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# Chemical Composition and Functional Properties of Some Fruit Seed Kernel Flours

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**Abstract**

Many fruits and vegetables are processed, resulting in a considerable amount of waste that could contaminate the environment. The most important fruits farmed and processed in Egypt are apricot, peach, and mango. This work aimed to study the proximate composition, functional characteristics, and mineral content of seed kernel flours from apricot, peach, and mango. According to the results, oil makes up the majority of the apricot and peach kernels (48.52 and 41.26 %, respectively), followed by protein (27.67 and 25.51 %, respectively), while carbohydrates was the majority in the mango kernel (74.10 %), followed by oil (12.70 %). The removal of lipids from apricot, peach, and mango kernels increased the protein amount significantly (47.37, 43.34 and 13.31 %; respectively). Defatted apricot, peach, and mango kernel flours were shown to have high functional qualities during the study. All of the defatted kernel flour samples included significant quantities of minerals making them viable food supplements in the future.

**Keywords:**
Fruits, By-product, Seed Kernels, Chemical Composition, Functional Properties.

# Introduction

Fruits are among humanity's most significant foods because they are not only nutritious but also necessary for good health. Fruit, both fresh and processed, improve the quality of our diets while also providing critical nutrients such as minerals and vitamins (Siddiqui, 2015). Many fruits and vegetables products are processed, resulting in a considerable amount of wastes that could pollute the environment. Apricot, peach and mango are the most important fruits grown and processed in Egypt. The apricot (*Prunus armeniaca*) is a popular fruit tree in the *Rosaceae* family. It's mostly grown in countries of Mediterranean, but it's also grown in Russia and the United States (Hussain *et al.*, 2011). Apricot production in the world is estimated to be around 4.1 million tons. Egyptian production of apricots reached about 98.295 thousand tons/year (FAOSTAT, 2019). Sweet, semi-bitter and bitter are the three types of apricot tree fruit seeds (Lee *et al.*, 2013). Apricot seed include a wide range of bioactive components, and apricot kernel ingestion has been linked to a lower risk of chronic diseases. (Zhang *et al.,* 2011).The kernels of apricot that considered as a by-product in the canning and fruit processing, have been utilized in USA and Germany for the production of fixed oil. In contrast, the defatted apricot kernel powder containing 52% protein, which can be used in supplementing some food products with vegetative protein (Rizk *et al.*, 2009). The peach (*Prunus persica*), which belongs to the *Rosaceae* family, is a primary species for a variety of cultivars that are widely grown around the world. The peach fruit is one of the most common stone fruits for direct eating and useful material in industry of food. The world production of peach fruits in 2019 was at 25.7 million tons, with roughly 40% of that produced in the European Union. While Egypt's production of peach fruits reached about 358.000 tons (Nowicka & Wojdyło, 2019). As knowledge of the substances found in fruit seed kernels and their health promoting potential has expanded, the concept of employing them for human consumption, particularly to supplement man's diet with chemicals beneficial in the prevention of chronic diseases has attracted interest (Bak *et al.*, 2010*).* In Chinese medicine, peach seed kernel is one of nine plant elements used in a mixture for cardiovascular disease (Tu *et al.,* 2003). Such importance is most likely due to the fatty acid composition, which is low content of saturated fatty acid and high in linoleic and oleic acids, which account for 77 and 55 percent of total fatty acids, respectively (Calgaroto *et al.*, 2005). Mango (*Mangifera indica*) is a globally important fruit that is grown in over 100 countries, particularly in Asia. Mangoes belong to the *Mangifera* genus, which has a vast variety of tropical fruiting tree in the *Anacardiaceae* family of flowering plants (Fowomola, 2010). Due to its chemical composition, it is popular as the "King of Fruits" and it is the world's second most traded tropical fruit as well as fifth in overall production. Mango production in the world is estimated to be around 55 million tons. The Egyptian production of mango reached about 1.5 million tons/year (FAOSTAD, 2019). After industrial processing or consumption of the fruit, mango seeds are wasted in large quantities. Mango seed is the most common waste product, accounting for 30-45 percent of the fruit weight depending on the type (Alencar *et al.,* 2012). It is high in stearic and oleic acids and a good source of protein (6-13%) and carbohydrates (58-80%). It also has an appealing profile of essential amino acids and lipids (6-16%) (Siaka, 2014).

