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REVIEW: KAKAMACHI (SOLANUM NIGRUM LINN.) - A PROMINENT HERB IN AYURVEDA

D. K. JANI * and K. B. AHIR

*Reader, Department of Dravyaguna,
G. J. Patel Ayurveda College and Research Centre,
New Vallabh Vidyanagar, Anand
Lecturer, Indukaka Ipcowala College of Pharmacy,
New Vallabh Vidyanagar, Anand, Gujarat, India
drdilipn@yahoo.com

ABSTRACT:
India has an ancient heritage of traditional medicine. The materia medica of India provides a great deal of information on the Ayurveda, folklore practices and traditional aspects of therapeutically important natural products. It is very important to an Ayurvedic scholar to update the ancient therapeutic measures, which are given in classics and to find out new drugs and formulation without leaking the theoretical essence. So it is an inevitability to review the drugs and related literatures for the proper understanding of Trisutra Ayurveda i.e. Hetu (Causes), Linga (Symptoms), Aushadhyayanam (Knowledge of medicines), thereby for the betterment of both healthy and ill presents. Traditional system of Indian medicine is unique but there is a common thread in its fundamental principle and practice. With the emerging worldwide interest in adopting and studying traditional systems and exploiting their potential based on different health care systems, the evaluation of the rich heritage of traditional medicine is essential. Kakamachi (Solanum nigrum Linn.) is one of the herbs mentioned since Vedic period in Ayurveda. Many Ayurveda philosophers and healers praised about the properties of this plant and utilized in various disorders. Here, a review made on the screening of Solanum nigrum for various activities. It is found that the drug is very potential and can be used for various applications as mentioned in Ayurveda.

KEY WORDS: Ayurveda, Solanum nigrum, Kakamachi
INTRODUCTION:
The government and the private sector are exploring all of the possibilities for the perfect evaluation of traditional systems like Ayurveda in order to effectively adopt the therapeutic approaches available in original systems of medicine as well as to help in generating data to put the herbal products on the health program. The evaluation of these drugs is primarily based on phytochemical, pharmacological, and allied approaches including various instrumental techniques such as chromatography, microscopy, and others. Solanum nigrum was studied for many activities. These screening of the drug helps to understand the behavior of the drug in the body. In the context of holistic Medicare the concept of therapeutic measures needs greater attention to be paid to the broader systems of environment and culture and their interconnections to understand the use of traditional therapies.
Solanum nigrum was screened for antioxidant property. In one of the study it is found that it doesn’t possess the significant antioxidant activity. In the study the methanolic extract was used for experiment and its radical scavenging potential was also evaluated and the assessment was done by Griess assay. In another study it is found that the extract of the plant contains calf thymus DNA and free radical generating system, which protects DNA against oxidative damage to its deoxyribose sugar moiety. The effect depends on concentration of plant extract. It is observed that the hepato-protective effect of the plant may be due to their ability to suppress the oxidative degeneration of DNA in the tissue debries.
Solanum nigrum was widely studied for cytotoxic and antitumor activity. It is found that it has remarkable cytotoxic and apoptotic effect. Solanum nigrum glycoprotein induces apoptosis and it is one of the chemotherapeutic agents. 50% ethanol extract of whole plant of Solanum nigrum was tested for cytoprotection against gentamycin-induced cytotoxicity. The cytotoxicity was significantly inhibited as assessed by Trypan blue exclusion assay. Extract also exhibited significant hydroxyl radical scavenging potential. Thus, it suggests the probable mechanism of cytoprotection. Solanum nigrum glycoprotein shows a dose dependent radical scavenging activity on radicals. This glycoprotein caused a strong cytotoxic effect, rather than a radical scavenging effect. Apoptosis, according to the apoptosis assay, increased as a result of treatment with glycoprotein in a time-dependent manner. Consequently, this glycoprotein may induce apoptosis through the inhibition of NF-kB activation, induced by oxidative stress in HT-29 cells.
The Solanum nigrum ethanol extract by proliferation assay shows the proliferative capacity of MCF-7 cells was strongly suppressed. MTT assay and trypan blue exclusion experiments showed a very close correlation between the Solanum nigrum extract concentration and the
surviving cell number. This extract was revealed to be potential scavenger of hydroxyl radicals and DPPH radicals rather than superoxide anions. Thus Solanum nigrum fruit extracts could be used as an antioxidant and cancer chemo-preventive material. Extract of Solanum nigrum showed cytotoxicity to Salmonella typhimurium TA 100 in the absence of S9 mix. The toxicity of extracts from different parts of plant, such as leaf, stem, immature fruit and mature fruit towards Salmonella typhimurium TA 100 and human lymphocyte was also assayed. The immature fruit extract exhibited strong cytotoxicity with dose dependent. It induced significant DNA damage in human lymphocytes based on the comet assay. No mutagenisity was found to TA98 or TA100 either with or without the S9 mixture.

The isolation of Solanum nigrum glycoprotein, found that it was cytotoxic at low concentration. With respect to cytotoxicity, it is found that Solanum nigrum glycoprotein induces apoptosis through modulation of PKCα and NF-κB activity in MCF-7 cells. Collectively, the data demonstrate that this glycoprotein is a potential natural anticancer agent because of its ability to induce apoptosis in MCF-7 cells. The TPA-induced MCF-7 cells are the part of human breast cancer cell line without estrogen receptors. Solanum nigrum glycoprotein might be one of the agents that blocks TPA-mediated signal responses in tumor cells. One attempt was made to identify carcinogens contribution in the food at high incidence of esophageal cancer in Transkei diet. Food collected from the gardens belonging to families in which the members had developed esophageal cancer. The two groups was studied the one, which contain maize, beans and salt mixture and the second, contain full Transkei diet consisting of Solanum nigrum. The second group develops severe liver lesions and epithelial-cell dysplasia of the esophagus. The group was also suffered from an increased incidence of tumors of various types. The same factor may also contribute the high incidence of esophageal and liver cancer occurring in the man in the Transkei.

