Original Article

Solanum Nigrum Linn: An Analysis Of The Medicinal Properties Of The Plant

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Abstract

Solanum nigrum linn. is a member of the Solanaceae family since it is often used to treat a broad range of infectious disorders that may harm humans. These herbs not only possess beneficial medicinal characteristics, but they also mitigate the potential side effects of some medications. In addition, they possess beneficial therapeutic characteristics. Because it is an edible sort of plant, several Indian cultures use it as a food supply. This chemical has been used to effectively treat a variety of cancers, as well as acute nephritis, leucorrhea, sore throats, toothaches, dermatitis, and eczema. It has been shown that the Solanum nigrum plant has around 188 distinct chemical components that may be separated from one another. In decreasing order of significance, the four most essential bioactive components included within these chemical compounds are referred to as "steroidal saponins," "alkaloids," "phenols," and "polysaccharides," respectively. As part of the scope of this study, we investigated the pharmacological processes carried out by the Solanum nigrum plant and developed a thorough list of its pharmacological applications in order to get a knowledge of a medicinal component with a broad variety of possible applications.

Keywords: Pharmacological activity; Solanum nigrum; Solanaceae.

1. INTRODUCTION:

Since the beginning of recorded human history, which is to say far before the conceptions of "medicine" or "medical science," people have used a variety of plant species for medicinal reasons. The genus Solanum has over 2,000 distinct species of tropical and subtropical plants that may be found growing in all areas of the globe that are categorised as tropical or subtropical. The plant Solanum nigrum Linn. is also referred to as Ganake soppu in Kannada, Makoi in Hindi, Kachchipandu in Telugu, Munatakali in Tamil, Piludi in Gujarati, and Black Night Shade in English. In addition to these names, this plant is also known as Ganake soppu and Kamuni in Kannada. Perennial black nightshade is a short-lived plant that grows in shrub form. It sometimes could be coloured between between purple and green. It will have no prickles on its hairs, whether they are glandular or plain and non-glandular. The "plant" is used internally in India to cure illnesses like cardalgia and gripe because of its antibacterial and antidysenteric characteristics. Additionally, the "plant" is well known for its antimicrobial characteristics. The Solanum nigrum plant produces a

broad range of pharmacological qualities, including antioxidant, anticancer, hepatoprotective, neuroprotective, and antiulcerogenic effects. Recent research in rats have examined the potential oxidative harm induced by CCL4 and the potential protective effects of an aqueous leaf extract of the Solanum nigrum plant. [1]

2. PLANT PROFILE

2.1. Synonyms Kannada: Ganikesopu, Ganike gida,Elachi gida Garden night shade, black night shade plant, and garden night shade Hindi: Makoya,mokoi, Sanskrit: Dhvansamaci, Malayalam: Manatakkali,mulaku-thakkali. [1]
2.2. Biological source: Its biological origin is the dried and whole plant of the Solanum nigrum Linn species.
2.3. Family: The Solanaceae is the family to which this plant belongs.
2.4. TAXONOMY

Kingdom : Plantae

Division: Magnoliophyta

Class : Magnoliopsida

Genus : Solanum

Species : Nigrum

Authority : Linn.

