



# *Solanum nigrum* Linn: An analysis of the therapeutic properties of plant

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## Abstract

*Solanum nigrum* (black nightshade) is an indigenous medicinal plant that has been utilized in traditional medical systems for ages. *S. nigrum* includes bioactive substances such as alkaloids, flavonoids, steroids, and saponins, according to phytochemical research. Extracts and isolated chemicals indicate antioxidant, anti-inflammatory, antibacterial, antifungal, anti-diabetic, anti-cancer, immune-stimulating, therapeutic, and heart-protective effects. *S. nigrum* extracts, in particular, limit cancer cell growth, minimize chemically induced organ damage, alter immunological function, and provide protection against oxidative stress, according to animal and cell culture studies. *S. nigrum* has traditionally been used for the prevention of symptoms such as discomfort, inflammation, infections, and problems with the gastrointestinal tract. While preliminary research suggests that *S. nigrum* has therapeutic potential, more phytochemical, toxicological, and epidemiological investigations are needed to fully characterize its efficacy, safety, bioactive components, mechanisms of action, and transpose folk practices into scientifically supported medicinal applications. Overall, this comprehensive study reveals the varied therapeutic qualities of *S. nigrum* that demand further exploration. It is important to note that further research is still needed to fully understand its mechanisms of action and evaluate its safety and efficacy in humans.

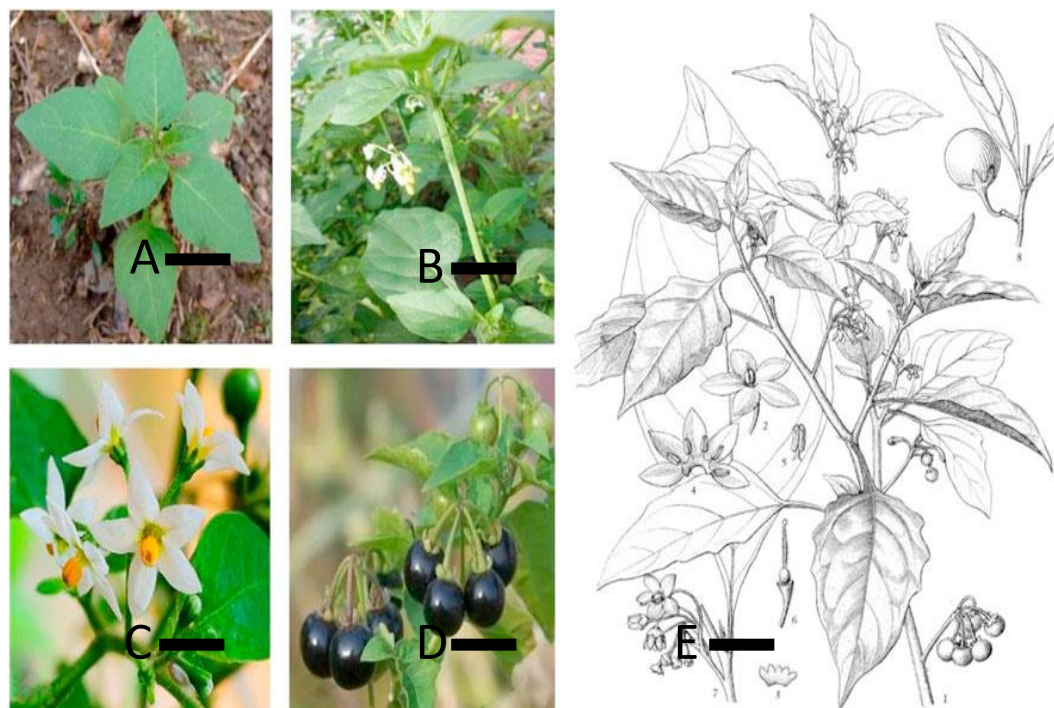
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## Introduction

