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A REVIEW ON MEDICINAL USE & PROPERTIES OF SOLANUM NIGRUM

Dhanedhar Vaishnavi S.*, Kalamkar Monika K.[2] and Kodag Poonam B.[3]

Rashtriya College of Pharmacy Hatnoor, TQ. Kannad, Dist. Aurangabad Maharashtra-431103.

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***Corresponding Author**
Dhanedhar Vaishnavi S.
Rashtriya College of Pharmacy Hatnoor, TQ. Kannad, Dist. Aurangabad Maharashtra-431103.

ABSTRACT

Medicinal plants are extensively used to cure various infections diseases in human beings, hence Solanum nigrum, was investigated for its activity against the isolated pathogens form sputum samples. The study was designed to screen and characterize the bacteria isolated form the respiratory tract infected patients. Aqueous, ethanol and diethyl ether extract of solanum nigrum was prepared; four different concentrations of each extract were taken to determine the antibacterial activity against the isolated bacteria. The ethanolic extract of solanum nigrum showed highest antimicrobial activity in comparison to aqueous and diethyl ether extracts. Phytochemical analysis of the plant showed the presence alkaloids, terpenoid, flavonoids, saponins, steroids and phenols. Thus, solanum nigrum has anti-microbial activity and can be used clinically to find novel antibacterial compounds for respiratory tract pathogens.

KEYWORDS*:* Solanum nigrum, anti-cancer activity, carcinogenic.

1) INTRODUCTION

Respiratory tract infection (RTIs), which involve the upper or lower respiratory tract, frequently occurs after birth. RTIs, such as sore throat, earaches, laryngitis, common cold, sinusitis, and mastoiditis, are the most frequently-occurred infection of all human diseases and have been frequently documented. RTLs are amongst the most wide spread and serious infection, accounting for over 50 million deaths globally each year. Each year approximately seven million peoples die as direct consequences of acute and chronic respiratory infection. Bronchitis and pneumonia are the most common infection. Respiratory pathogens like

klebsiellapneumoniae, Pseudomonas aeruginosa and Staphylococcus aureus are some of the causative agents responsible for bronchitis and pneumonia.

Solanum nigrum commonly known as "Black night shade" belongs to Solanaceae family. It is called as Manathakkali in Tamil. It shows medicinal properties like anti-microbial, anti-oxidant, cytotoxic properties, anti-ulcerogenic, and hepato-protective activity. It is an African pediatric plant utilized for several ailments that are responsible for infant mortality especially feverish convulsions, eye disease, hydrophobia and chronic skin ailments. It is a potential herbal alternative that acts as an anti-cancer agent.

2) Plant profile

1) Biological source

It consists of the dried and full-grown berries of solanum nigrum

2) Geographical source

Medicinal Botany, National Institute of Siddha, Chennai, Tami Nadu, India.

3) Family: Solanaceae

4) Common name

Black night shade, Makoi.

5) Synonyms

Australia: Black night shade, Black berry night shade,

Europe: Black night shade, annual night shade, common night shade, garden night shade,

New Zealand: Black night shade,

South Africa: Night shade,

Sanskrit: Dudakamai,

Bengali: Gudakamai,

Urdu: Mako,

Punjabi: Mako, Peelak, Mamoli,

Marathi: Kamoni,

Malayalam: Manatakkali,

Kannada: Ganikesopu,

Hindi: Makoya, Kakamachi, Kali makay,

English: Garden night shade.

6) Taxonomy

Kingdom: Plantae - Plants

Subkingdom: Tracheobionta - Vascular plants

Superdivision: Spermatophyta - Seed plants

Division: Magnoliophyta - Flowering plants

Class: Magnoliopsida - Dicotyledons

Subclass: Asteridae Order - Solanales

Genus: Solanum - Night shade

Species: Solanum Nigrum L. - Black night shade

Authority: Linn.