# MATERIALS AND METHODS

## Materials

**Fruits**

Mango (*Mangifera indica*), apricot (*Prunus armeniaca*) and peach (*Prunus persica*) fruits were procured from local market (Assiut-Egypt, during the summer season of 2019).

**Chemicals**

All chemicals used in this study were produced by Sigma chemical co. (U.S.A) and obtained from El-Gomhouria Company. Assiut city, Egypt.

## Methods

**Preparation of fruit Seed kernel flours**

Seeds were removed from fruits and the seeds outer shell was washed with water to remove the remaining fruit pulp and sun-dried for 3 weeks, then the outer shell of seeds was cracked manually and the kernels was ground to fine flour by laboratory mill (Braun, Germany).

**Extraction of oil**

Hexane was used to extract the oil from the seed kernel flour by immersing in an extractor in order to get rid of the existed oil. The solvent was removed by a rotary evaporator.

**Determination of approximate chemical composition**

Moisture, crude fat, crude protein, ash and crude fiber of sample were determined according to AOAC (2012). The carbohydrates were calculated by the difference. All determinations were in three replications, and the means were recorded.

**Functional properties of seed kernel flours**

Water holding capacity was estimated according to AACC (2010). Oil holding capacity was estimated according to Menon *et al*. (2014). Protein solubility was achieved according to Morr *et al*. (1985). Emulsion stability was determined according to Yasumatsu *et al.* (1972). Foaming stability was carried out according to Menon *et al*. (2014).

**Determination of mineral contents**

Sodium, potassium, calcium, phosphorus, magnesium, zinc and iron contents were determined according to AOAC (2012).

## RESULTS AND DISCUSSION

**Approximate chemical composition of whole apricot, peach and mango seed kernel flours**

Approximate chemical composition of whole seed kernel flours of apricot, peach and mango are given in Table (1). Data indicate that there were significant variations between the studied samples in their content of crude lipids, crude protein, ash, crude fiber, and carbohydrate. The moisture content of apricot seed kernel flour (4.13%) was a lower value compared with peach (5.15%) and mango seed kernel flour (7.75 %). Concerning crude protein, apricot seed kernel flour contained the highest level (27.67%), while mango seed kernel flour recorded the lowest value (8.76%). Regarding lipids, peach and apricot kernel flours contained higher levels (41.26 and 48.52 %, respectively), which reflects the significance of such seeds in the oil industry. Similar results were recorded by Soliman *et al.* (2005); Zayan *et al.* (2010) and Abd El-Rahman *et al.* (2015). In addition, it can be shown from the same Table that peach seed kernel flour had the highest content of crude fiber (2.97%) while mango seed kernel flour showed the lowest content (2.24%). Likewise, peach and apricot kernel flours were contained the highest level of ash, while mango kernel flour contained the lowest percentage. In contrast, data showed that the highest level of carbohydrate has occurred in mango kernel flour. These results are coincidence with those of Dakare *et al.* (2012); Bandyopadhyay *et al.* (2014) and Tanwar *et al.* (2018).

**Table (1): Approximate composition of whole apricot, peach and mango seed kernel flours (g /100g; on dry weight basis).**

| | Apricot whole kernel | Peach whole kernel | Mango whole kernel |
|---|---|---|---|
| **Moisture %** | 4.13 ±0.13[c] | 5.15 ±0.21[b] | 7.75 ±0.23[a] |
| **Protein % *** | 27.67 ±0.18[a] | 25.51 ±0.25[b] | 8.76 ±0.10[c] |
| **Fat % *** | 48.52 ±0.17[a] | 41.26 ±0.21[b] | 12.70 ±0.17[c] |
| **Crude fiber % *** | 2.53 ±0.05[b] | 2.97 ±0.02[a] | 2.24 ±0.05[c] |
| **Ash % *** | 3.23 ±0.11[b] | 3.67 ±0.24[a] | 2.14 ±0.10[c] |
| **Carbohydrates% **** | 18.05±0.23[c] | 26.59 ±0.31[b] | 74.10 ±0.27[a] |
| *On dry weight basis, | | | |

Values are the mean of triplicate determinations with standard division.