One study was carried out by using mouse peritoneal macrophages and examined the mechanism by which Solanum nigrum regulates NO production. It is found that there was a marked cooperative induction of NO production. Nitric oxide (NO) is an anti-tumor molecule produced in activated macrophages.

The use of leaves of Solanum nigrum as antidiabetic agents was studied by using the oral glucose tolerance. It is found that there was no significant lowering in blood glucose levels by Solanum nigrum. One study was carried out for estimation of tress elements in some antidiabetic medicinal plants using PIXE technique. It shows that the presence of the elements like K, Ca, Cr, Mn, Cu and Zn, in are responsible for potentiating insulin action. Not all the elements but Solanum nigrum leaf contain Ca, P, and Fe. Solanum nigrum also has
Beta-carotene, rich source of riboflavin, nicotinic acid, and vitamin C. Higher values for vitamin C (20-40 mg./100 g.) have also been reported including protein, 5.9; fat, 1.0; minerals, 2.1; and carbohydrates, 8.9 g.

*Solanum nigrum* was screened for CNS depressant action. The ethanol extract of fruit significantly prolong sleeping time, alteration in general behavior pattern, reduce exploratory behavior pattern, suppressed the aggressive behavior, affected locomotor activity, and reduced spontaneous motility, i.e. it possess potential CNS-depressant action.

One of the study highlights to analyze the production of reactive oxygen species (ROS), lipid peroxidation and lypoxygenase activity. The relative increase in ROS production was higher in the susceptible clone H-8150 than in the resistance genotype. Lipid peroxidation increased only in the non-host *Solanum nigrum*. Increase in Lipid peroxidation in *Solanum nigrum* leaves coincides with enhances Lipoxygenase (LOX) activity. *Solanum nigrum* also has strong scavenging activity against lipid peroxyl radicals. Plasma lipoprotein levels (TG, TC and LDL) were significantly reduced. *Solanum nigrum* glycoprotein can be used as cholesterol lowering agent even at low concentration. With the aim of diversifying the lipids sources eaten by the African populations and those of Congo Brazzaville in particular, a physicochemical study of *Solanum nigrum* seeds was carried out. The dry matter content of the seeds is 94.22%. Average lipids content varies between 34.5 and 37.5% dry matter, proteins content is 17% dry matter and crude ash content averages 7.18% dry matter and the principal mineral element is Mg (180 mg/100g). The fatty acid compositions of *Solanum nigrum* seeds oil shows that it has 67.9% of linoleic acid, indicating its high unsaturation. Apart from linoleic acid, other prominent fatty acids were palmitic, stearic and oleic acids.

*Solanum nigrum* was studied for ulcer healing activity on acetic acid induced ulcer model. It showed concomitant attenuation of gastric secretary volume, acidity and pepsin secretion in ulcerated rat. Thus, offer antiulcer activity by blocking acid secretion through inhibition of H⁺K⁺ATPase and decrease of gastrin secretion. This might be due to antisecretary activity. The antiulcerogenic effects of the methanolic extract of *Solanum nigrum* berries on aspirin induced ulceration in rats with respect to antioxidant status in the gastric mucosa have been investigated. The results indicate that the extract may exert its gastroprotective effect by a free radical scavenging action. The observations suggest that this extract may have considerable therapeutic potential in the treatment of gastric diseases. The drug was also studied for antinociceptive, anti-inflammatory and antipyretic effects of Chloroform extract in animal models. *Solanum nigrum* also perform the Antifungal activity.
DISCUSSION AND CONCLUSION:
In Ayurveda Solanum nigrum is indicated for various disorders like Shotha (Inflammation), Vrana (Wound healer), Visarpa (Herpes), Vrishanashotha (Antitoxic), Yakritshotha (Inflammation of Lever), Udararoga (Ascitis), Mukharoga (Diseases of mouth), Kantharoga (Throat Disorders), Nasaroga (Nasal Disorder), Karnashoola (Ear ache), Netraroga (Eye disorders), Shwitra (Lucoderma / vitiligo), Agnimandya (Appetizer), Chhardi (Anti-emetic), Arsha (Anti-hemorrhoid), Jeerna Pravahita (Chronic amoebiasis), Atisara (Anti-diarrhela), Pleehavriddhi (Splenomegali), Hridroga (Heart diseases), Raktabharadhiyka (Antihypertensive), Kushtha (Skin diseases), Vatarakta (Gout), Amavata (Antirheumatoid), Vrikaroga (Kidney disorders), Prameha (Antidiabetic), Jeerna Jwara (Chronic fever), Samanya Daurbalya (General Debility), Kshaya (Antitubercular). Unfortunately till date the drug is screened for only anti-inflammatory, hepatoprotective, antiseptic, narcotic, antispasmodic, antibacterial, antimicrobial, CNS depressant, anti-ulcer, cardiac depressant, or immuno-modulator activities. It is found that the extraordinary observations or experimentations done by earlier philosophers of Ayurveda and mentioned in the texts still seems to be valid. All these data and concepts are in need to re-research on the present scientific tools. It can really contribute to medical and pharmaceutical practices. There are still many more activities waiting for screening the drug.

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REFERENCES:


