

## Changing Trends of *Solanum nigrum* Based Pharmacognosy

Anam Javed<sup>1\*</sup>, Sonia Aslam<sup>2</sup>, Zubaida Qayyum<sup>3</sup>, Arooj Fatima<sup>4</sup>, Anam Sadiq<sup>5</sup> and Khadija Tul Kubra<sup>6</sup>

<sup>1</sup>Assistant professor, School of Zoology, Minhaj University, Lahore, Pakistan

<sup>2</sup>Lecturer, School of Zoology, Minhaj University, Lahore, Pakistan

<sup>3</sup>Lecturer, University of Home Economics, Lahore, Pakistan

<sup>4-6</sup>BS Researcher, School of Zoology, Minhaj University, Lahore, Pakistan

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\*Corresponding author: Anam Javed

Assistant professor, School of Zoology, Minhaj University, Lahore, Pakistan

### Abstract

*Solanum nigrum* is one of the commonly found herb around the globe and contains diverse therapeutic along with biological control based potentials. For last few decades, not only aqueous but also other organic solvents based extract have been prepared to obtain maximum benefits of its components to recover external and internal wounds, inflammations, infections, cancer and to control many disorders like cytotoxicity, cardiovascular, hepatic, gastric and enzymatic complications. Moreover, it has been found as effective to reduce aging and an ideal local cost source of phytoremediation. For future progress, its dose and shots optimization should be focused by researchers.

**Keywords:** *Solanum nigrum*; therapeutic; biological control; wounds; cancer; phytoremediation.

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### INTRODUCTION

Herbal treatment is well renowned globally and in this regard the members of family Solanaceae [1] are quite prominent for example *Datura stramonium* L. (Jimson weed), *Hyoscyamus niger* L. (black henbane), *Atropa belladonna* L. (deadly nightshade) and *Solanum nigrum* (black night shade) [2, 3]. It also comprises of a variety of vegetables and fruits and other ornamental plants like *Petunia* genus. Their compositional biochemicals i.e., flavonoids, alkaloids, steroidal lactones and glycosides are considered pharmacognosally significant as antidiabetic, antiseptic, and of diuretic nature [4]. But among them, *S. nigrum* (Table 1) has exceptional medicinal importance due to its anti-oxidant, cytotoxic properties,

anticancer, antiulcerogenic, anti-cancer and antimicrobial potential against e.g., *Echerichia coli*, *Bacillus subtilis*, *Klebsiella pneumonia*, *Vibrio cholera*, *Micrococcus luteus*, *Salmonella typhurium*, *Aspergillus niger*, *Aspergillus fumigatus* and *Candida albicans*. In addition to that, steroidal glycosides i.e., saponin and diosgenin are also found in *S. nigrum* which are utilized to prepare oral contraceptives, corticosteroids, sexual hormones and other steroidal drugs [3, 5, 6]. Moreover, it is also utilized to cure several dermal and optical ailments and hydrophobia [3]. Among constitutional minerals phosphorus, iron, calcium, vitamins A and C are included, parallel to these, significant amounts of protein, fats and fibres also are found in leaves of *S. nigrum* [7].

**Table-1: Traditional uses of *S. nigrum* for medical purposes**

Parts of <i>S. nigrum</i>	Medicinal Usage	References
Leaf	To cure ringworm, stomach ulcer and rabies; as dressing of HPV and as tonic for liver and ingestion process	[8-12, 14]
Fruits	To stop kids' bed wetting; to treat blindness treatment, optical bacterial infection and cataract	[8, 13]
Roots	Increases feminine fertility; Recovers cough and other respiratory infections	[15, 16]
Whole plant	As remedy for dermal infections, burns and scald; snake venom; complications of oncogenic origin	[13, 17, 53, 54]