The different letters at the row means significant differences at ($p<0.05$) and the same letters means no significant differences.

**Approximate chemical composition of defatted apricot, peach and mango seed kernel flours**

The approximate chemical composition of defatted seed kernel flours of apricot, peach and mango are given in Table (2). Results indicated that there were significant variations between the studied samples in their content of crude lipids, crude protein, ash, crude fiber, and carbohydrate. The moisture content of defatted mango kernel flour (9.54%) was significantly higher than that of the defatted apricot seed kernel flour (7.33%) and defatted peach seed kernel flour (8.83%). Also, data in Table (2) indicate that removal of oil from apricot, peach and mango kernel flours in a considerable increase significantly ($P<0.05$) in crude protein content (47.37, 43.34 and 13.31%, respectively). The increase in the other component after defatting was expected. Crude fiber and ash content of defatted peach kernel flour (5.95% and 4.52%) was higher than defatted apricot kernel flour (4.79% and 4.33%) and defatted mango kernel flour (3.75% and 3.31%), respectively. These results are almost agreement with Soliman *et al.* (2005); Zayan *et al.* (2010) and Elkot *et al.* (2017). Concerning carbohydrate, defatted mango kernel flour recorded the highest level (77.22%) compared with defatted apricot and peach kernel flour 38.98 and 42.58%; respectively.

**Table (2): Approximate composition of defatted apricot, peach and mango seed kernel flours (g /100g; on dry weight basis).**

| Samples | Defatted apricot kernel | Defatted peach kernel | Defatted mango kernel |
|---|---|---|---|
| **Moisture %** | 7.33 ±0.26[c] | 8.83 ±0.22[b] | 9.54 ±0.31[a] |
| **Protein % *** | 47.37 ±0.13[a] | 43.34 ±0.15[b] | 13.31 ±0.11[e] |
| **Fat % *** | 4.53 ±0.24[d] | 3.61 ±0.21[e] | 2.41 ±0.07[f] |
| **Crude fiber % *** | 4.79 ±0.10[b] | 5.95 ±0.07[a] | 3.75 ±0.11[c] |
| **Ash % *** | 4.33 ±0.10[a] | 4.52 ±0.07[a] | 3.31 ±0.11[b] |
| **Carbohydrates% **** | 38.98 ±0.06[c] | 42.58 ±0.10[b] | 77.22 ±0.19[a] |
| *On dry weight basis, | | | |

Values are the mean of triplicate determinations with standard division.
The different letters at the row means significant differences at ($p<0.05$) and the same letters means no significant differences.