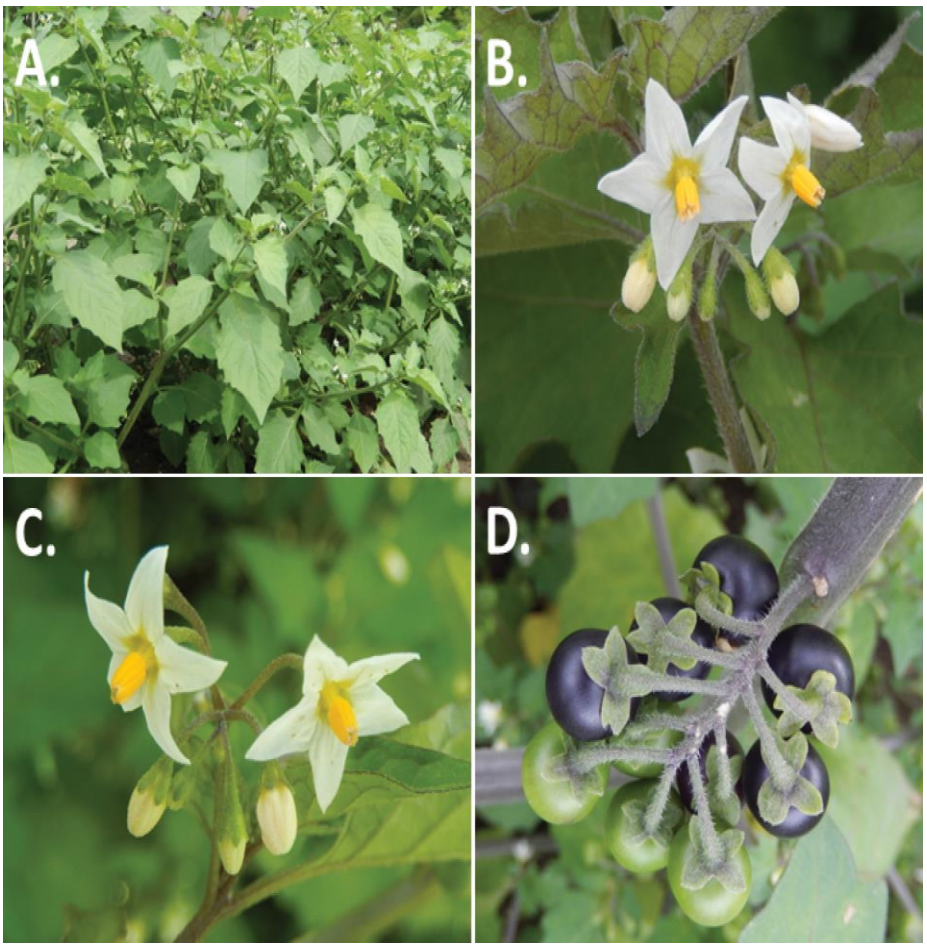

Fig No 1:

3) MACROSCOPY

The bark is thin and easily peeled off exposing pale-yellow wood. The flowers have five petals and are generally regular in shape. They may be round and flat or star- shape, but are often bell shaped or tubular. Members of this family are often climbers or at least scrambling plants, often with hairy stem and leaves. The leaves are variable, and may be entire or dissected, without stipules, and are usually alternate. The morphological study shows the root

with few branches and numerus small lateral roots, externally it is smooth pale brown. The fruit shows thin, papery epicarp, pulpy measocarp and axle placentation, seeds lie free in pulp of fruit. The fruits are berry; 6mm diameter, obtuse, usually.

4) MICROSCOPY

Petiole and midrib of leaf shows covering, unit seriate trichomes that are 3-5 celled having pointed tips they show arc shaped by collateral vascular bundle arrangement. Lamina of leaf shows anisocytic stomata scattered on both upper and lower surfaces but more abundant lower surface. Palisade ratio: 2-4 and Vein islets number: 7-10.

5) CHEMICAL CONSTITUENTS

Green unripe fruits contain glycoalkaloids and their eating is a toxic to human being as well as livestock that include solamargine, solasonine, solanine, alfa and beta -solamagrine, solasodinsolanidine (0.09-0.65%). The former tow also found in leaves. Solanine is found in all parts of plants, with the level increasing as the plats matures, though it is apparently modified by soil type and climate.