### Biochemical components of *S. nigrum*

According to the reported data, *S. nigrum* consists of phytosterols, reducing sugar molecules, antinutrient factor (tannin) [18], glycosides [19], glycoprotein [20], proteins, carbohydrates, alkaloids [19] (An *et al.*, 2006), steroid alkaloids [21], flavonoids [7], Linoleic acid [22], steroidal and saponins [21]. Along with protein content (30.26%) [Mainly glycine and proline] and carbohydrate content (69.74%) [55]. Whereas the concentration of the solasodine is found less in mature plants, but its concentration is high in unripe fruit [56]. Recent research indicated the occurrence two disaccharides in isolates of *S. nigrum*,

having chemical structures: ethyl  $\beta$ -D-thevetopyranosyl-(1-4)- $\beta$ -D-oleandropyranoside and ethyl  $\beta$ -D-thevetopyranosyl-(1-4)- $\alpha$ -D-oleandropyranoside, respectively [22]. Ascorbic acid is also present in the fruit of the plants [58]. Furthermore, FTIR analysis showed the presence of functional groups with different peaks such as carboxylic acid, anhydrides, alkyl group, alcoholic group and ethers [23].

### Extracts of *Solanum nigrum*

The so far reported pharmacognosial potential of black night shade's extract is as follows (Table 2):

**Table-2: Pharmacognosial potential of *Solanum nigrum* extracts**

Type of <i>S. nigrum</i> extracts	Pharmaceutical Role	Reference (s)
Methanolic extracts	Anti-oxidant	[24, 25]
	Antibacterial	[26, 27]
	Cardioprotective	[28]
	Anticancer	[29, 30]
	Anti-ulcer	[31]
	Hepatoprotective	Ruby <i>et al.</i> , 2012; [29, 30]
Ethanollic extracts	Anti-inflammatory and Anti-convulsant	[26, 32]
	Anti-diarrheal	[33]
	Analgesic	[29, 58]
	Anti-Diabetic	[34]
	Cytotoxic	[35, 58]
	Anti-HCV activity	[18,36]
	Antiaging effect	[52]
	Anti-diarrheal effect	[29, 58]
Aqueous extracts	Anti-convulsant	[37]
	Antiseizure activity diuretic and antipyretic. antiepileptic	[38]
	metastasis was probably suppressed, antitumor	[39, 40]
	Antiproliferative activity	[41, 42]
Chloroform based extract	Anti-inflammatory, antipyretic and antinociceptive activities	[43]
Diethyl ether based extract	Ameliorate the serum level of ALT enzyme	[44]

### Current trends and Future perspective

Not only the pharmacognosial aspect but over view of other possible potentials of *S. nigrum* based extracts is as follows:

- The leaf extract of *S. nigrum* has significant potential of biological control against *Cx. vishnui* group and *An. Subpictus* and in near future the isolated bioactive phytochemical may serve as efficient could be used as a source of an effective mosquitocidal agent [45].
- The *in vitro* and *in vivo* antiplasmodial effects of *S. nigrum* highlighted the need of further investigation to identify the active constituents of this plant and to explore their exact mode of action [46].
- The aqueous extracts of roots, stems and leaves of *S. nigrum* has potent chelating ability and of soil phytoremediation against hyperaccumulation of heavy metals like Cd and Pb [47].

- Recently, several steroidal glycoalkaloids based secondary metabolites have been isolated from *S. nigrum* and by using CRISPR/Cas9 technology the plant components, its secondary metabolites, and therapeutic applications can be further enhanced to obtain broad spectrum benefits [48].
- Moreover; for future use, the ethyl acetate, petroleum ether, chloroform, n-butanol, ethanol and aqueous media based isolated fraction from *S. nigrum* by exhibiting cytotoxic and anticancer effects on different cell lines, revealed major antioncogenic and other therapeutic potentials of this plant [49, 50].

### CONCLUSION

Thus it can be concluded that the aqueous and organic extracts of diverse components of *S. nigrum* indicate promising therapeutic effects. Thus, before

appliance, further studies are required for their dose or shot optimization [51].

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