PHYTOCHEMICAL STUDY OF SOME PLANTS USED IN TREATMENT OF CANCER UNDER THE INFLUENCE OF INDUSTRIAL EFFLUENT

*Kavita Tyagi*, **Sandhya Sharma** and **Sadia Ayub**

*National Medicinal Plants Board, Department of AYUSH, Ministry of Health and Family Welfare, New Delhi-110 001, India

*Department of Botany, M.M.H. College, Ghaziabad-201 001, Uttar Pradesh, India

*Corresponding author: kavitatyagii@gmail.com

**Abstract**

The affect of industrial pollution on phytocochemical constituents of some medicinal plants used in the treatment of cancer. The study was conducted on *Calotropis procera* (Ait.) R. Br., *Ricinus communis* Linn., *Solanum nigrum* Linn. and *Withania somnifera* Dunal. These plants have high therapeutic value in various types of cancers. The various chemical tests (alkaloids, saponin, tannin, lignin, protein, carbohydrate, suberin, glucoside, oil, sugars, steroids and flavanoids), TLC, fluorescence behavior, LOD, total ash, acid insoluble and sulphated ash, water and alcoholic soluble extractives with plant powder were investigated under the impact of industrial effluent on these plants. Plants having vitamins (C, E, carotenoids etc.), flavonoids (flavones, isoflavones, anthocyanins and catechins), polyphenols (ellagic acid, gallic acid and tannins) possess remarkable antioxidant activity. A number of changes were observed in the plants grown on polluted areas. We may emphasize one vigilant observation on quality of the medicinal plants, which were growing in the vicinity of industries. These plants should not be used for the preparation of medicines and effluents should be treated or recycled before their disposal.

**Key words**: phytocochemicals, industrial effluent, medicinal plants, cancer

**Introduction**

Ghaziabad is an industrial city adjoining Delhi. In the vicinity of these industries, many medicinally important plants are found growing. Industrial effluents are not only changing the morphological and anatomical characters of these plants but also affecting their medicinal and chemical properties. The undesirable change may also be caused directly by the industrial effluent besides other factors. Medicinal plants are reservoir of therapeutic values. Since inception of civilization, medicinal plants are curing agents of ailments of human being. The industrialization has adversely affected the growth and quality of medicinal plants. Pharmacobotanical analysis plays a vital role in identification of plants and determination of their purity and quality of crude plant drugs, so an attempt has been made here for a comparative study of the impact of industrial pollution on some medicinal plants. Four Plants were selected for the present study viz. *Calotropis procera* (Ait.) R. Br., *Ricinus communis* Linn., *Solanum nigrum* Linn. and *Withania somnifera* Dunal. These plants have been reported to have high therapeutic value in various types of cancers.

**Materials and Methods**

For observing the impact of industrial effluent on the plants, two areas were selected, polluted (Sahibabad Industrial Area, Ghaziabad) and apparently non-polluted areas (ALTT Centre and Hindon Air Force Station, Ghaziabad). The four plants were selected for the various chemical tests viz. TLC, fluorescence behavior, LOD, total ash, acid insoluble and sulphated ash, water and alcohol soluble extractives with plant powder to study the impact of pollution on plants. The chemical and pharmacological actions of selected plants are as follows: *Calotropis procera* (Ait.) R. Br. Belongs to family Asclepiadaceae is an erect shrub, and commonly known as Ak or Madar. The plants contain α-amyrin, β-amyrin, taraxasterol, isomer,
taraxasteryl isovalerate, taraxasteryl acetate, β-sitosterol, α- and β-calotropeols, α-pyroカテchuic acid, ostigmasterol, giganteol, calotropin, a triterpinoid flavonoid (m. p. 168-75°), a flavonoid glycoside, volatile long-chain fatty acids, wax acids, alcohols, holarrhentine, cyanidin-3-rhamnoglucoside, (Anonymous, 1950). The latex contains water and water solubles, 88.4-93.0%; caoutchouc, 0.8-2.5%; trypsin, an active labenzyme and a heart poison. From the latex of the African plant, alpha-lactuceryl isovalerate and alpha-lactuceryl acetate have been isolated. On hydrolysis both yield alpha-lactuceryl, which can be converted into isolactucerol. The coagulum contains: resin, 52.8-85.0 and caoutchouc, 11.4-22.9% (Duke, 1987). Latex also contains the cardiac glycosides; calotropin, uscharin, calotroxin (potencies are 83, 58 and 76 respectively), calactin, uscharidin, voruscharin, (dihydrouscharin), proceroside, two genins, uzarigenin, syriogenin, α- and β-amyrin, and β-sitosterol (Anonymous, 1950).

Pharmacological action

Leaves are used in cancer and cardiac arrhythmia. Crude latex and its protein fraction are highly fibrinolytic and anticoagulant in rats and human plasma (Asolkar et al., 1965-81). The ethanolic (50%) extract of the root exhibits anticancer activity against human epidermal carcinoma of the nasopharynx in tissue culture (Dhar et al., 1968 and Bhakuni et al., 1969). Calotropin has shown antitumor activity. *Ricinus communis* Linn. (Erandi) belongs to family Euphorbiaceae is a monotypic genus. *Ricinus communis* Linn. is believed to be a native of tropical Africa. Plant contains alkaloids, ricinoleic, stearic, oleic, linoleic, dihydroxystearic, palmitic acid, β-sitosterol, squalene (38 mg/100g) and tocopherols, stearic acid (av., 45 μg/ 100 gm made up mostly γ and δ) (Chatterjee and Prakash, 1994). The plants also contain glyceride, tri-rincinolein, di-rincinolein, oleo-dirincinolein, linocol-dirincinolein, monoricinoleins and non-rinicoleo glycerides. Plants have toxic ricinie and ricin (Anonymous, 1950).