2.5. GEOGRAPHICAL DISTRIBUTION:
People from Eurasia introduced it to the Americas, Australia, and South Africa, even though it was originated from Eurasia. However, it was first discovered there. It is also available for purchase in a variety of other countries, such as India, Afghanistan, Bangladesh, Bhutan, Indonesia, Iraq, Iran, Japan, Pakistan, Europe, North America, South America, Brazil, Peru, Colombia, and a variety of other countries. [2]
2.6. MACROSCOPY:
A Solanum nigrum Linn. may grow to a height of anywhere between 25 and 100 centimetres. It is a plant that develops each year and has pubescent-looking hairs. The thin, pale-yellow bark and pointy, pubescent stems that give it its distinctive appearance. It also has these attributes. The fruits are irregular in shape and have a dark black colour, whereas the flowers have five or more petals and a regular shape. Regular-shaped plants have the blooms. The leaves are green in colour and are arranged in an alternating pattern. Their length may range from 4 to 7.5 centimetres, while their width may range from 2 to 5 centimetres, and their natural shape ranges from oval to heart-shaped. The petiole is between one and three centimetres long, has teeth that are especially noticeable along the margins, and the base is naturally uneven. [3]
2.7. MICROSCOPY:
It exhibits a single layer of oval or tangentially oriented epidermis in the region of the petiole, and the covering may be observed on both the petiole and the midrib of the leaf. The cuticle layer should be covering it; the epidermis should have warty and glandular trichomes; the epidermis layer should be in a single layer; the collenchymas should be two to three layered; the T.S. of a leaf through the midrib should reveal upper and lower epidermis cells with a round, oval shape; it should reveal upper and lower epidermis cells with a round, oval shape; The parenchyma is made up of spherical cells with very thin cell walls. [4]
2.8. CHEMICAL CONSTITUENTS:
Alkaloids, steroidal alkaloids, steroidal saponins and glycoproteins, flavonoids, tannins, proteins, carbohydrates, coumarins, and phytosterols are only a few of the significant components that are present.
Solamargine, Solasonine, and Solanigrine are steroidal alkaloids and glycosides found in the berries of the Solanum nigrum Linn plant. Trace levels of these substances may also be found. The quantity of solasodine in the Solanum

nigrum plant's fruits increased while they were still immature, but as they matured, both the concentration and total amount of solasodine in each fruit decreased. [5]

2.9. THERAPEUTIC USES:

a) In addition to treating tuberculosis, it is also used in the management of nausea and disorders that affect the nervous system.
b) This medication is effective in the treatment of rheumatoid arthritis, gout, as well as skin conditions.
c) In addition to this, there is evidence that it works against cancer.
d) In addition, it is used in the treatment of bacterial infections that might cause coughing and indigestion.
e) In addition to that, it is effective against the growth of cells and the oxidation of molecules.
f) It plays an important part in the process of reducing inflammation and guarding the liver from damage.
g) It does this by acting as an anticonvulsant, which prevents seizures from occurring.
h) The consumption of the fruit has been shown to be effective in the treatment of diarrhoea as well as gastrointestinal disorders [6].

3. MEDICINAL PROPERTIES OF SOLANUM NIGRUM LINN:

Solanum nigrum linn is a significant medicinal plant, and in recent times, this plant has been discovered to possess a variety of qualities that are beneficial to human health.

3.1 ANTI INFLAMMATORY ACTIVITY:

Since pain and inflammatory conditions are now widespread among people, solanum nigrum Linn. plays a key function in the treatment of inflammation. Prostaglandins, leukotrienes, and other intricate mediators are released by leukocytes, which results in the disease known as inflammation. Solanum nigrum Linn may be used to alleviate inflammation. The plant's berries' methanolic extract was administered to experimental animals at a dose of 375 mg/kg body weight, and it shown to have potent anti-inflammatory activities (Ravi et al., 2009). The method that is thought to be the most important and popular method for studying the anti-inflammatory effects of drugs in animals is that of inducing local edoema in rat paws by injecting an irritating chemical like carrageenan. This method shows that the plant's anti-inflammatory activity is better when extracted with methanol in a rat model of induced edoema. [7]

3.2. ANALGESIC ACTIVITY:

It has been shown that the ethanolic extract of the Solanum nigrum Linn. plant has potent analgesic effects in mice. The experimental animals were given daily doses of 0.5 millilitres of one of four plant potencies, including 2X, 4X, 8X, and 30C, for a total of thirty days. The information is organised in the table based on how it performed when compared to certain points in time, such as the tenth, twenty, and thirty-first day of the experiment.