Plant-based medicines have been used in folkloric medicine by humans for many years (Nyeem et al., 2017; Zeeshan et al., 2023). The genus *Solanum* has over 2,000 different tropical and subtropical perennials that are thought to be found in all tropical and subtropical regions of the planet. Ganake soppu in Kannada, Makoi in Hindi, Kachchipandu in Telugu, Munatakali in Tamil, Piludi in Gujarati, and Black Night Shade in English are all names for the plant *S. nigrum* Linn. In addition to these names, this species of plant is also known as Ganake soppu and Kamuni in Kannada. Locally, medicinal plants are used to cure diseases caused by fungus, bacteria, viruses, and parasites. Furthermore, nearly 60% of individuals in rural regions rely on traditional medicine to address their problems. Various plants have been utilized as inspiration for the creation of new medications. Plant-based medications are commonly utilized because they are safer than synthetic counterparts and are more readily available and less expensive. Secondary metabolites are the active ingredients of many medicines discovered in plants (Kumar et al., 2020). The annual shrub-like black nightshade has a limited life period. It might be anywhere amongst shades of green and purple at times. Its hairs will be free of prickles, whether follicular or uncomplicated and non-glandular. Because of its antibacterial and

antidysentery properties, the "plant" has been employed domestically in India to treat ailments such as cardialgia and gripe. Furthermore, the "plant" is widely recognized for its antibacterial properties. The *S. nigrum* plant has a variety of medicinal properties notably anti-oxidative, anticancerous, detoxifying, neurological-protective, and antiulcerogenic properties. Current rat studies looked at the possible oxidative damage caused by CCL4 as well as the potential preventive benefits of an oral extract of the leaves of the *S. nigrum* plant (Rani et al., 2017). *S. nigrum* Linn. Belongs to Solanaceae family the plant used to cure a variety of infectious diseases that can affect people (Mandal et al., 2023). *S. nigrum*, which is additionally known as black night shade, biosynthesizes a variety of bioactive chemicals with a variety of therapeutic effects, including the treatment of cardiovascular illnesses and type 2 diabetes, among others (Nderitu et al., 2023). *S. nigrum* has traditionally been used to treat a variety of maladies including discomfort, eczema, hay fever, and gastrointestinal infections (Rani et al., 2004). It is also used in the treatment of sexually transmitted illnesses (Atanu et al., 2011). *S. nigrum* has been repeatedly employed in conventional medical practices throughout history for its possible therapeutic effects. The plant has been used to cure a variety of diseases, particularly allergic reactions, dermatitis, gastrointestinal problems, and asthma. It has previously been administered as aphrodisiacs and for pain relief (Pandey et al., 2021).



**Fig. 1** Leaves (A); stems and leaves (B); flowers (C); fruits (D); illustration of *S. nigrum* (E) (1, Upper portion of plant with flowers and fruits; 2, Flower; 3, Opened calyx adaxial view; 4, Opened corolla showing stamens; 5, Stamen; 6, Pistil; 7, Flowering branch; 8, Fruiting branch).

### Macroscopy

The wood is light yellow and can be seen through the thin, easily peeled bark. The blooms are typically symmetrical and have five petals. They can be flat and round or star-shaped, although they're more frequently bell or tubular shaped. Plants in this family frequently have hairy stems and leaves and are jumpers or at best clinging plants. The leaves are frequently interspersed, entire, or split, and without septate. The root is outwardly smooth and pale brown, with only a few projections and numerous little lateral roots, according to the morphological analysis. Fruit pulp has free-lying seeds and displays narrow, spongy texture modules, fruity endosperm, and barrel anovulation. The fruits are berries, often oblique and 6mm in diameter (Rajani et al., 2012).

### Microscopy

Uni seriate trichomes with hooked points that cover the twig and rachis of the leaf exhibit an arc-shaped organization of secondary vascular tissue. Anisocytic stomata can be seen on the lamina of the leaf, albeit they seem to be more prevalent on the lower side. Ratio of the palisade: 2-4 and number of vein islets: 7-10. (Jani et al., 2012).

### Nutritional value of vegetable black nightshades

The leaves of nightshades plant can provide substantial amounts of methylene, an amino acid that is uncommon in

