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Commentary on Therapeutic Potential of *Gnidia glauca*: A Novel Medicinal Plant

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Abstract

Medicinal plants have drawn focus worldwide in recent times as complementary and alternative medicines owing to their biocompatibility unlike the chemically synthesized drug associated side effects and health hazards. Hereby, isolation, identification and evaluation of active principles from ethnomedicinal plant have become the prime focus of drug discovery programs. Gnidia glauca is one of such comparatively less explored medicinal plants with potent therapeutic applications in global traditional herbal remedy. It is well known for its anticancer activity as well as for its use as piscicidal, insecticidal and molluscicidal activity. Hereby, we present for the first time a commentary on complete research carried out till date on G. glauca and its medicinal properties.

Keywords: *Gnidia glauca*; Phytochemistry; Ethnomedicine

Introduction

Search of complementary and alternative medicine has gained a thrust in the recent decade due to the pronounced side effects and health hazards of the chemically synthesized drugs. Hereby, a comprehensive knowledge about the traditionally used medicinal plants is indispensable for exploration of its novel bioactive components. One of such comparatively less explored medicinal plant is *Gnidia glauca*. Although, it has folkloric, traditional phytomedicinal and agrochemical applications in various parts of the world, still there are no available scientific validations or evidences to support the fact. In African medicine it is used for treatment of abdominal pain, cancers, wounds, snake bites, sore throat and burns. It is also well known for its piscicidal, insecticidal, molluscicidal and even homicidal activity for its use as arrow poisons. Similarly, its antineoplastic activity is reported to be remarkably superior [1]. However, till date there is no comprehensive information on the plant.

In view of the background, herein we present the first commentary on complete research carried out till date on *G. glauca* and its promises as complementary and alternative medicine (Figure 1).

Antimicrobial Activity

Plant pathogenic fungi are major cause of heavy losses in the crop yield as well as the economic turnover of the farmers. Hereby, development of eco-friendly herbal and cheap antifungal agents is of utmost importance. Aqueous extracts of various parts of *G. glauca* exhibited variable mycelia inhibition against *Phytophthora parasitica*, a plant pathogenic fungi causing heart rot in pineapple. At a concentration of 5% the *G. glauca* seeds, leaves and barks showed an inhibition upto 19.16, 15.90 and 23.46%, respectively. Similarly, an enhanced activity was observed with a higher concentration at 10%, equivalent to 28.47, 34.59, 33.60% for seed, leaves and bark respectively [2]. A significant anticariogenic activity against *Streptococcus mutans* by the methanolic extract of *G. glauca* leaves was reported recently. The active extracts showed a high total phenolic (126.25 ± 0.20 µg GAE/mg) and flavonoid (25.75 ± 0.10 µg CE/mg) content [3]. *G. glauca* bark extract is reported to have superior antibacterial activity against urinary tract infection causing pathogens like *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Enterococcus faecalisas* compared to leaf and flower [4].

Back Ache and Joint Ache

According to ethnobotanical information, roots of *G. glauca* are widely used as a traditional medicine in Embu and Mbeere districts, Eastern Province of Kenya for treatment of back ache and joint ache [5].

Insecticidal and Larvicidal Activity

Leaves of *G. glauca* are used in Kenya as insecticidal agent [5]. Sequentially extracted hexane and chloroform extracts of dried bark of *G. glauca* exhibited moderate mosquito larvicidal activity, whereas hexane, choloroform and MeOH extracts of fresh bark of the plant showed superior larvicidal activity against second instar larvae of *Aedes aegypti*. Maximum activity upto 100 % mortality was exhibited by the chloroform extract of fresh bark within a few minutes. Bioassay guided fractionation confirmed that compounds like bicoumarin and Pimelea factor P2 are mostly responsible for larvicidal activity [6]. Aqueous extract of *G. glauca* leaf and bark showed a notable ovicidal activity against the eggs of teak defoliator, *Hyblaea puera* Cramer upto 44.4 and 45.7 %, respectively [7]. In order to check the antileukemic and piscicidal activity of *G. glauca*, dried ground roots were extracted at room temperature with 95% ethanol under stirring condition for 24 h. The extract was further partitioned in various proportion of chloroform – water mixture to yield the gold fish piscitoxic fraction identified as gnidiglaucin ($C_{32}H_{46}O_{10}$). However, the isolated compound failed to show inhibitory activity in in-vivo assay for antileukemic activity (P-388) [8].