**Functional properties of defatted apricot, peach and mango seed kernel flours**

The results presented in Table (3) showed the functional properties of defatted apricot, peach and mango kernel flours. The most functional properties determined for apricot defatted kernel flour exhibited higher values than that observed for peach and mango defatted kernel flours and showed significant variations ($p<0.05$); and this observation is agree with the results obtained by El-Safy *et al.* (2012); Okpala & Gibson-Umeh (2013) and Niyi, (2014). Defatted apricot kernel flour exhibited high values for the water holding capacity (192.93%), while the lowest value was recorded by defatted mango kernel flour (119.48%). This is due to the high protein content of defatted apricot kernel flour, which contains polar amino acid residues that appear often on the protein surface matrix and thus bind more water (El-Safy *et al.*, 2012). High water holding capacity flour is beneficial as a functional constituent in bakery products because they help to minimize staling by limiting moisture loss (Okpala & Gibson-Umeh, 2013). Also, regarding oil holding capacity, the defatted apricot kernel flour recorded the highest percentage (252.53%) followed by defatted peach kernel flour (225.09%), this may give an advantage to defatted apricot and peach kernel flours in bakery products like biscuit or cake which require flour with high oil holding capacity. While the lowest percentage was recorded by defatted mango kernel flour (109.91%), the difference in oil holding capacity may be due to the degree of interaction with water and oil and difference in protein concentration (Butt & Batool, 2010). Because oil functions as a flavor keeper and improves mouthfeel, flour's capacity to absorb oil is important. It plays an important role in food compositions (Abulude *et al.*, 2008). Apart from the protein solubility of (which had values of 25.75 and 23.46 as % of total sample protein for defatted apricot and peach kernel flours, respectively), there was no significant difference between the two flours. However, there was significant difference compared with defatted mango kernel flour. Protein solubility is typically influenced by its hydrophobic or hydrophobicity balance, which varies based on amino acid composition, especially near the protein surface (Moure *et al.*, 2006). Maximum foam stability and emulsification stability were recorded by defatted apricot kernel flour (51.75 and 38.52%), while the lowest value (27.09 and 26.30%), respectively was observed in defatted mango kernel flour. These findings correspond to those reported by El-Safy *et al.* (2012) and Legesse & Emire (2012).

**Table (3): Functional properties of defatted apricot, peach and mango seed kernel flours:**

| Functional properties | Apricot | Peach | Mango |
|---|---|---|---|
| **Water holding capacity (%)** | 192.93±2.02[a] | 177.77±2.24[b] | 119.48±2.10[c] |
| **Oil holding capacity (%)** | 252.53±7.36[a] | 225.09±4.77[b] | 109.91±3.93[c] |
| **Soluble protein as % of total sample protein** | 25.75±1.59[a] | 23.46±1.91[a] | 10.67±0.41[b] |
| **Emulsion stability (%)** | 38.52±0.95[a] | 32.21±1.44[b] | 26.30±1.27[c] |
| **Foam stability*(%)** | 51.75±1.46[a] | 44.24±2.90[b] | 27.09±3.36[c] |

Values are the mean of triplicate determinations with standard division.
The different letters at the row means significant differences at ($p<0.05$) and the same letters means no significant differences.

**Mineral composition of defatted apricot, peach and mango seed kernel flours**

The results presented in Table (4) showed the minerals content phosphorus, calcium, potassium, magnesium, sodium, zinc and iron in defatted apricot, peach and mango seed kernel flours. It is evident from these data that defatted apricot and peach kernel flours were contained a higher amount of all minerals except potassium compared with the defatted mango kernel flour. The higher concentration of magnesium (382.93mg/100g) and phosphorus (498.35mg/100g) recorded in defatted peach kernel flour, while the lowest level of magnesium (68.00mg/100g) and phosphorus (19.97mg/100g) recorded in defatted mango kernel flour. Magnesium is a necessary mineral for regulating the acid-alkaline balance in the body and enzyme activity. Phosphorus is important for bone, cell growth and kidney function (Nzikou *et al.* 2010). These results are in agreement with AL-Hamadani (2012) and Tanwar *et al.* (2018). On the other hand, data in Table (4) shows that, defatted mango kernel flour contained the highest value of potassium (751.33 mg/100g), followed by defatted peach kernel flour (371.37mg/100g) while, the lowest value (321.21 mg/100g) recorded in defatted apricot kernel flour. Potassium is essential for tissues of muscle, heart, kidney, and other essential organs of the body in good condition. It has a significant role in synthesis of protein and amino acid (Ebrahim & Gaali, 2015). Regarding calcium and sodium, defatted apricot kernel flour showed superior value compared with defatted peach and mango kernel flours. Calcium play a significant role in, bone building mineral for enzyme activity and nucleic acids metabolism (Heaney, 2001). Iron and zinc content of the defatted peach kernel flour showed the highest content (23.66 mg/100g) and (7.79 mg/100g) while, defatted mango kernel flour contained the lowest values (8.39 mg/100g) and (1.10 mg/100g); respectively. Potassium and iron are essential nutrients and has important function in blood formation and synthesis of amino acids and proteins (Kittiphoom, 2012). These results are in accordance with these of Alpaslan & Hayta (2006) and Ebrahim & Gaali (2015).