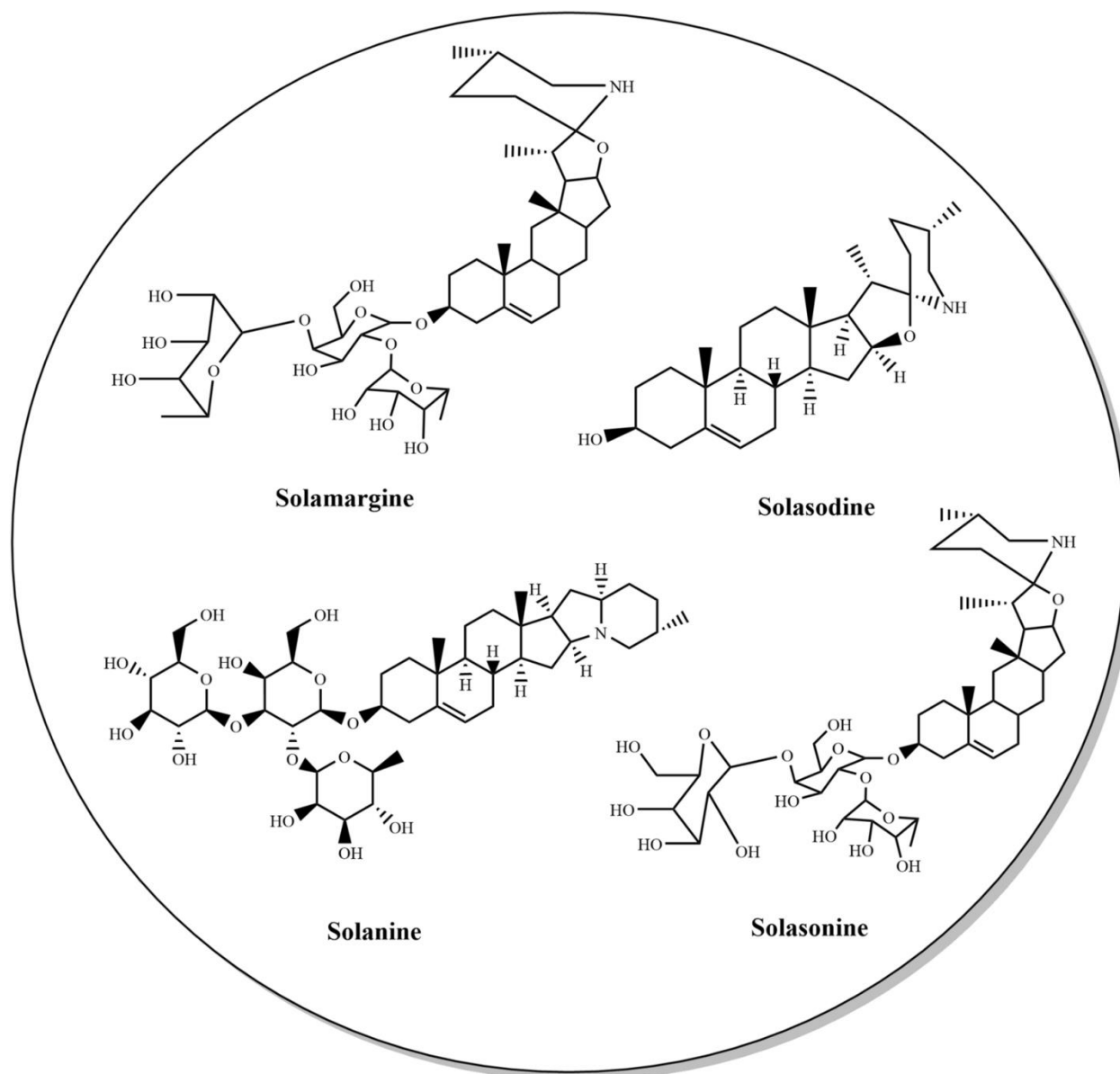
other plants, as well as high levels of oil, fiber, vitamins A and C, calcium, iron, and phosphorus. Additionally, the berries are said to be able to produce significant quantities of C and beta-carotene, as well as high levels of iron, calcium, and vitamins. The seeds also include carotene and vitamin C (Watt et al., 1962; Fortuin et al., 1980). However, depending on the soil fertility, plant kind, and nutritional levels (i.e., variant or species). It was discovered that the maturity of the plant affected the nutritional value of "*S. nigrum*" leaves. Additionally, the addition of nitrogen raises the levels of protein and ascorbic acid while lowering the intracellular concentrations in the leaves (Edmonds and Chweya 1997). According to Mathooko and Imungi's experiments, ascorbate concentration dropped as boiling time and water volume increased. The species include oxalates, phenolics, and deposit nitrates (Mathooko et al., 1994).

