

Mini Review

Medicinal Functions of Physalis Fruits for Biomedical Applications

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Introduction

Drug innovation using natural products is an interesting mission for planning new leads. It describes the bioactive compounds resulting from natural resources, characterization and pharmacological examination. It emphasizes on the triumph of these resources in the process of finding and realizing new and effective drug compounds that can be beneficial for human resources. For medicinal devotions and for the progress of pharmaceutical substances, medicinal plants were used such as *Physalis angulata* L which is a medicinal plant used for numerous therapies including wound healing [1].

Physalis peruviana (golden berry) is an herbaceous annual plants belongs to the family Solanaceae [2]. This plant has a tremendous medicinal value for curing out different diseases: cancer, leukemia, diabetes, ulcers, malaria, asthma, hepatitis, dermatitis, rheumatism and several other diseases [3]. The golden berry fruit tastes like a sweet tomato and includes high levels of vitamin C, vitamin A and the vitamin B-complex. The fruit was demonstrated to have both anti-inflammatory and antioxidant properties [4,5].

Herbal specialists and local people of several countries have used many extracts of medicinal plants to achieve and treat various diseases comprising wound healing [6]. *Physalis* with its notable benefits related to high nutrients and bioactive compounds with extraordinary antioxidant activity and other several medicinal properties have been ascribed to these compounds [7,8]. The bioactive compounds are formed as primary and secondary metabolites of the fruits. These compounds are biologically active with cytotoxic, antimicrobial, antioxidant, antiviral, fungicidal, insecticidal, tranquilizing, analgesic, anti-inflammatory, and contraceptive actions, among others. Such compounds are used for several dedications, such as in medical therapy, to cure diseases, in the cosmetics, and in the food industry as antioxidants or flavorings [9] (Figure 1).

Wounds are well-defined as a break in the cellular integrity of the anatomic continuousness of a tissue generally because of a chemical, microbial, physical or thermal injury [10]. Recently, wounds have become a very exciting pathological problem. Abdul-Nasir-Deen et al., explored the anti-inflammatory and wound healing properties of methanol leaf extract of *Physalis angulata* L [11]. They indicated that such extract possesses anti-inflammatory and wound healing



Figure 1: *Physalis angulata* L Fruits within its cover [16].



Figure 2: Therapeutic effect of methanol leaf extract of *Physalis angulata* on carrageenan-induced oedema in rats. A: Time-course curve, B: Area under the curve of carrageenan induced oedema, Saline: Normal Saline Control group, Aspirin: Aspirin-treated group, PAL: methanol leaf extract of *Physalis angulata*. Values are mean \pm SEM (n=5). ^{ns}p>0.05, ^{*}p<0.05, ^{**}p<0.01, ^{***}p<0.001, ^{****}p<0.0001 compared with normal saline control [11].

activity which may justify its medicinal uses in the treatment of wounds. The PAL formulated cream at several concentrations of 1.25, 2.5, 5 and 10% w/v verified wound healing properties with obvious angiogenesis, collagenation and re-epithelization distinctive of fibrous tissue formation in wound bed [12] as presented in Figure 2.

Moreover, the methanol leaf extracts of *Physalis angulata* with the existence of secondary metabolites including flavonoids and tannins justify the biological and pharmacological achieved activities Figure 3.

To formulate a porous carbon material that had an abundance of surface functional groups and a huge specific surface area; *Physalis alkekengi* L. husk (PH) was used for the first time as a carbon source from PH and designated as porous carbon *Physalis alkekengi* L. husk (PCPH) by Zhang et al. [13]. The experimental results demonstrate that (PCPH) prepared from PH has good adsorption performance for Malachite Green (MG). MG was used as a model dye for evaluating the adsorption performance of PCPH. Zhang et al concluded that PCPH has excellent application potential in the treatment of environmental water pollution. Therefore, the preparation of PCPH with high adsorption performance has upright scenarios treatment of wastewater from printing and dye industries, and similarly affords a hypothetical basis for the inclusive use of shell-based agricultural

