



## A review on ethnomedicinal uses of *Solanum nigrum*

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### Abstract

Ethno pharmacological relevance: *S. nigrum* Linn. (Solanaceae) is a dicot weed that grows all over the world due to its not so specific water, temperature and mineral requirements, except polar and extreme deserts. Far and wide, different parts of this plant have been utilized conventionally to cure various maladies and ill health conditions such as cough, fever, joint pain, anemia, malaria, dressing wounds, burns, indigestion, rabies, insect or snake bite, diarrhea, dysentery, diabetes, asthma, lumbago, toothache, ophthalmic issues, cancer, tumors etc.

Aim of the review: The foremost aim of this review paper is to come up with an overview and also to critically analyze the earlier reported ethno medicinal uses, phytochemistry, pharmacological properties and toxicological studies of *S. nigrum*. This paper will also serve the purpose to pinpoint the remaining gap, in addition to furnish a basis for future studies and investigations in above mentioned fields regarding this plant. Another lead motive of this review paper is to draw attention of researchers toward the extensive pharmaceutical values of this plant for their better implementation in upcoming times.

**Keywords:** ethnomedicinal uses, pharmacology, phytochemistry, *S. nigrum*

### Introduction

*S. nigrum* is a member of Solanaceae. This family comprises many genera, well known for their curative properties. It is also known as African Nightshade, Makoi/ Mako, Peelak and many more vernacular names all over the world. In addition to *S. nigrum*, this family includes fruits and vegetables such as potato (*Solanum tuberosum*), tomato, and peppers, ornamental plants such as *petunia*, and other medicinal plants such as *Atropa belladonna* L. (deadly nightshade), *Datura stramonium* L. (Jimson weed), and *Hyoscyamus niger* L. (black henbane) (Sharma *et al.*, 2011) <sup>[1, 6]</sup>. Generally, two varieties of *S. nigrum* found one is having black colored fruit and second produce reddish brown colored fruit. In both varieties unripe fruit are toxic. Leaves, stem, twigs and roots are used for health point of view. Furthermore, they are rich in bioactive compounds, particularly lutein, zeaxanthin, polyphenol, flavonoids, and chlorophylls, which possess antioxidant activity, anti-genotoxicants, and anticancer properties (Sangija *et al.*, 2021, Ojiewo, 2013) <sup>[2, 9, 17]</sup>.

### Material and Methods

All the relevant data and information on *S. nigrum* was collected using several databases such as PubMed, PubChem, Springer, Google Scholar, NCBI (National Center for Biotechnology Information), Science Direct, Research Gate as well as research and review articles from peer-reviewed journals and unpublished data such as PhD thesis, etc. Further 'grey literature' sources such as webpages, ethnobotanical books, chapters, Wikipedia were also considered.

### Ethnomedicinal Uses of *S. nigrum*

In ancient medicine literatures whether they are from India, Middle East, Greece, China or Europe *S. nigrum* was always mentioned for its health beneficial effects. Various parts of this plant like leaves, roots, flower, stem etc. have been utilized by folk either in combination with other herbs or singly to prepare traditional potions to get rid of several body problems. Till today villagers, tribal communities, people practicing Ayurveda and locals of undeveloped countries avail this plant frequently worldwide to treat diseases like:

**Table 1:** Ethnomedicinal uses

Sr. No.	Ailment	Part used	Preparation	Area	References
1.	Ringworm	Leaves Raw berries	Make smooth paste of clean and dry Leaves and berries	Tanzania	Moshi <i>et al.</i> , 2009; Yang, 2009
2.	Warts	Leaves	Topically apply paste of green Leaves	Tanzania	Moshi <i>et al.</i> , 2009
3.	Burns	Whole plant	Balm	Algeria Iran	Boulos, 1983
4.	Wounds	Whole plant	Topically apply paste of green Leaves	Tamil Nadu India	Jain <i>et al.</i> , 2011