**Table (4): Mineral composition of defatted apricot, peach and mango seed kernel flours (mg/100g on dry weight basis):**

| Samples | Ca | Mg | Na | K | P | Fe | Zn |
|---|---|---|---|---|---|---|---|
| **Apricot** | 56.30 | 230.55 | 52.63 | 321.21 | 312.23 | 20.17 | 7.39 |
| **Peach** | 23.76 | 382.93 | 35.31 | 371.37 | 498.35 | 23.66 | 7.79 |
| **Mango** | 51.31 | 68.00 | 20.54 | 751.33 | 19.97 | 8.39 | 1.10 |

# CONCLUSION

The current study indicated that apricot, peach, and mango kernel flours may be used as an efficient additive in foods such as biscuits, bread, and cakes as an essential new protein source and a rich source of minerals. Whereas water and oil binding capabilities are critical, flours with a high water holding capacity can help prevent staling by limiting moisture loss, while the capacity of flour to binding of oil is critical since oil functions as a flavor keeper and increases mouthfeel. It has a significant impact on food industries.

# REFERENCES

AACC. (2010). Approved Methods of Analysis of American Association of Cereal Chemists. St. Paul, MNY, USA.

AOAC. (2012). Official Methods of Analysis 19th Ed. Association of Official Agriculture, Washington DC. Analytical Chemists International Arligton, Virginia, U.S.A.

Abd El-Rahman, A.A., El-Hadary, A.E., & Abd El-Aleem, M. I. (2015). Detexofication and nutritional evaluation of peach and apricot meal proteins. *Journal of Biological Chemistry and Environmental Science* 10(3): 597-622.

Abulude, F.O., Alo, F.I., Ashafa, S.L., & Fesobi, M. (2008). Chemical composition and functional properties of *Irvingia gabonensis* seed flour. Cont. *Journal of Food Science and Technology.* (2): 33-36.

Alencar, W. S., Acayanka, E., Lima, E. C., Royer, B., de Souza, F. E., Lameira, J., & Alves, C. N. (2012). Application of *Mangifera indica* (mango) seeds as a biosorbent for removal of Victazol Orange 3R dye from aqueous solution and study of the biosorption mechanism. *Chemical Engineering Journal*, (209): 577-588.

AL-Hamadani, F. H. K. (2012). Detoxification from Cotyledons of Apricot Seeds (*Prunus armeniaca*) and its Effect on the Properties of Raw Material and Extracted Oil. *Engineering and Technology Journal*, 30(17): 3082-3097.

Alpaslan, M., & Hayta, M. (2006). Apricot kernel: Physical and chemical properties. *Journal-American Oil Chemists Society*, 83(5), 469- 471.

Bak, I., Lekli, I., Juhasz, B., Varga, E., Varga, B., Gesztelyi, R., &Tosaki, A. (2010). Isolation and analysis of bioactive constituents of sour cherry (*Prunus cerasus*) seed kernel: an emerging functional food. *Journal of Medicinal Food*, 13(4):905-910.

Bandyopadhyay, K., Chakraborty, C., & Bhattacharyya, S. (2014). Fortification of mango peel and kernel powder in cookies formulation. *Journal of Academia and Industrial Research*, 2(12), 661-664.

Butt, M.S., & R. Batool, (2010). Nutritional and functional properties of some promising legumes protein isolates. *Pakistan Journal of Nutrition*, 9(4): 373-379.

Calgaroto, C., Pilecco, J., Oliveira, M.P., Furlan, L., & Zambiazi, R. (2005). Extraction and characterization of peach almond oil. In Scientific Initiation Congress of UFPel, XIV, 2005, Pelotas Anais do XIV Scientific Initiation Congress of the Federal University of Pelotas, Pelotas, Brazil. http://www.ufpel.edu.br/cic/2005/ indice_CA.html (accessed March 31, 2009).