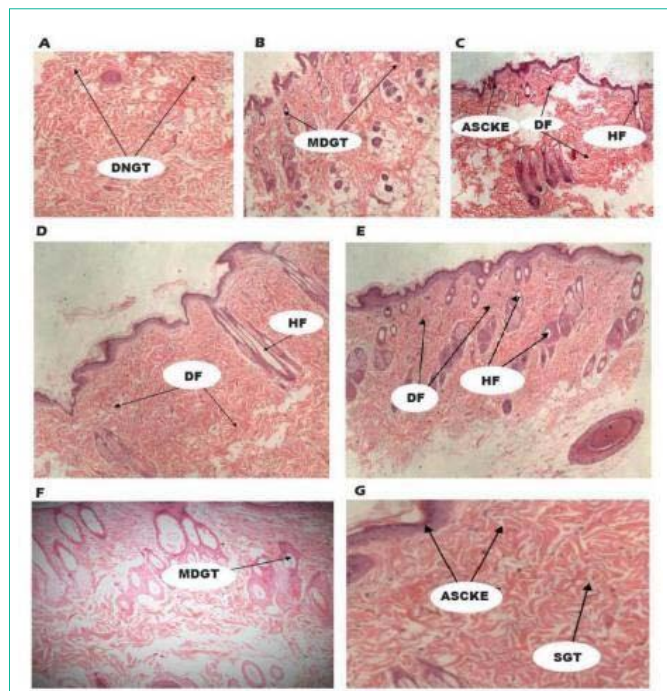


Figure 3: Histological images (x 400) showing influence of PAL on excised wound tissues from both treated and untreated wound tissues. A: Untreated wound tissues; B: vehicle treated (aqueous cream only) wound tissues; C: 1% w/w silver sulphadiazinetreated wound tissues; D: 10% w/w PAL-treated wound tissues; E: 5% w/w PAL-treated wound tissues; F: 2.5% w/w PAL-treated wound; G: 1.25% w/w PAL-treated wound; DNGT: Diffuse necrotic granulation tissue, MDGT: Moderate diffuse granulation tissue, HF: hair follicle, DF: Dense fibrous tissue, ASCKE: Atrophic squamous cell keratinized epithelium, SGT: Reduced granulation tissue, SeG: Sebaceous gland, SwG: Sweat gland [11].

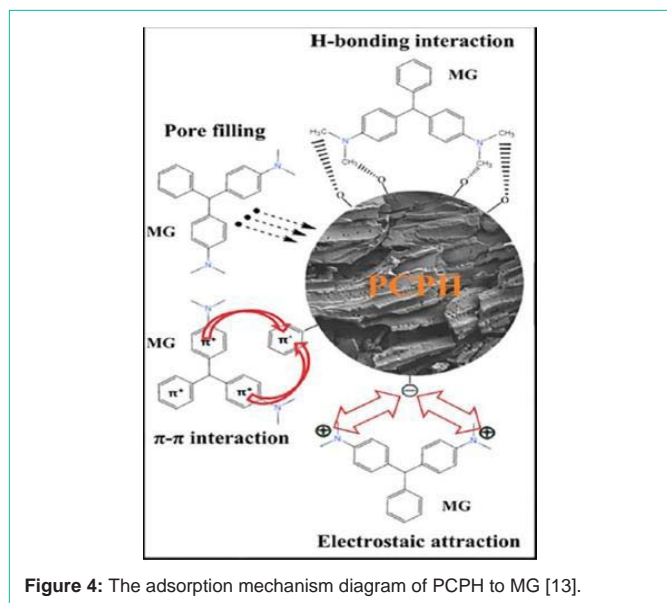


Figure 4: The adsorption mechanism diagram of PCPH to MG [13].

waste [14]. The possible adsorption mechanisms of PCPH for MG are anticipated; which comprises H-bond interaction, pore filling, π - π interaction, and electrostatic attraction (Figure 4) [15].

Recently, Zimmer et al., concluded that the extracts of the

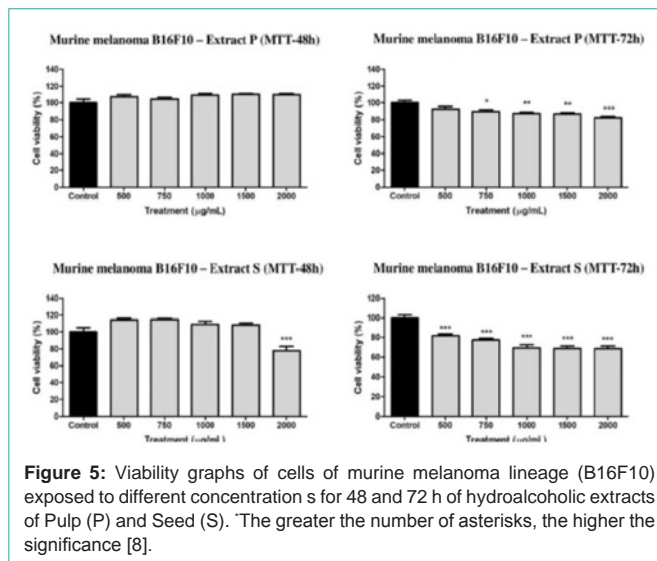


Figure 5: Viability graphs of cells of murine melanoma lineage (B16F10) exposed to different concentrations for 48 and 72 h of hydroalcoholic extracts of Pulp (P) and Seed (S). The greater the number of asterisks, the higher the significance [8].

Physalis fruit have functional properties of great importance, being a source of phenolic compounds possessing antioxidant, antibacterial, and antitumor activities [8]. The pulp and seed extracts displayed moderately active inhibition halos in the existence of Gram-positive bacteria. Both pulp and seeds extracts were talented to reduce the cell viability percentage. The Pulp (P) and Seed (S) hydroalcoholic extracts of *Physalis pubescens* showed moderate antibacterial activity against Gram-positive *Staphylococcus aureus* and *Listeria monocytogenes* [16]. The Pulp (P) and Seed (S) extracts showed moderate anti-tumor activity against the rat glioblastoma cell line (C6) and murine melanoma cell line (B16F10).

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