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<b>ARABIC SUMMARY .....</b>	

## LIST OF ABBREVIATIONS

Symbol	Meaning (Indicator)
ADF	Acid detergent fibers .
BD	Bulk density .
BHT	Butelated hydroxy toluene .
CF	Crude fibers .
EC	Emulsification capacity .
FC	Foaming capacity .
FS	Foaming stability .
GME	Grape seeds methanolic extract
LCE	Lycopene crude extract .
MME	Mango seed kernels methanolic extract
MUSFA	Mono unsaturated fatty acids .
NDF	Neutral detergent fibers .
OHC	Oil holding capacity .
PME	Peach seed kernels methanolic extract
PUSFA	Poly unsaturated fatty acids .
SFA	Saturated fatty acids .
TDF	Total dietary fibers .
TME	Tomato seeds methanolic extract
USFA	Unsaturated fatty acids .
WHC	Water holding capacity.

## 5. SUMMARY

Grape , mango , peach and tomato are the most important fruits grown in Egypt . Large quantities of these fruits are widely processed to produce many products such as juices , nectars , jams and concentrated syrups . Large quantities of wastes are being left over and disposal of these waste materials becomes difficult and pose serious problems, where they are considered a main source of microbial contamination and pollution . Peel and kernels are the most important wastes remaining after the processing of grape , mango , peach and tomato fruits .These wastes represent about 17.00 , 46.00 , 10.93 and 7.84 , respectively, and are potential sources of dietary fibers , oils and phenolic compounds . Therefore , this work was a trial to utilize of these wastes as food additives as source of dietary fibers and untraditional sources of edible oils with highly antioxidative properties and antimicrobial agents.

**The obtained results are summarized as follows :**

### **1. Utilization of peel :**

1.1- Peach peel had the highest value of water holding capacity ( 9.649 gm / gm ) followed by tomato , mango and grape peel ( 9.406 , 7.876 and 7.862 gm / gm respectively ).

1.2 - Oil holding capacity ( OHC ) of tomato peel was the highest value ( 2.530 ) , meanwhile , grape , mango and peach OHC values were 1.763 , 1.231 and 1.070 gm oil / gm sample , respectively.

1.3 - The lowest BD was found for the tomato peel ( 0.193 gm / cm<sup>3</sup> ), meanwhile , mango peel had the highest value of BD ( 0.741 ) . On the other hand , grape and peach peel BD values were 0.540 and 0.672 gm / cm<sup>3</sup> , respectively .

1.4- Peach peel had the highest emulsification capacity ( 56.923% ) , while mango peel had the lowest value ( 10.784% ) . EC of grape and tomato peel were 46.666 and 23.256% , respectively .

1.5- All tested peel had high values of water and fat absorption and no foaming stability values .

1.6 - Tomato peel had approximately the highest crude fibers ( 53.98% ) , protein ( 16.11% ) and fat ( 6.47 % ) contents as well as grape peel had the highest ash content ( 12.43 % ) compared with those of the studied peel .

1.7- Mango peel had the highest content of tannins ( 8.166 % ) while the other peel had no tannin content . Also , no phytic acid was detected in all studied wastes peel .

1.8- All tested fruits peel had adequate amounts of minerals and are considered a sufficient sources of minerals for human nutrition . Grape peel had noticeable amounts of calcium and iron ( 1517.72 and 87.27 mg / 100 gm , respectively ) and tomato and peach peel had the highest contents of zinc ( 157.37 and 67.33 mg / 100 gm , respectively ) .

1.9- Peach and mango peel residues had the highest amounts of TDF ( 76.320 and 62.687 % , respectively ) . Peach peel had the highest content of pectin ( soluble dietary fibers ) ( 39.712 % ) , which recorded more three folds (

12.147 % ) than mango peel pectin content . This means that peach peel can be used as a new commercial source for production of pectin compared with citrus peel and apple pomace.

1.10 - Tomato peel had the highest contents of chlorophyll a and b ( 10.04 and 12.76 mg / 100 gm ) compared with those of the other fruits peel .

1.11 - Tomato and mango peel had the highest contents of total carotenoids ( 4392.74 and 3852.01 mg / 100 gm , respectively ) compared with those of the peach and grape .

## **2. Utilization of seeds :**

2.1- Both peach and tomato seeds had the highest contents of fat (43.14 ,26.24 % , respectively ) and protein ( 22.65 , 28.64% , respectively ) while mango and grape seeds had the highest values of total carbohydrates and crude fibers ( 55.841 and 32.747 % , respectively ) .

2.2- Hydrocyanic acid was not detected in the all tested seeds except for peach seed kernels and tomato seeds which contained traces amounts ( 0.157 % and 0.063 % , respectively ) . Mango seed kernels had the highest content of tannin ( 8.166 % ) followed by grape seeds ( 6.373 % ) . The grape , mango and peach seeds had lower contents of phytic acid than tomato seeds which was 1.36 % .

2.3- Calcium , iron and zinc contents of all tested fruits wastes were found in a large and sufficient portion . Grape seeds had the highest content of calcium

( 1121.149 mg / 100 gm) . As well as , peach seeds had the highest content of iron which represent more than about three folds its peel contents .

Tomato and peach seeds had the highest contents of zinc ( 67.328 , 147.845 mg / 100 gm, respectively ) .