### Phytochemicals from *S. nigrum*

The entire plant has coumarins, phytosterols, proteins, carbohydrates, tannins, flavonoids, and glycosides, according to a phytochemical investigation. Glycoprotein, steroidal saponins, and steroid alkaloids, all of which have been verified to be present in *S. nigrum*, have been shown to contain chemicals with anti-tumor effect. A study looked at the chemical composition of an osmotin like protein from this plant (Jami et al., 2007). This plant has created a novel glycoprotein (150 KDa) that is over 50% polar amino acids include glycine and proline and is predominantly made of carbohydrates (69.74%) and proteins (30.26%) (Lee & Lim, 2003) *S. nigrum's* tiny, immature fruits had high levels of

solasodine, but as they develop, both the proportion and the total amount per fruit decrease. Recently, it was revealed that the berries of the *S. nigrum* plant growing in New Zealand contain the compounds solamargine, solasonine, and solanigrine. In the fruit of *S. nigrum* (Varsheny et al., 1965) a conjugated steroidal genin identified termed tigogenin by combined melting point or IR spectroscopy was found. Two furostanol glycosides and one Spiro stanol glycoside were obtained from an ethanolic preparation of the branches and roots of *S. nigrum* (Sharma et al., 1983). According to some experts, the species of *S. nigrum* generate acetic acid, however it is more abundant in the berry than the root (Kumar et al., 2004). Six new intravenous testosterone saponins (solanigrins C-H), also known as glycosides

(degalactotigonin), were discovered from the complete *S. nigrum* plant (Zhou et al., 2006). Researchers have isolated four saponins from the complete *S. nigrum* plant, including two new steroidal saponins classified as *nigrumnins* I and II as well as two existing recognized saponins. (Ikeda et al., 2000) As a result, employing phytochemical research, two novel sugars were extracted from *S. nigrum*. Their structures were determined to be ethyl b- D-thevetopyranosyl-(1-4)- b- D-oleandropyranoside and ethyl b-D-thevetopyranosyl-(1-4)- a-D-oleandropyranoside, respectively, using chemical and spectroscopic methods. *S. nigrum* seeds have a high lipid content. They are an excellent source of protein, minerals, especially magnesium as the most prominent, and linoleic acid, which is a major component of *S. nigrum* oil (Dhellit et al., 2006).



**Fig. 2** Phytochemical studies of *S. nigrum* show the presence of glycoalkaloids like solanine, solamargine, (Tai et al., 2018) and solasodine (Ding et al., 2013) as the primary marker compounds

### Pharmacology of *S. nigrum* Linn

Numerous studies have shown that *S. nigrum* infusions acted as a cytoprotective agent against gentamicin-induced Vero cell damage in addition to acting as an anti-neoplastic agent against Sarcoma 180 in rodents, inhibiting oxidant-mediated DNA sugar damage. Recent research discovered that *S. nigrum* focuses had a detrimental effect on binding protein 13-acetate (TPA)-mediated tumor promotion in HCT-116 cells and that methanolic extracts of fresh fruits had an outstanding anticarcinogenic effect against caused liver damage. The aqueous extract of *S. nigrum* contains several antioxidants, including cinnamic acid, PCA, catechin, carnosic acid, epicatechin, rutin, and narigenin, and exhibits considerable cellular antioxidant activity in vitro (Chou et al., 2008; Athar et al., 1995). On laboratory animals, the biological effects of an ethanol extract of the fruit of *S. nigrum* were explored. The extract also altered general behavioral patterns, decreased exploratory behavior patterns, suppressed violent conduct, changed higher levels of activity, and reduced spontaneous movement by prolonging pentobarbital-induced sleep duration after intraperitoneal administration. The discovery implies that the fruit of *S. nigrum* has neurogenic properties (Perez et al., 1998). In rats with carbon tetrachloride (CCl<sub>4</sub>)-induced liver damage, the efficacy of *S. nigrum* water infusion avoid liver damage was investigated. According to the study's findings, *S. nigrum* may be able to protect rat liver from CCl<sub>4</sub>-induced damage from oxidation. This hepatoprotective function may be attributed to the herb's ability to control purifying proteins, as well as its oxidative and free radical-scavenging properties (Chou et al., 2008). Previous research has shown that lowering transforming growth factor (TGF)-1 release can reduce hepatic fibrosis in rats. In several studies, a glycoprotein from *S. nigrum* was found to exhibit high anti-reactive oxygen radical scavenging or growth-inhibiting properties against JA221 and XL1-Blue. Furthermore, MCF-7 and HT-29 cells have been shown to be cytotoxic to amino acids, even when exposed to low concentrations. Inhibiting systemic HMG-CoA reductase in rats improves the activity of decontaminating enzymes and has considerable anti-lipid per oxide radical and hypolipidemic effects through glycoprotein (Heo et al., 2004; Lim et al., 2004; Lee et al., 2005). According to research, MCF-7 cells degrade proteins. According to (Lee & Lim, 2003; Son et al., 2003), the methanol extract exhibits lethal, necrotic, and anti-proliferative adverse effects on MCF-7 cells. In HCT-116 cells, glycoprotein induces apoptosis by activating NF- and producing inhibiting nitric oxide (iNO) (Lee & Lim, 2003). TPA-induced DNA-binding activities of gene transcription factors and NO interpreting, both of which are important for MCF-7 cell anticancer activity, can be altered by glycoprotein. As a consequence, a glycoprotein derived from *S. nigrum* may be one chemical that inhibits the production of TPA signal pathways in cancer cells (Heo et al., 2004). On Vero cells, the ability of a 50% alcoholic