6) PHYTOCONSTITUENTS FROM SOLANUM NIGRUM Phytochemical investigationof whole plant reported that which contain alkaloids, flavonoids, tannins, saponins, glycosides, proteins, carbohydrates, coumarins & phytosterols. It has been found that Solanum nigrum contains the substances, such as total alkaloid.[6] steroid alkaloid.[7] steroidal saponins.[8] and glycoprotein.[9] exhibiting anti-tumor activity.[10] Researchers studied the chemical characterization of osmotin – like protein from this plant.[11] New glycoprotein (150 KDa) has been isolated from this plant which consist carbohydrate content (69.74%) and protein content (30.26%) which contain more than 50% hydrophobic aminoacids such as glycine and proline.[12] Small unripe fruits of Solanum nigrum had a high concentration of solasodine, but both the concentration and the absolute amount per fruit decreases with fruit maturation.[13] The berries of Solanum nigrum from New Zealand have recently been studied and found to contain 4 steroidal alkaloid glycosides, Solamargine, Solasonine, α and β- solanigrine. The berries of Solanum nigrum have been found to contain a saturated steroidal genin, which has been identified as tigogenin by mixed melting point and IR spectroscopy.[14] One spirosestanol glycoside and two furostanol glycosides have been isolated from a methanol extract of the stems and roots of Solanum nigrum.[15] Some researchers found the presence of ascorbic acid in the fruits of Solanum nigrum and the concentration of ascorbic acid is more in fruit than root.[16] Six new steroidal saponins,

solanigrosides C-H, and one known saponin, degalactotigonin, were isolated from the whole plant of Solanum nigrum.[17] Some researchers isolated two new steroidal saponins, named nigrumnins I and II, together with two known saponins were obtained from the whole plant of Solanum nigrum.[18] Recently phytochemical analysis of Solanum nigrum has resulted in the isolation of two novel disaccharides. Their structures were determined as ethyl b - D - thevetopyranosyl-(1-4)- b- D -oleandropyranoside and ethyl b- D -thevetopyranosyl-(1-4)- a - D-oleandropyranoside, respectively, by chemical and spectroscopic methods.[19] Solanum nigrum seeds have high lipid content. Their protein content and minerals elements (Mg being prominent) are considerable and Solanum nigrum oil is an important source of linoleic acid.[20] hemical structures of some phytoconstituents from Solanum nigrum present in Fig 2.