Antiviral

A recent ethnobotanical study on medicinal plants used by people

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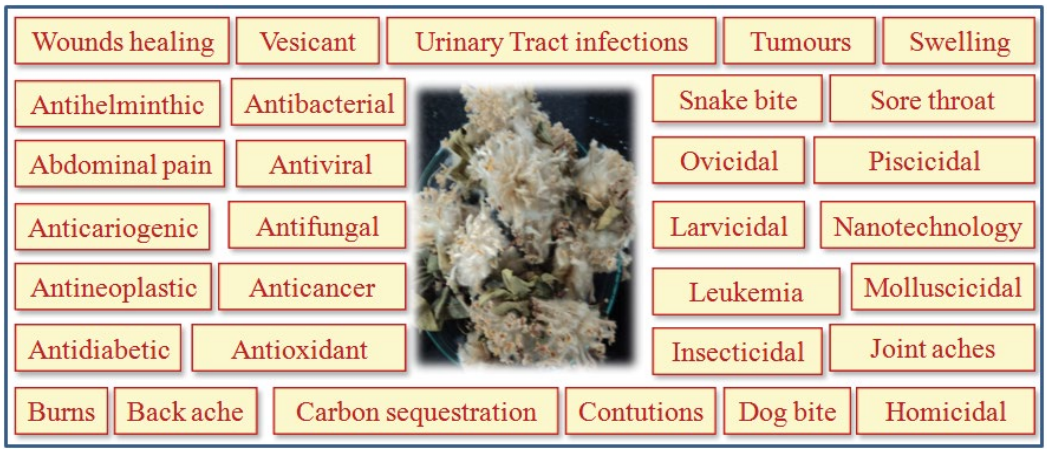

Figure 1: Ethnomedicinal importance of *G. glauca*.

in Zegie, Peninsula, Northwestern Ethiopia revealed that the root powder of *G. glauca* mixed with skimmed milk is taken orally for seven days for treatment of rabies [9].

Antioxidant Activity

The methanolic extract of *G. glauca* leaf with high antioxidant activity showed major phenolic content of 203.3 GAE/g. It could scavenge both ABTS (IC_{50} = 16.3 µg/mL) and nitric oxide (IC_{50} = 360.8 µg/mL) radicals. Further, FRAP value of 993.7 µm TE/mg was recorded at 30 min and 142.5 mg AAE/g of total antioxidant activity was evaluated [1]. In our previous report as well, we observed similar trend where the alcoholic extracts of *G. glauca* leaf showed high phenolic and flavonoid content. In case of pulse radiolysis generated hydroxyl radical scavenging second order rate constants of ethanolic extracts of *G. glauca* flower (4×10^6) was found to be very high indicating superior activity, followed by its leaf (3.73×10^6) and stem (3.66×10^6). Methanol extract of leaf showed efficient scavenging activity against DPPH radical, super oxide and nitric oxide radicals [10].

Antidiabetic Activity

Metabolic enzymes, like α-amylase and α-glucosidase are considered as key targets for discovery of antidiabetic drugs. Ethanolic, methanolic and ethyl acetate extracts of *G. glauca* flowers showed an excellent inhibitory potential (~70 % and above) against α-amylase while only methanol extract of leaf showed high inhibition against α-glucosidase [11].

Nanobiotechnology

The higher content of phenolics and flavonoids is responsible for the synthesis of gold nanoparticles by *G. glauca* flower extract. It showed one of the most rapid routes for synthesis to be completed entirely within just 20 min. The resulting AuNPs were small spheres with a diameter of 10 nm in majority. Exotic shapes like nanotriangles were also observed employing high resolution transmission electron microscopy along with other characterization tools. These AuNPs exhibited excellent catalytic properties in a reaction where 4-nitrophenol is reduced to 4-aminophenol by $NaBH_4$ [12].

Toxicology Study

Toxicology studies to establish the safety of methanolic extract of *G. glauca* barks and roots involved the evaluation of acute oral toxicity in female rats. Neither mortality, nor morbidity was observed at administered dosages of 175, 550 and 2000 mg/kg body wt., which reveal the safety of these extracts in the doses up to 2000 mg/kg body weight. This study establishing that an LD_{50} value of *G. glauca* bark and root extracts, higher than 2000 mg/kg body weight is definitely advantageous for its clinical studies [13]. Thus it provided the scientific rationale supporting the wide usage of *G. glauca* for diverse therapeutic purposes [14].

Conclusion

G. glauca being one of the very important ethnomedicinal plant, will continue to be explored by researchers from various disciplines. In near future scientific discoveries, adding newer attributes to its therapeutic spectrum will surely enable it to emerge as one of the very vital model system, pivotal to many field of research like, pharmacognosy, pharmacy, phytochemistry, drug discovery and nanobiotechnology.

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