extract of the whole *S. nigrum* plant to cytoprotective against gentamicin-induced toxicity was evaluated in vitro. Both the mitochondrial enzyme production (MTT) and the Trypan Blue Exemption Examination demonstrated a considerable reduction in cytotoxicity. Furthermore, the study decoction had shown a substantial ability to neutralize hydroxyl radicals, demonstrating a potential cause of cell harm (Kumar et al., 2004). Previous research found that treating rats with *S. nigrum* fruit has antiulcer, antioxidant, and tumor-stimulating effects (Jainu & Devi, 2004). Aerial parts of *S. nigrum* are hypothesized to have antiulcer properties in rats exposed to aspirin-induced ulcerogenesis via peptic or acidic inhibition (Akhtar & Munir, 1989). The intravenous of *S. nigrum*, which exhibited considerable antibacterial activity without any clear toxicological consequences, lends evidence to *S. nigrum*'s efficacy in Indian ayurvedic medicines for stomach treatment. While both ulcer-preventing and ulcer-healing capabilities of *S. nigrum* may be attributed to an antisecretory effect, the antisecretory activity tends to be principally associated with the inhibition of H+K+ATPase and the decrease of secretion release (Jainu & Devi, 2006). The antioxidant ability of *S. nigrum* leaf extract was evaluated using the management of restraint-induced oxidative stress. Crude extract used after treatment was shown to be more effective than prophylaxis at reversing the oxidative alterations caused by immobilization stress in rat plasma. Infusion of *S. nigrum* can be administered as a preventative and restorative treatment for removing free radicals in order to reduce oxidative stress, which is evident in many clinical illnesses (Al-Qirim et al., 2008). The antimicrobial capacity of the isolated proteins was tested using DPPH, hydroxyl radical, and hydroperoxyl tests. Based on these findings, it has been demonstrated that glycoprotein has significant antioxidative potential (Heo & Lim, 2004). It has also been reported that *S. nigrum* fruit extracts have potent rate of mortality, anti-inflammatory, and soothing qualities (Ravi et al., 2009). Although the precise mechanism of action is uncertain, these studies imply that *S. nigrum* has beneficial antioxidant, anticancer, and hepatoprotective properties.

### Antiproliferative activity/Cancer preventive

On many cancer cell lines, *S. nigrum*'s chloroform extract and separated constituents both have antiproliferative properties. The antiproliferative properties of the raw organic extricate and separated components were examined on tumor cell lines of the liver. Although it may be produced from the complete plant, crude extract is frequently produced with dried fruits. (HepG2) (Ji et al., 2008; Lee et al., 2004) (HT29 and HCT-116) (Ji et al., 2008) Breast (Lee et al., 2004) (MCF-7) cervical cancer (Li et al., 2009) (U1424, 25 and HeLa27). The antimutagenic activity of these fractions was examined by examining the toxicity of the isolate on cells. DNA fragmentation, a sign of apoptosis, was used to analyses the extent of cell death in the treated cells. Apoptosis, commonly known as "programmed cell death," is mediated by two routes. Hepatocytes are necessary for the intrinsic mechanism to work, but death receptors initiate the exogenous pathway. Known to control apoptosis at the mitochondria are the antiapoptotic