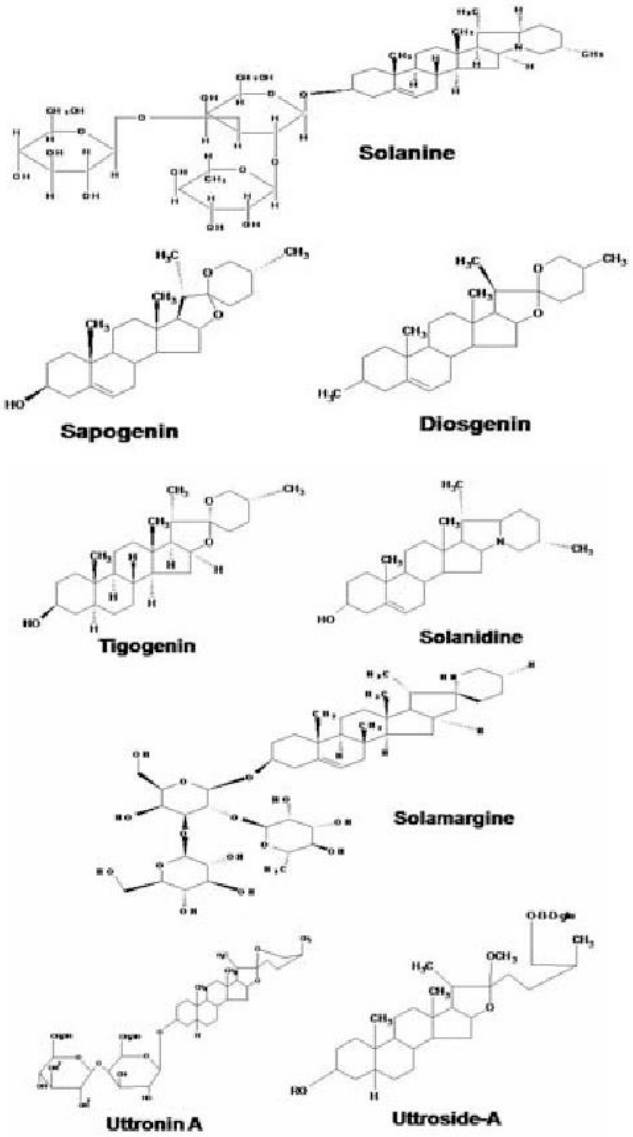

Fig 2 : Phytoconstituents of the plant

7) TRADITIONAL *USES*

Leaves are used for rheumatic and gouty joints, skin diseases, also used in the treatment of tuberculosis, nausea and nervous disorders.

The decoction and juice of the berries is useful in cough, diarrhea, inflammations and skin diseases 5, 6. Anti-oxidative 18, anti-inflammatory and anti-pyretic effects of Solanum nigrum chloroform extract has also been found.

The ethanol extract of dried fruits of Solanum nigrum showed a remarkable hepatoprotective effect against CCI4 induced oxidative damage on liver cells.

The most important property of Solanum nigrum is its Anti-cancerous property.

8) PHARMACOLOGICAL PROPERTIES

8.1) Anti- Tumor Effect

Sepide Miraj et al., 2016 has investigated on the polysaccharide friction from Solanum nigrum, SNppF3 was examined regarding to immune-modulatory activity. These results suggested that tumor suppression mechanisms observed in SN-ppF3 treated mice were most probably due through enhancing the host immune response. SNL-P1 a had significant growth inhibition effect on U14 cervical cancer and protective effect on thymus tissue of tumor bearing mice.

8.2) Anti-Cancer Activity

Sepide Miraj et al., 2016 has evaluated on the suppression of EMT in MCF-7 breast cancer cells treated with AESN was evaluated. The results suggested that AESN could inhibit EMT of MCF-7 breast cancer cells mediated by attenuation of mitochondrial function. The present study provides new insight into the application of Solanum nigrum for colon carcinoma treatment that are worthy of further study.

8.3) Anti-Fungal Effect

Sepide Miraj et al., 2016 the anti-fungal effect of Solanum nigrum L. was investigated and result showed that the production of solamargine by a cultivable fungal endophyte at a significant yield is a new observation. Further experiments such as media optimization, OSMAC (One Strain Many Compounds) or Epigenetic modifiers could be enhancing the fungal solamargine production.

8.4) Anti-Larvicidal Effect

Sepide Miraj et al., 2016 has performed by the biocontrol potentiality of active ingredient isolated from ethyl acetate extract of mature leaves of Solanum nigrum L. (Solanaceae) was investigated. The findings indicated that there is a clear dose dependent mortality, as the rate of mortality (Y) was positively correlated with the concentration of the compound (X); having regression coefficient value close to 1.

8.5) Anti-Stress Effect

Sepide Miraj et al., 2016 The prophylactic or curative anti-oxidant efficacy of crude extract and the active constituent of Solanum nigrum leaves were evaluated. Result suggested that Brain is vulnerable to stress induced prooxidant insult due to high levels of fat content. Thus, as a safe herbal medication the Solanum nigrum leaves extract or isolated constituents can be used as nutritional supplement for scavenging free radical generated in the brain due to physical or psychological stress or any neuronal disease per see.

8.6) Anti-Oxidative Effect

Sepide Miraj et al., 2016 has investigated on effects of endophytic bacterium inoculation on plant growth were evaluated. The beneficial effect was more obvious at relatively low Cd concentration (10 micro). Based on the alteration of nutrient uptake and activated oxygen metabolism in infected plants, the possible mechanism of endophytic bacterium in Cd phytotoxicity reduction can be concluded as uptake enhancement of essential mineral nutrition and improvement in the anti-oxidative enzyme's activities in infected plant.