The aqueous extract of the leaves of the Solanum nigrum Linn. plant and the methanolic extract of the seeds of the Solanum nigrum Linn. plant will generate greater analgesic effectiveness when it is administered to female rats utilising the hot plate technique or the tail flick method. [8]

3.3. ANTI ALLERGIC ACTIVITY:

A Solanum nigrum berry extract produced with petroleum ether has been shown to be effective in reducing the factors related to the asthma condition. In order to better understand the therapeutic potential of employing berries from the Solanum nigrum plant to treat asthma, Sepide Miraj et al., 2016 conducted study. [9]

3.4. HEPATOPROTECTIVE ACTIVITY:

Rats were given 0.2 millilitres of carbon tetra chloride per kilogramme of body weight every day for 10 days to test the hepatoprotective effects of aqueous and methanolic extracts of Solanum nigrum Llinn. To test the extracts, this was done. Rats were given an aqueous extract of Solanum nigrum in doses ranging from 250 to 500 milligrammes per kilogramme of body weight after being treated with carbon tetrachloride for ten to eleven days. The aqueous extracts were proven to have hepatoprotective properties against the liver damage caused by carbon tetra chloride. This demonstrates the drop in blood levels of alkaline phosphates, aspartate amino transferase (AST), and alanine amino transferase (ALT) (ALP). [10]

3.5. ANTI SEIZURE ACTIVITY:

It has been shown that giving mice and rats an intraperitoneal leaf extract has an anticonvulsant effect on the animals. The efficacy of the anticonvulsant may rise as a consequence of amphetamine usage. Enhancing the qualities that function as an anticonvulsant is advantageous. [11]

3.6. ANTI MICROBIAL ACTIVITY:

Activity against several microorganisms shown by Solanum nigrum Linn. In accordance with CLSI regulations, an extract was tested for efficacy against E. coli, Bacillus subtilis, and pseudomonas aeruginosa at concentrations of about 10 micrograms, 50 micrograms, and 100 micrograms, respectively. The table was used to make the first notation of the obstruction zones. Then, following that, it was tested against streptomycin, in addition to the regular control. When conducting the experiment, it is common practise to make use of solvents such as ethanol, petroleum ether, chloroform, ethyl acetate, and isobutanol. [12]

3.7 ANTI FUNGAL ACTIVITY:

The effectiveness of the plant extract as an antifungal agent is evaluated using the agar diffusion method and the following three fungus strains: penicillin notatum, aspergillus niger, and fuserium oxisporium. In contrast to the other leaf and root extracts, the ethanolic seed extract has the greatest activity (about 6.0- 16.8mm) against all of the examined fungal strains. In comparison to other strains, the penicillin notatum resistance of ethyl acetate root extracts is much lower (4 -4.5mm). [13]

3.8. ANTI CANCER ACTIVITY:

In the agar diffusion technique, which is used to determine whether or not the plant extract has antifungal action, the fungus strains penicillin notatum, aspergillus niger, and fuserium oxisporium are used as test subjects. Ethanolic seed extract exhibits the maximum activity (approximately 6.0- 16.8mm) against all of the various fungal strains that were investigated, in comparison to the other leaf and root extracts. The amount of penicillin notatum resistance shown by cultures of bacteria extracted with ethyl acetate is much lower than that seen by other strains (4 -4.5mm). [13]

3.9. ANTI- OXIDANT ACTIVITY:

Because the stable DPPH radical would create a strong absorption band at 517 nm, it is employed to examine the free radical-scavenging capacity of solanum nigrum linn. extract. Thus, in the presence of a free radical scavenger, this electron will pair off with another electron, leading to decolorization and an increase in the number of electrons taken up. The final product contains a DPPH concentration of 86 micromilligrams in addition to various additional concentrations of each extract. [15]