Dakare, M. A., Danladi, A. A., Abel, S. A., & Sunday, E. A. (2012). Effects of processing techniques on the nutritional and antinutritional contents of mango (*Mangifera indica*) seed kernel. *World Journal of Young Researchers*, 2(3): 55-59.

Ebrahim, A. A., & El Gaali, E. E. (2015). Physiochemical Properties of Mango (*Mangifera indica* L.) Seed Kernel's Oil. *Sudan Academy of Sciences Journal*, (10): 80-92.

Elkot, W. F., El-Nawasany, L. I., & Sakr, H. S. (2017). Composition and quality of stirred yoghurt supplemented with apricot kernels powder. *Journal of Agroalimentary Processes and Technologies*, 23(3), 125-130.

El-Safy, F. S., Salem, R. H., & Abd El-Ghany, M. E. (2012). Chemical and nutritional evaluation of different seed flours as novel sources of protein. *World Journal of Dairy & food sciences*, *7*(1): 59-65.

FAOSTAT. (2019). FAO statistics, food and agriculture organization of the United Nations. https://www.fao.org/faostat/ar/#data/QCL.

Fowomola. M. A. (2010). Some nutrients and antinutrients contents of mango (*Magnifera indica*) seed. *African Journal of Food Science*, 4(8):472-476.

Heaney, R. P. (2001). Calcium needs of the elderly to reduce fracture risk. *Journal of American College Nutrition*, 2:192-197.

Hussain, I., Gulzar, S., & Shakir, I. (2011). Physico-chemical properties of bitter and sweet apricot kernel flour and oil from North of Pakistan. *Internet Journal of Food Safety*, (13):11-15.

Kittiphoom, S. (2012). Utilization of mango seed. *International Food Research Journal*, 19(4): 1325-1335.

Lee. J., Zhang, G., Wood, E., Castillo. C., & Mitchell, A. E. (2013). Quantification of amygdalin in nonbitter, semibitter, and bitter almonds (*Prunus dulcis*) by UHPLC-(ESI) QqQ MS/MS. *Journal of Agricultural and Food Chemistry*, 61(32):7754-7759.

Legesse, M. B., & Emire, S. A. (2012). Functional and physicochemical properties of mango seed kernels and wheat flour and their blends for biscuit production. *African Journal of Food Science and Technology,* 3(9), 193-203.

Menon, L., Majumdar, S. D., & Ravi, U. (2014). Mango (*Mangifera indica* L.) kernel flour as a potential ingredient in the development of composite flour bread.

Morr, C.V.; German, B.; Kinsella, J.E.; Regesntein, J.P.; Van Buren, J. P., & Kilara, A. (1985). A collaborative study to develop a standardized food protein solubility procedure. *Journal of Food Science*, (51):1715-1718.

Moure, A.; Sineiro, J.; Dominguez, H., & Parajo, J.C. (2006). Functionality of oil seed protein products: A review. *Food Research International,* (39): 945-963.

Niyi, O. H. (2014). Chemical and amino acid composition of Raw and Defatted African Mango (*Irvingia gabonensis*) kernel. *Biotechnology Journal International*, 244-253.

Nowicka, P., & Wojdyło, A. (2019). Content of bioactive compounds in the peach kernels and their antioxidant, anti-hyperglycemic, anti-aging properties. *European Food Research and Technology,* (245):1123-1136.

Nzikou, J. M., Kimbonguila, A., Matos, L., Loumouamou, B., Pambou-Tobi, N. P.G., Ndangui, C. B., & Desobry, S. (2010). Extraction and characteristics of seed kernel oil from mango (*Mangifera indica*). *Research Journal of Environmental and Earth Sciences*, 2(1): 31-35.

Okpala, L. C., & Gibson-Umeh, G. I. (2013). Physicochemical properties of mango seed flour. *Nigerian Food Journal*, 31(1): 23-27.

Rizk, E.M., Alia, M. El-Gharably., & A. Azouz. (2009). Characterization of defatted apricot kernel meal and their effects on rheological, biological and sensory evaluating for cookies. *Egyptian Journal of Nutrition,* (4): 29-54.