5.	Insect bite	Leaves	Maceration	Congo	Chifundera,1998
6.	Fungal Infections	Leaves	Make smooth paste of clean and dry Leaves	India	Zahara <i>et al.</i> ,2019
7.	Rashes and Boils	Leaves	Topically apply paste of green Leaves	Africa	Zahara <i>et al.</i> ,2019
8.	Stomachache	Leaves	Fresh Leaves cooked with onion bulbs and cumin seeds	Tamil Nadu India	Jain <i>et al.</i> ,2011
9.	Gastric ulcers	Leaves	Leaves juice can be taken orally	Tamil Nadu	Yang & Ojiewo, 2013
10.	Indigestion	Leaves	Leaves juice can be taken orally	Himalayan Regions of India	Kala 2005
11.	Liver detoxification	Ripe berries Leaves	Can be consumed as fruit also, cooked Leaves can be taken with meals	Himalayan Regions of India	Jain <i>et al.</i> ,2011
12.	Dysentery	Leaves	decoction	India	Kaushik <i>et al.</i> , 2009
13.	Lost appetite	Leaves	Consume in form of decoction.	Iran	Jain <i>et al.</i> ,2011
14.	Intestinal worms	Berries and Leaves	Eat ripe berries and Leaves can be used to prepare oral decoction	Africa	Jain <i>et al.</i> ,2011
15.	Constipation	Ripe berries	Should be consumed directly	India Iran Africa	Jain <i>et al.</i> ,2011
16.	Diarrhea	Leaves and berries	Decoction of Leaves. Cooked Leaves can be taken with meals along with berries	Africa Iran India Pakistan	Jain <i>et al.</i> ,2011
17.	Jaundice	Leaves	Juice of fresh Leaves	Africa	Yang & Ojiewo, 2013
18.	Asthma	Roots and berries	Extract of berries or decoction of roots	India Assam	Jain <i>et al.</i> , 2011
19.	Pneumonia	Leaves	Oral decoction	Cameroon	Zahara <i>et al.</i> ,2019
20.	Cough	Whole plant	Taken as meal  Oral decoction	Iran India	Yang & Ojiewo, 2013
21.	Tonsillitis	Leaves	decoction of Leaves	Africa	Zahara <i>et al.</i> ,2019
22.	Whooping cough	Roots	Juice of roots	Assam India	Jain <i>et al.</i> , 2011
23.	Sore throat	Leaves	Decoction should be prepared with fresh Leaves	Iran	Jain <i>et al.</i> ,2011
24.	Blindness	Berries and Leaves	Diluted infusion of berries and Leaves	Algeria	Boulos, 1983; Jain <i>et al.</i> , 2011
25.	Conjunctivitis	Leaves and berries	Diluted infusion of Leaves and berries	Algeria	Boulos, 1983; Jain <i>et al.</i> , 2011
26.	Glaucoma	Leaves and berries	Diluted infusion of Leaves and berries	Algeria	Boulos, 1983; Jain <i>et al.</i> , 2011
27.	Trachoma	Fruit	Aqueous infusion of berries	Algeria	Boulos, 1983; Jain <i>et al.</i> , 2011
28.	Cataract	Leaves and fruit	Diluted infusion of Leaves and berries	Algeria	Boulos, 1983; Jain <i>et al.</i> , 2011
29.	Snake bite	Whole plant	Maceration	United Republic of Congo	Chifundera 1998
30.	Rabies	Leaves	Grind the Leaves to make a paste and apply it with extract on the infected area	India	Sivaperumal <i>et al.</i> ,2010; Ramya and Jayakumarara 2009; Muthu <i>et al.</i> , 2006
31.	Tooth Ache	Raw berries	Either extract of raw berries or they can be consumed directly	Tanzania Algeria India	Yang & Ojiewo, 2013
32.	Tuberculosis	Leaves	Can be directly consumed, cooked Leaves with other veggies or	India	Kaushik <i>et al.</i> , 2009

			decoction can be utilized		
33.	Joint pain	Leaves	Decoction	Iran	Jain <i>et al.</i> , 2011; Kuete <i>et al.</i> , 2017
34.	Alcohol related hangover	Leaves	Bitter and dark green colored mature Leaves are crushed and that extracted liquid is diluted and utilized	Africa	Jain <i>et al.</i> , 2011
35.	Fever	Whole plant	Leaves are used to prepare decoction. Ripe berries can be consumed directly	India	Kaushik <i>et al.</i> , 2009; Kuete <i>et al.</i> , 2017
36.	Malaria	Leaves	Extract of Leaves	Africa	Jain <i>et al.</i> , 2011; Kuete <i>et al.</i> , 2017
37.	Blood purification	Berries and Leaves	Cooked Leaves and berries are edible	East Africa	
38.	Anemia in children and nursing mothers	Whole plant	Ripen fruits and Leaves can be cooked with other vegetables or cereals and can be consumed as a meal	Africa Kenya	Olouch <i>et al.</i> , 2012
39.	Vomiting and tetanus after abortion	Ripe berries and roots	Fruits can be directly consumed and decoction of roots	Africa	Olouch <i>et al.</i> , 2012
40.	Sedative	Roots	Decoction	Africa	Dolatkhahi, 2014
41.	Analgesic	Leaves and fruit	Balm	Iran	Dolatkhahi, 2014
42.	To increase fertility in women	Roots	Roots boiled with little sugar	Rajasthan India	Jain <i>et al.</i> , 2011
43.	Bed wetting in kids	Ripe berries	Ripe berries directly consumed as fruit	Tanzania	Jain <i>et al.</i> , 2011
44.	Diabetes	Leaves	Aqueous extract prepared from fresh Leaves	Asia and Europe	Nyaga <i>et al.</i> , 2019
45.	Heart pain and swelling	Leaves	Consume raw Leaves as well as cooked with other meals	Kenya	Onyango, 2015
46.	Lumbago	Roots	Ashes of roots are rubbed on lower back in form of ointment	Algeria	Edmonds & Chweya, 1997
47.	Erysipelas	Whole plant	Sap	Tunisia	Onyango, 2015
48.	Cut Restoration	Leaves and Fruit	Balm	Iran	Eskandari <i>et al.</i> , 2019
49.	Carminative	Leaves and fruits	Oral decoction	Iran	Eskandari <i>et al.</i> , 2019
50.	Small pox in children	Ripe fruits	Oral decoction	Iran	Eskandari <i>et al.</i> , 2019
51.	Antidepressant	Fruits	Oral decoction	Iran	Saki & Bahmani, 2014
52.	Inflammatory bowel diseases	Fruit	Isolated glycoproteins	Iran	Saki & Bahmani, 2014
53.	Alcohol Addiction	Fruit	Oral decoction	Iran	Saki & Bahmani, 2014
54.	Expectorant	Fruit	Oral decoction	Iran	Eskandari <i>et al.</i> , 2019
55.	Bladder pain	Aerial parts	Oral decoction	Iran	Maleki & Akhiani, 2018
56.	Eczema	Aerial parts	Oral decoction	Iran	Maleki & Akhiani, 2018
57.	Hemorrhoids	Leaves fruits	Consume fruits	India	Saki & Bahmani, 2014
58.	Dysuria	Aerial fruits	Oral decoction	Iran	Maleki & Akhiani, 2018

Several species of *S. nigrum* also possess antitumor, anti-inflammatory, diuretic, antipyretic activities (Kuete *et al.*, 2017) <sup>[15]</sup>. Along with these above mentioned uses of *S. nigrum* it also serves as a great source of several essential minerals, ions and vitamins. It is loaded with calcium, magnesium, iron, phosphorous, potassium, zinc

and Sulphur. The procedure and techniques of cooking and consuming prominently determine the nutritional value of various plant parts. Also, the other companion food taken with *S. nigrum* can enhance or destroy nutrients like vitamin B and Vitamin C, carotenes etc. So, the right combination of veggies and cereals is a kind of must to derive the complete benefits of the plant.

### Conclusion

*S. nigrum* is an invaluable medicinal source. The further investigations and research on this plant can legitimize its traditional and ethnobotanical use. However, many aspects of the plant have not been clear yet. The pharmaceutical properties of the bioactive constituents isolated from the plant are proven only for treatment of a few ailments due to lack of bio-guided isolation strategies. Further, research work on bioavailability, pharmacokinetics, and mechanism of action and structural activity relationship studies of isolated pure compounds will contribute more in understanding their pharmacological effects and toxicity. Also, side-effects in humans and animals are needed to be thoroughly studied. More work has to be done, to investigate the long term *in vivo* toxicity and clinical effectiveness of the plant.

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