3.10. ANTI-LARVICIDAL ACTIVITY:

For the tests, 100 ml of each extract was transferred into a separate sterile glass beaker with a capacity of roughly 120 to 150 ml after being prepared in various concentrations of crude extract (2, 2.5, 3, 3.5, and 3%) and ethyl acetate solvent extract (40, 60, 80, 100, and 120 ppm) of each plant part. The larvae are collected, put in each beaker, and each beaker is then given 20 mg of larval food (powdered dog biscuits and yeast). At 24, 48, and 78 hours following the experiment's initiation, the mortality rate was noted. Once a larva reaches the point where it can no longer move, it is said to have died. [16]

3.11 ANTI- DIABETIC ACTIVITY:

Using, the anti-diabetic activity was evaluated "Descriptions of the -amylase inhibitory test by Oboh et al (2013). A mixture of 500 litres of extract concentration (10-100 g mLG1) and 500 litres of "-amylase (0.5 mg mLG1) at 25° C for ten minutes. 500 L of a 1% starch solution are mixed with a 0.02 M sodium phosphate buffer, and the combination is then incubated at 25 °C. The combination was prepared by adding 1 ml of 3,5-Dinitrosalicylic acid, heating it in a boiling water bath for 5 minutes, diluting it with 10 ml of double-distilled water, and allowing it to cool to room temperature. The absorbance at 540 nm was then measured using a spectrophotometer. The alpha amylase inhibitory activity was afterwards calculated and recorded. [17]

3.12. CYTOPROTECTIVE ACTIVITY:

Potawale and co. (2008) a Solanum nigrum Linn. plant extract that was produced using 50% ethanol. was tested in vitro for its capacity to shield Vero cells from the harm caused by gentamycin. We performed the mitochondrial dehydrogenase activity assay and the Trypan Blue exclusion assay in order to determine whether or not cytotoxicity was present. The ability of the ethanol extract to function as a hepatoprotective agent was also evaluated by microscopically analysing the liver to look for any histological abnormalities. It has a strong hepatoprotective effect

as a direct outcome of the discovery. After administering the toxicant (Carbon Tera Chloride), a rat that had liver tissue examined revealed significant centrilobular necrosis. The treatment has the side effect of regeneration of healthy liver cells as well as the elimination of necrosis and vacuoles. Mature male albino Wistar rats weighing between 150 and 170 grammes were the rodents utilised in the investigation. The investigation employed these rats. The animals were kept in polypropylene cages with a light cycle of 12 hours of daylight and 12 hours of darkness, which were kept at a constant temperature of 25 degrees Celsius. With a total of six animals in each group, the animals were split up into six groups. Then, the various groups were put into different cages. By intubating the stomach, the drug was administered to each of the different groups. The method of administration used was this one. 0.2 ml of acacia, 20% ethanol, and SNFEt should all be injected into Groups 1, 2, and 3, respectively. Groups 2 and 3 should also get the 20% ethanol injection. The whole group of rats was allowed to go without food for the full night prior to being given ketamine chloride to put them under anaesthesia. Many biochemical estimates employed plasma, which was acquired after blood was extracted. Blood was used to make these estimates. A few drops of heparin were added to each of the sterile, fully dry test tubes in which the blood was collected. [18]

CONCLUSION:

Solanum nigrum linn is an excellent treatment for a number of these problems and is used to treat hepatitis, fever, ulcers, and a broad range of other immunological disorders and ailments. The study's findings suggest that the plant is beneficial for preventing hepatotoxicity and cytotoxicity as well as for promoting the health of the kidneys and liver. The herb is also advantageous for avoiding cytotoxicity and hepatotoxicity. Additionally, analgesic, anti-inflammatory, and anti-diabetic characteristics have been proposed for it. It's probable that this aspect will have a substantial impact on the results of pharmacological and clinical studies. It is a fascinating plant with the potential to be used in the creation of several medications. Additionally, it has hepatoprotective, antiallergic, and anticonvulsant qualities.

Conflict of Interest; The authors declare that the review was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest
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