Pharmacological action: The flowers are useful in glandular tumours. The oil is sweetish, cathortic, aphrodisiac, anhelmintic and alterative, useful in tumours (Kirtikar and Basu, 1935). Castor oil once given as a cottage remedy it is now found that the caster oil has a value in treating leukaemia and cancer, containing ricin, a toxic extract from the plant used in treating malignant cancer cells in bone marrow. Ricin is extracted from the water soluble part of the castor oil seed. It is hoped that it will have wide application in the future for relieving cancer patients. However, as a fresh seed it presents a dangerous poisonous plant to children.

*Solanum nigrum* Linn. Family-Solanaceae, is a herbaceous or suffrutescent, variable annual herb, commonly known as Makoy. Plant contains β-carotene (0.74 mg/100 g, material); α- carotene , flavokinase (opt. pH 8.6; opt. temp. 40-45°); diosgenin, tigogenin, solanine which can be separated into α-solanine, β-solanine, γ-solanine, α-chaconine, β-chaconine and γ-chaconine. Solasodine, solasonine, solamargine, β-solamargine and α-β-solasodamine, solangrine gitogenes, traces of saponins, 7-10% tannin (Khanna and Rathore, 1977), solasodine (0.09-0.65%), fatty acids etc.

Pharmacological action

The alcohol extract of leaves is active against *Staphylococcus aureus* and *Escherichia coli*. Infusions or decoctions of the plant after transient stimulation depress the central nervous system and the reflexes of the spinal cord. Small doses increase, and large doses decrease, cardiac activity; reduction in the blood pressure is also evident. Extracts of the plant affect the rate and amplitude of respiration (Anonymous, 1950). Solanine is also said to exhibit teratogenic properties (Weller and Phipps, 1979). Garden Nightshade (Black Nightshade) leaves used in treatment of cancer in the form of an ointment. The unripe berry contains poisonous soloamine. Sedative aerial parts of plant have paralysing effect on nerve ends and used in painkilling ointments. *Solanum lyra* shows strong inhibiting action on cancer cells without affecting normal cells. *Withania somnifera* Dunal. is an important drug in the ancient Ayurvedic literature commonly known as Ashwagandh, belongs to family Solanaceae and sometimes called “Indian ginseng". It contains meso-anafarine, curcoshygrine, anahygrine, tropine, pseudotropine, anaferine, isopelletierine, hygrine, 3 alpha-tigloyloxytrpane, choline, withasominine, 0.1%
saccharose, 0.02% beta-sitosterol, sommifere, withanine, withaninine, nicotine, ipuranol, hentriacontane, fatty oils, essential oils, withanolide, scopoletin (Watt and Breyer, 1962). More recently, a new alkaloid, visamine, has been reported from the plant collected from Soviet Union.

Pharmacological action

Leaves and root are narcotic (Kapoor, 2000). Withaferin A in concentration of 10 µg/ml. inhibited the growth of various Gram-positive bacteria, acid-fast and aerobic bacilli, and pathogenic fungi, but is inactive against Gram-negative organisms and anaerobes. It is active against Micrococcus pyogenes var. aureus and partially inhibited the activity of Bacillus subtilis glucose-6-phosphate-dehydrogenase. It does not inhibit the oxidation of pyruvic acid by intact cells of Streptococcus faecalis. It also inhibits Ranikhet virus, both in vitro and in vivo and shows marked tumour-inhibitory activity when tested in vitro against cells derived from human carcinoma of nasopharynx (KB). It is also acts as a mitotic poison arresting the division of cultured human-larynx carcinoma cells at metaphase (Anonymous, 1950). Some workers studied pharmacological actions of this plant. Leaves, roots and berries of the plant possess anti oxidative properties. It prevents premature ageing and arthritis; enhance psychomotor co-ordination and immune system. Berries are blood tonifier that improves circulation and absorption of nutrients by cells. Leaves are used for treatment of tumors. Withania A, Viscosalactone B₁₂ inhibits the tumor formation.

Results

The preliminary colour reaction tests of plant powders showed the presence of alkaloids, lignin, tannin, carbohydrates, proteins, sugars, subernin, glycosides, saponin, steroid, oil and flavins in both the cases only some degrees of change in colour reaction tests were observed. TLC observations showed that the number of chemical compounds in polluted plant samples were lower in comparison to non-polluted plant samples. Number of spots was 1-4 in polluted plants and 1-5 in the non-polluted plants. The fluorescence behaviour of plant powder and their extracts in different solvents were studied under visible and ultraviolet light. There were only some colour changes. The water soluble extractive values and LOD were higher and alcohol soluble extractive values were comparatively lower in non-polluted plant samples. Total ash value was higher and acid insoluble and sulphated ash was comparatively lower in non-polluted plant samples. Similar study was carried by Vinay et al. (2010).

Conclusion

It can be concluded that all four plants are badly affected by industrial pollution. The effluent of industries should not be used for irrigation at any dilution. Further the medicinal plants, which were growing in the vicinity of these industries, should not be used for the preparation of medicines and effluents should be treated or recycled before their disposal.

References

Anonymous (1950). The wealth of India raw materials, council of scientific and industrial research, New Delhi, India 1: 24