(Bcl-XL, Bcl-2, and Mcl-1) and antitumor activity (Bax, Bak, Bid, Bim, and Bad) proteins. Crude extracts at medium and high concentrations have been demonstrated to trigger a variety of responses in cells in in vitro experiments. When liver tumor cell lines (HepG2) are exposed to large amounts of the crude extract, c-Jun N-terminal kinase (JNK) is activated, which results in the stimulation of antiapoptotic proteins like Bax. Furthermore, it results in the mitochondrial release of cytochrome C, which activates caspases and starts the apoptotic process. An additional (Glossman et al., 2003) Autophagy, as opposed to apoptosis, is brought on if the same hepatocytes are treated to small amounts of extracts (Sikdar & Dutta, 2008). The cell's defective vesicles or malfunctioning route get it ready to adapt to challenging conditions through autophagy, a lysosomal destruction mechanism. This may help to explain why a minimal quantity results in apoptotic cell death (Oh & Lim, 2007). The anti-cancer effect of hydrophilic plant extracts is demonstrated by the prevention of cervical carcinoma growth. The mechanisms of action of isolated polysaccharides (SNL-P) and aqueous extracts (Joo et al., 2009) were shown to be comparable (Joo et al., 2009). Polysaccharides are most likely the active components in antioxidant activities that have anticancer potential according to Li et al. (2008). SNL-P demonstrated no cytotoxic effects on U14 bioreactors produced from cancer. Its anticancer activities are caused by its immunomodulatory traits, which alter the host's immune response. (Li et al., 2008) is crucial since chemotherapy exacerbates the defense system's already compromised condition as cancer advances. By stopping these units in the G2/M phase, the SNL-P treatment developed by (Tournier et al., 2000) increases the fraction of CD-4+ lymphocytes. According to (Li et al., 2008) Immunotherapy (IFN-) predominantly stimulates T-helper 1 cells, whereas SNL-P promoted CD<sub>4</sub><sup>+</sup> cells. -1 cells support the fight against intracellular infections as well as the eradication of self-modified or premalignant (Mumberg et al., 1999). A genital disease in mice, SNL-P, has been demonstrated to exhibit significant immunomodulatory and anticancer actions (Li et al., 2008).

#### **Antioxidant activity/Degenerative disease; Anti-aging**

Exogenous antioxidants can somewhat regulate the generation of free radicals, which can accelerate ageing and cause the start of many neurological illnesses (Wannang et al., 2008) Alcoholic extricate of *S. nigrum* demonstrated notable antioxidant action in a variety of tests, including the estimate of the net phenolic components in the plant extricate and the measurement from which the 5-lipoxygenase action (Akula et al., 2008). The DPPH was 92 percent inhibited by *S. nigrum* extracts in methanol, whereas the aqueous extracts showed significantly less potent radical scavenger capabilities. There was a quantifiable relationship between antioxidant activity and polyphenol concentration, indicating that the

phenolics in the plant add to its capacity to scavenge free radicals. Isolated *S. nigrum* glycoproteins both have antioxidant properties in addition to methanolic extracts. Using tests like the DPPH radical assay, 2-deoxyribose degradation screening test, and peroxides scavenging assay on MCF-7 cell lines, activities are clearly specific. According to (Lee et al., 2003) *S. nigrum* glycoproteins efficiently and dose-dependently controlled hydroxyl radicals. However, the exact method by which the reviving cytokines interleukin [IL]-2, IL-4, IL-12, IFN, and tumor necrosis factor-alpha [TNF] serve as scavengers is yet unknown (Lee et al., 2003).

