitis labrusca* L.) pomace, were between (3.17) and (3.33) in the samples dried by different methods (*i.e.* oven dried and freeze dried). Also, Riazi *et al*. (2016) observed that pH value for red grape pomace was (3.80). Furthermore, Sadovoy *et al*. (2011) found that the active acidity (pH) of grape marc equaled to (3.86).

Table (3): Physical properties of peanut and grape skins powder (means ± S.D).

Parameter		GS	PS
pH - values		3.95 ±0.035	4.95 ±0.010
Color[1]	*L**	46.93 ±0.687	60.83 ±0.048
	*a**	7.64 ±0.369	9.23 ±0.048
	*b**	6.87 ±0.048	16.77 ±0.095

GS = grape skin powder, PS =peanut skin powder; *L** (lightness), *a**(redness), *b** (yellowness). [1]Values are means ± SD of seven replicates.

Also, Table (3) demonstrate that GS powder has *L** (lightness) value by (46.93), *a** (redness) value (7.64), and *b** (yellowness) value (6.87). These findings are in a close agreement with that presented by Pedroza *et al*. (2012) who observed that the oven dried (60 °C - until constant moisture) grape skinsha kept their reddish–purple color. Riazi *et al*. (2016) cleared in their work, that the color values of grape pomace were (25.45, 15.05 and 6.75) for *L**, *a** and *b**, respectively. The authors suggested that the dried grape pomace, can be classified as dark and green source of pigments. In contrast the CIELAB color values for GS powder in this study, indicate the color can by recognized as dark and red to purple source of pigments. This is most likely due to the environmental conditions such as grape growing, type of variety, soil/fertilizer, processing conditions, as well as dehydration method can affect these results. The obtained results in Table (3) reveal that PS powder have values of *L** (lightness), *a** (redness) and *b** (yellowness) were (60.83, 9.23 and 16.77) respectively. Chukwumah *et al*. (2009) reported that peanut skins have colors ranging from light brown to deep red, in his study was investigated the potential of PS color in 27 peanut cultivars as a biomarker for polyphenol content and antioxidant capacity. The values of *L** (lightness) and *b** (yellowness) for all cultivars were (54.63 to 32.7) and (25.67 to 13.58), respectively. The values of *a** were from (12.97 to 24.96). Muñoz-Arrieta *et al*. (2021) determined *CIE* Lab values (*L**, *a**, *b**) for three types of peanut skins (Spanish, Valencia and Virginia) and found *L** and *b** values, which indicate the darkness of the skins, for the three PS were (44.1, 34.7 and 39.1) and (22.7, 14.9 and 20.4), respectively. The *a** value, which indicates the redness of the skins, for the three PS were (15.0, 21.8 and 13.9) respectively. The Spanish and Virginia varieties had higher *L** and *b** values than the Valencia variety. The Valencia variety had higher *a** values than the Spanish and Virginia varieties. The evaluation of color of the PS powders is important because functional foods supplemented with PS could affect the color of the final product. Visual observance of GS and PS powders are showed in Figure (1).

Figure (1): Visual observance of GS and PS powders.

3.4 Functional properties of PS and GS powders

Functional properties of the GS and PS powders (mesh 60 = 0.25 mm) are presented in Table (4). Both powders exhibited bulk density (0.999 and 0.457 g/ml), water absorption index (2.87 and 4.02 g/g), water solubility index (0.51 and 0.08 %), oil absorption index (1.50 and 1.70 ml/g) and swelling index (1.06 and 1.20 ml/g) for GS and PS powder respectively. Moreover, foaming capacity and stability for GS powder were (2.97%) and (2.40%) respectively. On the other hand, observe foaming capacity and stability for PS powder haven’t observed. The recorded bulk density value for GS powder in this study, was two-fold higher than those found by Zhao *et al*. (2015) who found that, the bulk and tap density values for grape pomace powder (0.50 g/ml). As shown in Table (4), the low bulk density (0.457 g/ml) of PS powder in this study, was to some extent, in agreement with data collected by Embaby and Rayan (2016) who analyzed the acacia seed flour (ASF), bulk density values ranged (0.493-0.532 g/ml). The obtained value for bulk density was also., in the range reported by Appiah *et al*. (2011) for *Artocarpus altilis* flour (0.460 - 0.570 g/ml), in addition to, the bulk density was within range (0.490 -

0.93 g/cm3) reported for yam flours as affected by different drying methods (Hsu *et al*., 2003). On the contrary, the documented value of bulk density was lower than Mokhtar *et al*., (2018) for golden berry waste powder (GBWP) (0.63 g/ml). The values of water absorption (WAI), water solubility (WSI) and oil absorption (OAI) indexes in GS powder were (2.87 g/g, 0.51% and 1.50 ml/g respectively) and for PS powder were (4.02 g/g, 0.08% and 1.70 ml/g respectively). Clearly, the level of oil absorption index in both GS and PS powders were lower than water absorption index, and this may be due to the presence of a high number of hydrophilic groups which can bind water, and to the high level of soluble fibers which have high ability of water absorption. Protein is the major chemical affecting oil absorption index, which is composed of both hydrophobic and hydrophilic parts (Marques *et al*., 2013; Tharise *et al*., 2014).

Table (4): Functional properties of peanut and grape skins powder (means ± S.D).

Parameter	GS	PS
Bulk density (g/ml)	0.999 ±0.011	0.457 ±0.004
Water absorption index (g/g)	2.87 ±0.067	4.02 ±0.149
Water solubility index (%)	0.51 ±0.015	0.08 ±0.003
Oil absorption index (ml/g)	1.50 ±0.100	1.70 ±0.000
Swelling index (ml/g)	1.06 ±0.063	1.20 ±0.041
Foaming capacity (%)	2.97 ±0.010	ND
Foaming stability (%)	2.40 ±0.100	ND

ND = Not detected, values are means ± SD of three replicates.

Moreover, the obtained values for WAI and WSI in GS powder were lower than that reported by Mokhtar *et al*. (2018) for GBWP (3.38 g/g and 29.94%), and Embaby and Rayan (2016) for acacia seed flour (ASF), (3.17 g/g and 20.6%), respectively. Compared with our results for OAI values in both GS and PS powders (1.50 and 1.70 ml/g) respectively, Mokhtar *et al*. (2018) and Embaby and Rayan (2016) obtained lower OAI values at (1.26 ml/g) in GBWP and (1.28 ml/g) in ASF, respectively. Foaming capacity (FC) and stability (FS) in GS powder were (2.97 and 2.40%), respectively. These results are lower than those found by Mokhtar *et al*. (2018) and Embaby and Rayan (2016) who indicated that, the FC and FS in GBWP and ASF were (4.09 and 70.84%) and (7.17 and 71.8), respectively. On the other hand, foaming capacity and stability for PS powder haven't observed.

4. Conclusion

Grape skin (GS) and peanut skin (PS) powders can provide an inexpensive source of dietary fibers and polyphenols for use as functional ingredients in foods or dietary supplements. Moreover, they had distinguished techno-functional properties. Such findings could introduce GS and PS powders to play desirable technological and health promoting roles in many food products.

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