



## Review on Anticancer property of *Solanum nigrum* Linn

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### ABSTRACT

*Solanum nigrum* Linn (Solanaceae - Potato family), also known as black nightshade, gurki, and kakmachi. Plants are well-known for treating a variety of ailments, including cancer. It's a dicot weed that grows in arid areas of India and other parts of the world. Minerals, vitamins, hormones, and proteins abound in this plant. Antioxidant, neuroprotective, cytoprotective, anticancer, antimicrobial, antinociceptive, and antipyretic activities are among the medicinal properties of this plant. Whole plant and leaves are used but black colour fruit has toxicity content. therefore, they are't used for medicinal purposes. It is becoming increasingly vital to search for natural-based alternatives that are less hazardous. Plant-based products are not completely risk-free herb adverse effects, such as herb drug interactions, should be considered carefully.

**Keywords:** *Solanum nigrum* Linn, traditional medicine, plant derived compounds

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### INTRODUCTION

Traditional medicine has a plethora of medicinal foods with antioxidant properties. This could be effective in the treatment of a wide variety of diseases, but there is little or no scientific supporting evidence. Local people in Ethiopia, like the rest of Africa, relied heavily on plant-based traditional medicine to manage illnesses caused by worms, fungus, viruses, and protozoa [1,2]. *Solanum nigrum* is an anti-tumorigenic, anti-oxidant, anti-inflammatory, hepatoprotective, diuretic, and antipyretic herb that is widely used in oriental medicine. In mice, the herb prevents the growth of cervical cancer, according to Chinese research [3,4]. Annual branching plant reaching up to 90 cm in height, with dull dark green leaves that are juicy, oval or lanceolate in shape, and toothless to slightly toothed on the margins [5]. Commonly used as an eastern medicine where it is considered to be anticarcinogenic, antioxidant, anti-inflammatory, hepatoprotective, diuretic, and antipyretic [6].

### TAXONOMY

Kingdom	:	Plantae - Plants
Division	:	Embryophyta
Sub-division	:	Angiospermae
Class	:	Dicotyledoneae
Order	:	Tubeflorae
Sub-order	:	Solanales
Family	:	Solanaceae
Genera	:	Solanum

### Plant chemical composition

*Solanum nigrum* contains polyphenolic compounds like gallic acid, protocatechuic acid, catechin, caffeic acid, epicatechin, rutin, and naringenin, which possess strong antioxidant and anticancer activity. Besides these some proteins, carbohydrates, m coumarins and phytosterols crude polysaccharides, polyphenols, gentisic acid, luteolin, apigenin, kaempferol, anthocyanidin have also been reported. The steroidal alkaloids and glycoproteins are exhibiting anti-tumor activity [7] also this plant have a rich amount of secondary metabolites such as alkaloids, steroid alkaloids, and steroid saponins glycoprotein [8].

**Plant Traditional uses****Table.1 plant major used parts and their medicinal uses**

Plant part	Disorders and uses	Reference
Berries juice	Cough, diarrhoea, inflammations, skin disease, anti-inflammatory, dysentery, stomach complaints, and fever and to treat tuberculosis	[9,10]
Leaves	Rheumatic and guty joints, skin disease, tuberculosis, nervous disorders.	[9]
Root juice	Asthma and whooping cough	[11]

**Anti-cancer activity**

An ethanol extract of ripe *Solanum nigrum* fruit reduces cell growth and increases cell death in human MCF-7 breast cancer cells [12]. The principal phytoconstituents present in the whole plant of *Solanum nigrum* have been demonstrated to have anti-tumor effects, Despite the fact that solamargine and solasonine limit the growth and spread of malignancies such as breast, liver, lung, and cyst tumours, as well as leukemia. Furthermore, the steroidal glycosides impede the growth and spread of colon cancers and pheochromocytoma. This herb's polysaccharides have two unique anticancer properties that prevent the development of liver cancer [13,14].

*Solanum nigrum* has been shown to exhibit anti-cancer action in hepatocellular carcinoma cells [15], human ovarian carcinoma cells [16], human colorectal carcinoma cells [17], and human endometrial carcinoma cells [18]. In recent investigations, the plant's juice is used to treat ulcers and other skin conditions. As a tonic, laxative, appetite stimulant, and asthma treatment, the fruits are consumed. *Solanum nigrum* root part juice is used to treat asthma and whooping cough. *Solanum nigrum* is commonly used in eastern medicine as an antitumorogenic, antioxidant, diuretic, and antipyretic agent [19].