Siaka, D. (2014). Potential of mango (*Mangifera indica*) seed kernel as feed ingredient for poultry-a review. World's Poultry Science Journal, 70(2):279-288.

Siddiqui, M.W. (2015). Introduction. In: Postharvest Biology and Technology of Horticultural Crops: Principles and Practices for Quality Maintenance. Oakville, ON: AAP, *Apple Academic Press*, pp.296.

Soliman, A. E. M., El-Gharably, A.M., & Rizk, E. M. (2005). Physicochemical, biological and sensory evaluation of cookies fortified with protein from defatted peach kernel meal. *Annals of Agricultural Science Cairo*, 49(2), 571-584.

Tanwar, B., Modgil, R., & Goyal, A. (2018). Antinutritional factors and hypocholesterolemic effect of wild apricot kernel (*Prunus armeniaca* L.) as affected by detoxification. *Food & function*, 9(4): 2121-2135.

Tu, Z., Han, X., Wang, X., Hou, Y., Shao, B., Wang, X., Zhou, Q., & Fan, Q. (2003). Protective effects of CVPM on vascular endothelium in rats fed cholesterol diet. *Clinica Chimica Acta*, (333): 85-90.

Yasumatsu, K.; Sawada, K.; Moritaka, S.; Misaki, M.; Toda, J., & Wada, T. (1972). Whipping and emulsifying properties of soybean products. *Agricultural Biological Chemistry,* (36): 719-727.

Zayan, A. F., El-Gharably, A. M., & El-Bialy, A. R. (2010). Effect of partial substitution of supplementary skim milk powder with defatted apricot kernel powder on the quality of ice cream and yoghurt. *Journal of Food and Dairy Sciences*, 1(9):495-505.

Zhang, J., Gu, H. D., Zhang, L., Tian, Z. J., Zhang, Z. Q., Shi, X. C., & Ma, W. H. (2011). Protective effects of apricot kernel oil on myocardium against ischemia-reperfusion injury in rats. *Food and Chemical Toxicology*, 49(12): 3136-3141.

## التركيب الكيميائي والخصائص الوظيفية لدقيق بعض بذور الفاكهة

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هناك العديد من أنواع الفاكهة التي تستخدم في عمليات التصنيع الغذائي المختلفة وينتج عن ذلك كمية كبيرة من النواتج الثانوية التي يمكن أن تلوث البيئة. وتعتبر ثمار المشمش، الخوخ والمانجو من أهم أنواع الفاكهة التي يتم زراعتها وتصنيعها في مصر. وتهدف هذه الدراسة الى التعرف على التركيب الكيميائي العام، والخصائص الوظيفية، والمحتوى المعدني لمطحون بذور المشمش، الخوخ والمانجو. ومن النتائج المتحصل عليها، يتضح أن المحتوى من الزيت يمثل النسبة الأعلى في دقيق بذور المشمش والخوخ (48.52 و41.26٪ على التوالي)، يليها نسبة البروتين (27.67 و25.51٪ على التوالي)، بينما كانت نسبة الكربوهيدرات هي الأعلى في بذور المانجو (74.10٪) يليها نسبة الزيت (12.70٪). وقد أدت عملية إزالة الزيت من بذور المشمش، الخوخ والمانجو إلى ارتفاع نسبة البروتين معنوياً حيث وصلت الى 47.37 و43.34 و13.31٪ على التوالي. كما أظهرت النتائج المتحصل عليها من هذه الدراسة أن دقيق المشمش، الخوخ والمانجو المنزوع الزيت يتمتع بخصائص وظيفية عالية. كما احتوت جميع عينات دقيق البذور المنزوعة الزيت على نسب مرتفعة من العناصر المعدنية، وبذلك يمكن استخدام هذه النواتج في إعداد بعض الوجبات كمكملات غذائية قابلة للتطبيق مستقبلاً، بالإضافة الي المساهمة في تقليل التلوث البيئي الناتج عن هذه الصناعة.