#### **Anti-inflammatory activity/Inflammatory conditions**

Leukocytes and other complex mediator molecules, including proteinoids, erythropoietin, enkephalins, inflammatory mediators, platelet - derived growth factor, and IL-1, are released by tissues and migratory cells during an inflammation condition (Ravi et al., 2009). Numerous medications and extracts made from grapes, lavender, eucalyptus, mint, turmeric, and many other plants have been utilized to reduce inflammation (Vane et al., 1987; Darshan et al., 2004) identified the different extracts of the *S. nigrum*, identified the components that were causing the anti-inflammatory effect. The fat regulators that are concentrated more heavily during inflammatory process are leukotrienes like LTC<sub>4</sub>. Currently, anti-leukotrienes are employed to cure a wide range of inflammatory conditions, which include bronchitis and eczema dermatitis. One component of *S. nigrum*, (E)-ethyl caffeate, exhibits maximal leukotriene inhibition, which could make it an anti-inflammatory medicinal substance.

#### **Side effects and toxicity**

The majority of *Solanaceae* species are hazardous for humans and animals. The majority of the older literature claims on the plants' toxic effects. For instance, tropane alkaloids are present in deadly nightshade. When people consume toxins in significant doses, they have anticholinergic effects (Das et al., 2007). Though *S. nigrum* is considered to be an excellent source of nutrients, solanine, a glycoalkaloid that causes differing levels of toxicity in a dose-dependent manner, is mainly responsible for its toxic effects (cc) Solanine poisoning in humans can cause a variety of symptoms, such as dizziness, headaches, nausea, vomiting, diarrhea, lack of voice, temperature, perspiration, arrhythmias, dilated pupils, blindness, mental disorientation, convulsions, and fatalities (Watt et al., 1962). Weather, soil quality, seasonality, and plant maturity all affect how much poisonous chemical a plant (Watt et al., 1962) has young green berries are typically thought to be more harmful than ripe berries. (Cooper, 1984) Given that the plant is said to be eaten upon cooking, which is likely that boiling the plant destroys the harmful components. It has long been believed that eating veggies like tomato, potato, and eggplant might make arthritis patients feel worse since they aggravate their joint pain. According to some reports, the solanine found in these veggies' green sections is presumably

what causes joint discomfort. Furthermore, there is a paucity of empirical evidence linking intake of *S. nigrum* to joint damage.

### Cardio-protective activity

A global in situ ischemia perfusion injury paradigm is used to investigate the cardioprotective benefits of an ethyl acetate component of the *S. nigrum* berry species. Dosages of 2.5 and 5.0 mg/kg were used in this research for 6 days per week for 1 month. The fruit tincture of *S. nigrum* was shown to have cardioprotective properties (Bhatia et al., 2011)

### Anti-fungal effect

The inquiry into the anti-fungal activities of *S. nigrum* L. yielded an unexpected result: an effective farming bacterial fungus known as endophyte generates Sulphur dioxide at an exceedingly high yield. Further study might concentrate on medium manipulation, OSMAC (One Strain Many

Compounds), or genetic modifiers to promote the growth of the fungus *solanargine* (El-Hawary et al., 2016).

### Anti-larvicidal effect

The biocontrol capability of *S. nigrum* L. ripe leaf was investigated in an ethyl acetate solution (Solanaceae). Given that the death rate (Y) was positively related to the medication ratios (X) and had a Pearson correlation coefficient close to one, the data indicated that there is dose-dependent mortality (Rawani et al., 2014)

### Anti-stress effect

It was identified the active component and crude extract of *S. nigrum* leaves as possible preventive or therapeutic antioxidants. The findings show that the brain's elevated fat storage leaves it vulnerable to prooxidant damage caused by stress. As a dietary supplement, *S. nigrum* tincture of leaves or its isolated constituents can help eliminate free radicals formed in the mind as a byproduct of neurological stress or any neurological condition (Zaidi et al., 2014).

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

Parts of <i>S. nigrum</i>	Medicinal Usage	References
Leaf	To treat ringworm, ulcers of the gastrointestinal tract, and gonorrhea; as an HPV medication; and as a liver and swallowing stimulant.	Moshi et al. (2009)
Fruit	To prevent children from wetting their beds; to cure retinal detachment, ocular pneumonia, and dementia	Moshi et al. (2009)
Roots	Improves female fecundity; heals coughs and other ailments of the respiratory tract	Sikdar & Dutta (2008)
Whole plant	As a treatment for cutaneous pustules, rashes, and blisters; snake venom (venomous snakes); and carcinogenic problems	Javed et al. (2019); Javed & Kabeer (2018)

### Anti-microbial activity

A testing was performed to identify the chemicals generating anti-microbial effects and to ascertain the anti-bacterial action of methyl ester and the aqueous extracts of *S. nigrum* leaves. The conclusion allows for the possible conclusion that antibacterial chemicals in leaves might be separated using acetone (Kavishankar et al., 2011).