*Solanum nigrum* aqueous extract suppresses the development of cervical cancer (U14) by altering the immune response of tumor-bearing mice and generating cell apoptosis. With negligible toxicity to the experimental animals, this extract caused tumour cell cycle arrest in the G0/G1 phase, as well as apoptosis [20]. It has also been documented that an aqueous extract of *Solanum nigrum* can be used in combination with cisplatin or doxorubicin to treat patients with hepatocellular carcinoma 3 condition [15]. Apoptosis is a major process in the progression of cancer [21].

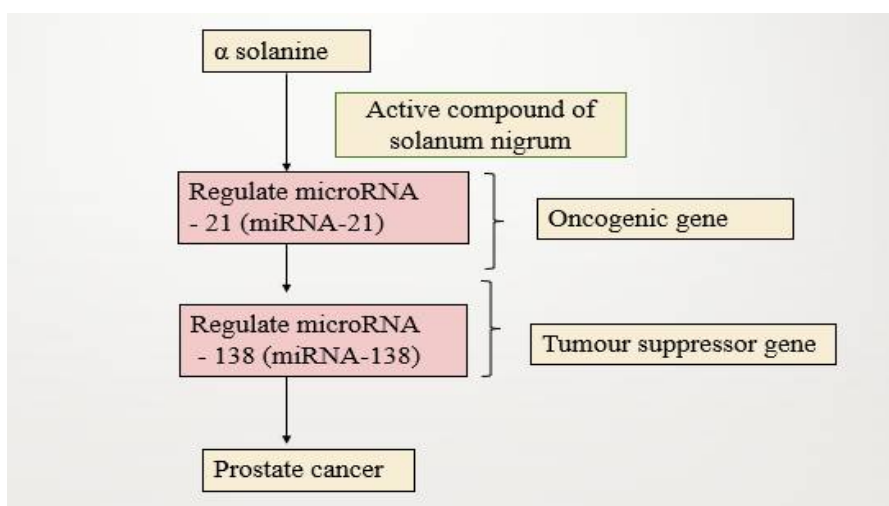
It was also discovered that the whole alkaloid extracted from *Solanum nigrum* interfered with the construction and function of tumour cell membranes, disrupted DNA and RNA production, and altered cell cycle distribution in tumour cells. As a result, whole alkaloids may have a role in tumour cell inhibition, whereas a glycoprotein isolated from the plant showed anticancer properties by blocking the anti-apoptotic pathway of NF- $\kappa$ B via activation of caspase cascades and improving nitric oxide synthesis [22].

$\alpha$ -solanine naturally occurring steroidal glycoalkaloid present *Solanum nigrum* plant, it suppresses tumour cell proliferation and induce apoptosis. It has been suggested that inhibition of PC-3 pancreatic cell invasion by  $\alpha$ -solanine, blocking epithelial-mesenchymal transition (EMT) and matrix metalloproteinases expression (MMPs).  $\alpha$ -solanine also suppresses the ERK and PI3K/Akt signalling pathways (signal transduction pathways that increase survival and growth in response to external signals) and also it regulates the expression of miR-138 and miR-21 [23]. These findings revealed that  $\alpha$ -solanine may have therapeutic potential in preventing prostate cancer cell invasion [23,24,25]. In breast cancer cells, an aqueous extract of *Solanum nigrum* (100 and 200 g/mL) caused mitochondrial fission. It (200  $\mu$ g/mL) significantly downregulated protein expression of N-cadherin, vimentin, and zinc finger E-box binding homeobox 1 in MCF-7 breast cancer cell lines [26].

Solanine, a naturally steroidal glycoalkaloid derived from *S. nigrum* L., has been found to have potent anti-cancer properties against prostate cancer [27]. Solanine promoted apoptotic cell death in DU145 cells via activating the P38 pathway. Solanine enhanced the phosphorylation of P38 and ATF2 in prostate cancer cells. Solanine dramatically reduced the mRNA and protein levels of cyclin D1, cyclin E1, cyclin dependent kinase 2 (CDK2), CDK4, and CDK6 in tumour tissues of mice xenografted with DU145 cells. These findings clearly suggested that solanine reduced the tumour cells growth in the xenografted mice model [27].

**Other biological and pharmacological activity**

Antibacterial activity [28,29], anti HCV activity [30, 31], hepatoprotective activity [32,33,34], antioxidant activity [35,36], cardio protective activity [37], anti-inflammatory [38,39], antidiarrheal [36].



**Fig. 1. α-solanine compound present in *Solanum nigrum* plant that regulate microRNA-21, microRNA-138 reaction against to prostate cancer**

## CONCLUSION

*Solanum nigrum* has been used to treat human ailments since time immemorial/antiquity. Traditional medical systems are still widely used today. Their use as such has been documented since antiquity, and various. As a result, more research is needed to isolate the active ingredients from the extract of *Solanum nigrum* for effective medication development to treat the above said health concerns through clinical trials.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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