8.7) Anti-Allergic Effect

Sepide Miraj et al., 2016 Potential of the plant berries in the treatment of asthma was evaluated.

The petroleum ether extract of Solanum nigrum berries can inhibits parameters linked to the asthma disease.

8.8) Estrogenic Activity

Sepide Miraj et al., 2016 has done on the estrogenic potential of Solanum nigrum fruits by in vitro and in vivo assays was evaluated. Result demonstrates the hormone like activity of Solanum glycosides both in vitro and in vivo in mouse, which needs to be further explored to evaluate the possible mechanism and clinical implication.

8.9) Hepato-Protective Activity

Vishwanath Jannu et al., 2012 has evaluated on the herbal based therapeutics for liver disorders has been in use in India for a long time and has been popularized world over by leading pharmaceuticals. Lack of standardization of the herbal drugs.

Lack of identification of active ingredient (s)/principle(s).

Lack of randomized controlled clinical trials (RCTs).

Lack of toxicological evaluation.

8.10) Anti-Convulsant Activity

Km. Ruby et al., 2012 has performed on the central nervous system depressant action of Sn was ascertained by measuring the effects of intraperitoneal injection of Sn on various neuropharmacological parameters. Isotonic contraction of the isolated toad rectus abdomens. Negative chronotropic and inotropic action on the isolated toad heart. Isotonic contraction of the isolated guinea pig's ileum. Isotonic contraction of rats isolated jejunum. Decrease on the cat's arterial blood pressure. Secretory effect on the rat's submaxillary gland.

8.11) Cardio-protective Activity

Km. Ruby et al., 2012 has done on the cardio-protective activity of methanolic extract of berries of the plant Solanum nigrum was evaluated by using global in vitro ischemia-reperfusion injury carried out using doses of 2.5 and 5.0mg/kg for 6 days per week for 30 days. The methanol extract of berries of the plant Solanum nigrum possessed cardio-protective activity.

8.12) Analgesic Activity

Km. Ruby et al., 2012 has performed on the ethanolic extracts of Solanum nigrum for analgesic activity was evaluated. Analgesic activity of the extract was evaluated for its central and peripheral pharmacological actions by Eddy's hot plate and acetic acid induced writhing respectively.

8.13) Anti-Diarrhoreal Activity

Km. Ruby et al., 2012 has performed on the ethanolic extract of the dried fruit of Solanum nigrum Linn was assessed for anti-diarrhoeal activity. The fruit extract showed a significant ($P<0.01$ and $P<0.001$) anti-diarrhoeal activity against castor oil induce diarrhoes in mice in which it decreased the frequency of defecation and increased the mean latent period at the Dose of 250mg/kg and 500mg/kg body weight.

8.14) Cytotoxic Activity

Km. Ruby et al., 2012 has on the ethanolic extract of the dried fruit of Solanum nigrum Linn. Cytotoxic activity. In the brine shrimp lethality test, the extract showed cytotoxicity significantly with LC50=63.10ml and LC90=160mg.

8.15) Anti-Seizure Activity

Km. Ruby et al., 2012 has performed on the aqueous extract of the leaves of Solanum nigrum was evaluated for anti-seizure activity in chicks, mice and rats by intraperitoneal administration of the extract. The anti-seizure property of the extract was potentiated by amphetamine.

8.16) Anti-Inflammatory Activity

Km. Ruby et al., 2012 has investigated on the methanolic extract of whole plants of Solanum nigrum L. was investigated for anti-inflammatory activity on the experimental animal models. The methanolic extract decreased the edema induced in hind paw. The methanolic extract of Solanum nigrum (375mg/kg b.w.) has showed significant anti- inflammatory.

9) CONCLUSION

This study shows that Solanum nigrum possess anti-microbial activity against bacteria associated with respiratory tract infections. The plant can be used as a source of oral drug against respiratory tract infection; however, further studies are required to isolate the active principle from the crude extract for proper drug development.

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