

**BIOLOGICAL AND CHEMICAL STUDIES
ON SOME FRUITS' PEELS**

By

ABOBAKR SEDEK MAHMOUD SAIED

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ABSTRACT

Food waste is one of the major problems of today's world and thus there is a need to utilize it in innovative applications to reduce the problems associated with it. Studies done have shown that fruit peels are a good source of bioactive compounds with anti-inflammatory, antioxidant, anti-cancer, and antimicrobial activities.

In this study, the antibacterial, in vitro antidiabetic and antioxidant activities, phenolic content, and total flavonoid were evaluated from peels of six types of fruits: *Mango (Mangifera indica)*, *Mandarin (Citrus reticulata)*, *kiwi (Actinidia deliciosa)*, *Annona (Annona squamosa)*, *Pomegranate (Punica granatum)*, and *Avocado (Persea Americana)*.

The antioxidant activity was assessed using 2, 2-diphenylpicryl-hydrazyl (DPPH) free radical scavenging method and total antioxidant assay with ascorbic acid as reference standard while antidiabetic activity was achieved in vitro amylase inhibition assay. The total phenolic analysis was done using Folin-Ciocalteu reagent and expressed as Gallic acid equivalent (GAE/g) while the total flavonoid content was determined by use of aluminum chloride colorimetric method and expressed as Rutin equivalent (Ru/g).

Antioxidant activity of all extracts increased with concentration. *Punica granatum L* extracts showed the highest DPPH scavenging activity of (92±0.15%, IC₅₀ = 82.5±0.18) while *C. reticulata* peels had the lowest (64.5±0.30%, IC₅₀ 143.5±0.64) activity at 200µg/ml of the extract. *Punica granatum L* showed the highest total phenolic (229.5 mg GAE/g) and flavonoid (78.4 mg RE/g) content. In vitro antidiabetic activity was done using 3,5-dinitrosalicylic acid assay (DNSA assay). The plant extracts showed a significant effect (p<0.05) in reducing the amylase activity. At the concentration of 200 µg/mL, the *P. Americana* peel extract exhibited 77.8% amylase inhibitory activity followed by *P. granatum L*. (76.6%). Antimicrobial activity against three foodborne pathogenic bacteria including,

Bacillus subtilis, Escherichia coli, and Salmonella typhi was examined using the disc diffusion method.

The peel extracts of *A. squamosa* and *P. Americana* showed excellent potential as reducing agents in the formation of nanoparticles (NPs). with good antioxidant, amylase inhibition and antibacterial activities compared to standard drugs. The results of the study showed that the fruit peels are source of compounds with promising antioxidants, anti- antibacterial, and amylase inhibition. There is a need to separate and identify actual phytochemicals responsible for antioxidant and anti-antibacterial and amylase inhibition activities. The findings of this study will provide information on potential sources of phytochemicals with antibacterial, anti-diabetic, and antioxidant activity from selected fruit peels.

Keywords: Fruit peels, Antioxidant activity, total phenolic content, total flavonoid content, Anti-bacterial, Biosynthesized AgNPs.

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List of Abbreviations

AgNPs.....	Silver Nanoparticles
AN.....	Annona
AV.....	Avocado
DLS.....	Dynamic light scattering
DMSO.....	Dimethyl Sulfoxide
DPPH	2,2-diphenyl-1-picrylhydrazyl
EDX	Energy dispersive X-ray spectroscopy
FT-IR	Fourier transform infrared spectroscopy
GAE.....	Gallic acid equivalents
HPLC	High Performance Liquid Chromatography
μL.....	Micro Litter
NPs	Nanoparticles
RE	Rutin equivalents
TEM	Transmission electron microscopy
TFC.....	Total Flavonoid Content
TLC.....	Thin Layer Chromatography
TPC.....	Total Phenolic Content
UV-Vis.....	Ultra Violet Visible Spectroscopy
XRD	X- ray diffraction