2.4- Because of the high content of oil ( 15 – 43.5 % ) in the studied wastes seeds , the extracted oils were evaluated . Acid values of all fruit seeds oils were higher than those found in refined SFO ( 0.164 % ) . The peroxide numbers of all extracted crude oils were in the range of 1.43 to 6.43 ( meq. O<sub>2</sub> / kg ) . Iodine value of grape seeds oil was the highest value ( 135.45 ) compared with those of the other extracted oils , while mango seed kernels oil showed the lowest iodine value (60.53). Grape seeds oil considered as a drying oil while peach and tomato crude oils are semi drying oils , and mango seed kernels oil is considered as non drying oil .

2.5- Grape seeds oil contains a large amount of USFA followed by tomato seeds oil , peach and mango seeds kernels oils . Linoleic acid ( C18:2 ) was the predominant fatty acid ( 56.33 % ) followed by oleic acid ( 23.47 % ) . Also, grape seeds oil was characterized by a low level of total USFA ( 13.89 % ) , mainly , palmitic acid ( 9.46 % ) and stearic acid ( 4.05 % ) , as well as a relatively high level of MUSFA ( oleic acid ) ( 23.465 % ) . Both stearic and oleic acids of mango seed kernels oil were the major fatty acids ( 40.748 and 40.992 % of total SFA and USFA , respectively ) .



Peach kernels oil contained the highest content of total USFA ( 92.677 % ) and the most abundant fatty acids in MUFA was oleic acid ( 71.685 % ) . The total USFA content of tomato seeds oil was ( 83.370 % ) . Linoleic acid represented the major part ( 58.327 % ) of total USFA followed by oleic acid ( 22.66 % ) .

In conclusion , all studied extracted seeds oils had chemical properties in the normal range of edible oils .

### **3- Utilization of seeds as source of natural antioxidants :**

3.1- Mango seed kernels had the highest of total phenolic compounds content ( 5180.9 mg / 100 gm as catechol ) followed by grape seeds ( 3681.6 mg / 100 gm ) compared with of other investigated seeds .Pyrogalllic acid was the most abundant phenolic compound in grape seed (51.407 mg / 100 gm ). Resorcinol was the predominant phenolic compound of mango seed kernels ( 95.846 mg / 100 gm ), followed by gallic acid (61.701mg/100gm) . Pyrogalllic acid ( 0.026 ) , hydroquinon ( 0.024 ) , gallic acid ( 0.304 ) and rutin ( 1.295 ) mg / 100 gm dry seeds were the four fractions of phenolic compounds found in peach seed kernels. Gallic acid was the predominant phenolic compound in tomato seeds.

3.2- The addition of GME at level 300 ppm improved the antioxidant activity and increasing index ( 1.156 % and 15.620 % , respectively ) . As well as , it can be used as a new source of natural antioxidants to improve the oxidative stability of sunflower oil . Mango seed kernels methanolic extract ( MME ) had highly antioxidant activity more than that of BHT . Increasing the

MME levels from 200 to 400 ppm raised the oxidative stability of sunflower oil . The highest content of total phenolic compounds of mango seed kernels ( 5180.936 mg/100 gm) offers a good protection against oxidation and increases the shelf life of sunflower oil . Mango seed kernels methanolic extract had a highly antioxidant activity and as considered a good source of natural antioxidants , as well as proved to be superior to BHT especially , at level 400 ppm .

3.3- The oxidative stability of sunflower oil was increased with increasing the level of PME until 400 ppm that exhibited the best oxidative stability and increased the shelf life of sunflower oil to 12.5 months .The highest oxidative stability ( 8.84 hr. ) was obtained using of TME at level 600 ppm compared with those of the other levels . Shelf life and antioxidant activity of sunflower oil were increased gradually with increasing the TME levels ( 11.03 to 12.67 hrs and 1.02 to 1.18 , respectively ).

3.4- Lycopene crude extract acted as pro-oxidant in higher concentrations ( 200 , 300 and 400 ppm ) , which had induction periods of 4.865 , 4.63 and 6.65 hrs. , respectively . Meanwhile , lower levels of lycopene extract ( 20 and 40 ppm ) had an antioxidant effects on the stability of sunflower oil , which had induction periods of 8.05 and 7.69 hrs. , respectively . There is an adverse relationship between concentration and induction period when lycopene added to sunflower oil.

## Comments and Conclusions

From the results obtained in this investigation the following recommendations could be summarized as follows :

Total dietary fibers of all tested fruits peel ranged from 55.886 to 78.06 % on dry weight basis . This makes the possibility to convert some waste materials such as grape , mango , peach and tomato peel to beneficial materials with high nutritional and functional properties . Also , this will improve the environmental ecology of industry by recycling its by-products and decrease the problems of pollution from industrial wastes . Utilization of these wastes will be solve one of the environmental pollution problems in food industries .

Finally , it could be concluded that the four sources used in this study are considered as rich sources of dietary fibers .

All studied wastes seeds especially , peach seeds , had high contents of oils ( 15 – 43.5 % ) and chemical properties in the normal range of edible oils .Peach kernels oil had the highest content of total USFA ( 92.677 % ) followed by tomato seeds oil ( 83.370 % ) and grape seeds oil ( 80.158 % ) than those found in mango kernels oil . It is worthy to mention that the percentage of the unsaturated fatty acids of peach , tomato and grape seeds oils were highly and reached approximately to 93% , especially , essential fatty acids ( Linoleic , Omega 6 ) which reflect the nutritional value of these oils .

Mango and grape seeds are considered to be rich sources of natural antioxidants and had a necessary biocomponents that play a great role in protecting human body and it could be used in the food industries .