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Solanum nigrum L. as potent medicine: A review

[*1] Romana Rashid, [2] Mahesh Kumar, [3] Muzaffer Hussain Wani, [4] Ashiq Hussain Bhat
[1] Department of Zoology, Govt. Degree Collage Women, Anantnag, Jammu and Kashmir, India
[2, 3] Sheri Kashmir University of Agriculture Sciences and Technology Jammu, Jammu and Kashmir, India
[4] Assistant Professor Zoology, Govt. Degree Collage Women, Anantnag, Jammu and Kashmir, India

Abstract
Medicinal plants have been used for decades for the treatment of different diseases. *Solanum nigrum* L. is an important medicinal plant in many traditional health care system. They are semi cultivated in most countries and largely utilized as a vegetable and fruit source. This plant has very much importance as a medicinal plant. It has been used for various diseases like liver disorder, diabeties, infections, cancer, inflammations and peptic ulcer. Fresh juice of this herb is used for curing fever and alleviating pain (Solanum, 2006).

Keywords: medicinal plant, *Solanum nigrum* L., vegetable, diseases

Introduction
Solanum nigrum L. (Solanaceae) commonly known as 'Black nightshade' that have been extensively used in traditional medicine in India and other parts of world to cure liver disorders, chronic skin ailments (psoriasis and ringworm), inflammatory conditions, painful periods, fevers, diarrhoea, eye diseases, hydrophobia, etc. It has been found that *Solanum nigrum* L. contains the substances, such as total alkaloid, steroid alkaloid, steroidal saponins and glycoprotein, exhibiting anti-tumor activity. In Indian traditional medicine, the plant is used as a hepatoprotective agent. In this review, we have explored the phyto-pharmacological properties of the *Solanum nigrum* L. plant and compiled its vast pharmacological applications to comprehend and synthesize the subject of its potential image of multipurpose medicinal agent.

Habitat and Distribution
It is annual plant 15 species of this genus are present in the flora of Europe, 9 in the flora of Serbia (Quatttrocchi, 2000). Some are crop weeds or weeds of ruderal habitats. *Solanum nigrum* L. has been recorded from deposits in the Paleolithic and Mesolithic era of ancient Britian and it is suggested by the botanist and ecologist Edward Salisbery that it was part of the part of the native flora. *Solanum nigrum* L.is a common herb or short lived potential herb, found in many wooded areas, as awll as disturbed habitats. It reaches a height of 30-120cm (12 to 47 in), leaves 4.0-7.5cm (1.6 to 3.0 in) long and 2-5cm (1 to 2 in) wide; ovate to heart shaped, with wavy or large toothed edges; both surfaces hairy or hairless, petiole 1-3 cm (0.5 to 1 in) long with a winged upper portion.

Ethnomedicinal Importance
The medicinal values of plants lay in some chemical compounds especially secondary metabolites that produce a definite physiological action on the human body. The most important of these bioactive compounds are flavonoids, terpenes, alkaloids, tannins, saponins and phenolic compounds. Plant secondary metabolites are substances which are exclusively produced by plants for their protection against pests, as coloring, scent or attractants and as the plant's own hormones. Recently it has been revealed that secondary metabolites carry out a number of protective functions in the human body. Plant secondary metabolites act by boosting the immune system, protect the body from free radicals, kill pathogenic microorganisms etc. Plant secondary metabolites do not possess nutrient value for humans and are usually found in very low amounts. Secondary metabolites have a scientifically proven effect on health.

Mass spectra of isolated component revealed fragmentation pattern by electron impact ionization: One of the chemical constituent of *Solanum nigrum* L. is Solasodine alkaloid with molecular formula $C_{27}H_{43}NO_2$ the molecular weight of the compound is 413.63 Da and M+23 is at m/e of 330 relatively abundant peak in the spectrum.

NMR spectrum helps to confirm equivalent protons or groups of protons, chemical shift position confirm different types of protons, intensity of peak confirm number of each type of protons and splitting pattern confirms nature and number of neighboring protons. The extended spectrum of isolated component showed six groups of protons appearing at δ ppm 0.809 alkyl or of methyl protons it is spllited peak may be triplet with coupling constant of 8.07 Hz indicate vicinal coupling; 1.089 methylene protons intense peak and spillited with high coupling coupling constant of 35.1Hz ; 1.5, 2.0, 2.5, 2.7 not intense peak but are splitted peaks with peak coupling interaction may be of methylene protons; 4 to 5 four groups of equivalent protons and are coupled. Splitted peaks observed. The protons may be alkene proton; 5.5 may be of hydroxyl proton; 7.129 may be of solvent proton.The data confirms the presence of alkene and aromatic protons. The whole data confirms that the isolated compound may be Solasodine

alkaloid.

On the basis of antioxidant and *in-vitro* activity. Further *in-vitro* anticancer activity of Chloroform and Ethyl acetate extract was ascertained on melanoma cell line in humans and in mice.

In vitro cell line Results

To measure the cytotoxicity of Chloroform and Ethyl acetate extract of *Solanum nigrum* L. in human cell lines (A375). A375 cells were cultured with chloroform extract (0.01, 0.1, 1, 10, 100 µg/ml) and (0.01, 0.1, 1, 10, 100 µg/ml) with ethyl acetate extract or without extract for 12hrs to 96hrs. IC_{50} value was experimentally calculated to be 55.93 mg/ml for chloroform and 64.67 mg/ml for ethyl acetate extracts. As chloroform extract having low IC_{50} was subjected to further proceeding. Cell viability was evaluated by trypan blue dye exclusion method. By using trypan blue test, chloroform extract exhibited a remarkable reduction against A375 cell viability in a concentration dependent manner, these results are in concordant with MTT assay. Thus inhibition of cell growth by a chloroform extract was more pronounced at concentration of (100ug/ml). On comparing both the extracts, chloroform extract showed high cell viability. Therefore potential growth inhibiting activity of chloroform extract of *Solanum nigrum* L. should be subjected to further phytochemical investigation and marker compound identification, so that it could be worn for further development as a cancer therapeutic against Human melanoma as alone or in combination with other chemotherapeutic drugs.

For *in vitro* anticancer investigation MTT [(3-(4, 5-dimethylthiazol-2-yl)-2, 5-diphenyl tetrasodium bromide)] assay was performed using melanoma B16F10 cell line obtained from C57BL/6. Melanoma is a malignant tumor of melanocytes. Melanocytes produces the dark pigment, melanin, which is responsible for the color of skin. In *in-vitro* anticancer investigation IC_{50} for Ethyl acetate extract and Chloroform extract was observed to be 60µg/ml and 50µg/ml respectively. This revealed that both extract were having significant anticancer potential, but amongst them Chloroform extract was more potent.

Conclusion

During evaluation of anticancer activity of chloroform extract of *Solanum nigrum* L. and its purified alkaloid (Solanine) exhibited significant anticancerous activity. A chemical combination of substances is used to get the enhanced desired activity and eliminate unwanted side effects. From present study it can be concluded that Chloroform extract of whole plant of *Solanum nigrum* L. and alkaloid (Solanine) isolated from extract possess sigainificant anticancer potential against skin melanoma cancer.

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