### Anti-seizure activity

A study described that the extract from *S. nigrum* leaves that has been tried on rodents, and chickens to discover whether it has any anti-seizure qualities. Amphetamine improved the extract's anti-seizure abilities (Noel et al., 2008).

### Cytotoxic activity

Cytotoxic properties of an ethanolic derivative of crushed fruit derived from *S. nigrum* L. The extract substantially demonstrated neurotoxicity in the brine shrimp killing experiment, with LC50 = 63.10 g/ml and LC90 = 160 g/ml (Bhatia et al., 2011).

### Anti-HCV activity

*S. nigrum* (SN) seed extracts in methanol and chloroform showed 37% and more than HCV is respectively 50% suppressed at nontoxic amounts. Interfering with hepatic cells with a DNA copy of the plasmid expressing HCV NS3 protease further explored the antiviral efficacy of *S. nigrum* seeds tincture when compared to HCV NS3 protease. The results revealed that GAPDH remained steady whereas aqueous Solanum extracts reduced HCV NS3 protease synthesis or activity in a dosages manner. These results suggest that SN content may include antiviral chemicals that are considerably more effective towards HCV, and that SN extract combined using interferon will be a preferable choice for treating chronic HCV (Javed et al., 2011).

### Antimycotic activity

Petroleum ether and 98% methanolic young leaf extracts of *S. nigrum* were used to test *Pseudomonas aeruginosa*, *Escherichia coli*, *Bacillus subtilis*, *Staphylococcus aureus*, *Candida albicans*, *Epidermophyton*, *Colletotrichum tonsurans*, *Microsporium gymseum*, and *Trichophyton*



*mentagrophytes*. The commonly utilized methanolic extract surpassed the low polarizing petroleum ether extract on the project. The highest bactericidal levels, lowest fungal-killing concentration, and lowest concentration of inhibitory substances were found for each test strain (Prakash et al., 2011)

### Pharmacological properties

The restorative behavior of the liver A carbon tetrachloride administration of 0.4 ml/kg/day for 10 days caused liver injury in rats, and a detailed study of the hydrophilic and fluid emphases of Sn indicates a significant hepatoprotective activity with methanolic diminishes (Kuppuswamy et al., 2003)

### Allergic activity

The study claims that ethanolic extracts of *S. nigrum* have been examined for their analgesic abilities. The heated plate of Eddy's method and induce wriggling acetic acid were used to test the extract's analgesic potency for both peripheral and central therapeutic actions. Different analgesic activities of the dehydrated fruit of *S. nigrum's* ethanolic extract have been investigated (Nirmal et al., 2012).

### Anti-convulsant activity

The CN subsystem inhibitory pathway of Sn was discovered by examining the effect of Sn infusions by intravenous route on various Neuropharmacological limits. The engorged amphibian's rectus abdominis contracts isotonicity. Inotropic and unfavorable chronotropic activity was seen in the isolated frog's heart. In cage-bound guinea pigs, isotopic ileal evacuation occurs. The rodent's limited jejunum undergoes isotonic constriction decrease in accordance with the rabbit's blood vascular pulse. Secretion's impact on the rodent's sublingual organ (Chauhan et al., 2012).

### Antidiarrheal activity

A substance made from ethanol of the dehydrated fruit of *S. nigrum* L. is being investigated to investigate its effectiveness in treating diarrhea. The fruit extract demonstrated a significant (P0.01 and P0.001) repellent activity against castor oil-mediated gastroenteritis in mice, reducing the severity of excrement and increasing the Mean concealed latency (Bhatia et al., 2011).

### Conclusion

We draw the conclusion that *S. nigrum*, a conventional treatment for ulcer, hepatotoxicity, and cancer, uses numerous antigenic implications in cancer and other diseases from the extensive literature review and experimental data analysis. The plant helps to avoid liver toxicity and cytotoxicity, which enhances the activities of the liver and kidney. It is also quite helpful for the functioning of CNS as

well as for issues with the abdomen and general body discomfort. Given the plant's many beneficial properties, it may be endorsed as a secure, crucial medical herb for all of humanity.

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