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A REVIEW ON RHODODENDRON ARBOREUM "A MEDICINAL HERB"

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ABSTRACT

Rhododendron arboreum is an evergreen shrub or small tree with a showy display of bright red flower. The mane 'RHODODENDRON' is derived from the Greek word 'RHODO' means rose &'DENDRON' means tree. Rhododendron is the national flower of Nepal & is known as (Laligurans) & the state tree of Uttarakhand. It is called 'Burans', Bras, Buras or barahke -phool market popularity as Rhodo juice/sharbat and the plant is found in the Himalayas from Kashmir eastwards to Nagaland. Cardiovascular diseases (CVDs) remain the main cause of death worldwide and increased production of reactive oxygen species (ROS) may be a unifying mechanism in CVDs process and plants are naturally loaded with distinctive secondary metabolites. HEPATOPROTECTIVE activity shown by leaves of Rhododendron arboreum possibly because of its reported anti-oxidants activity and this property may attributed to the quercetin related flavonoids, saponins, and phenolic compounds present in the leaves of Rhododendron arboreum.

KEYWORDS: Rhododendron, arboreum, Burans, Pharmacognosy, Cardiovascular, Hepatoprotective.

1.1 INTRODUCTION

One of the precious non-timber forest products (NTFPs) in Garhwal Himalaya is the Rhododendron arboreum, also referred to as "Burans" in the local dialect, which produces gorgeous blossoms. For the local population, these blooms provide a good source of cash and somewhat aid in subsistence. If possible gathering is done sustainably, R. arboreum flowers can assist the local community in improving their standard of living **(A.K., 2021).**[1]

Phytochemicals that possess the capability to suppress SARS-CoV-2 replication or bind to host receptors in a competitive manner could be valuable as COVID-19 adjuvant therapies. Using petals from Rhododendron arboreum that were obtained from Himalayan flora, we profiled and examined the phytochemicals of the petals, conducted in vitro experiments, and discovered that the plant was a worthy candidate to combat SARS-CoV-2. Our decision to test against SARS-CoV-2 was driven by reports from multiple scientific studies that the phytochemicals function against a variety of viruses both in vitro and in vivo **(et al Masakapalli, S.K., 2023).**[2]

Fig 1.1: This Fig Represent of Rhododendron Arboretum.

The antioxidant capacity of Rhododendron arboreum flowers was assessed using the identification and quantification of anthocyanins, flavonoids, and phenolic acids **(et al Bhandari, P., 2022).**[3]

In this work, an aqueous flower extract from Rhododendron arboretum is used to examine a green technique of synthesising zinc oxide (ZnO) nanorods (NRs) doped with chromium. In this case, chromium-doped ZnO NRs ranging in chromium doping concentration from 2–10% were produced. The green synthesised compounds were subjected to extensive investigation using scanning electron microscopy (SEM), ultraviolet spectroscopy (UV-Vis), and X-ray diffraction (XRD) (**et al Sharma, S 2024).**[4]

To investigate and isolate the Rhododendron arboreum (R. arboreum) flower ethanol extract's most effective antihyperglycemic fraction. All four fractions of R. arboreum flowers were administered to normal and streptozotocin-induced diabetic rats for a brief period of time,

with fraction 3 being used for a longer research. Following treatment, a number of markers were examined, such as liver enzymes that control carbohydrate metabolism, body weight, insulin secretion, plasma protein, haemoglobin A1C, and fasting blood glucose(**et al A.P., 2012).**[5]

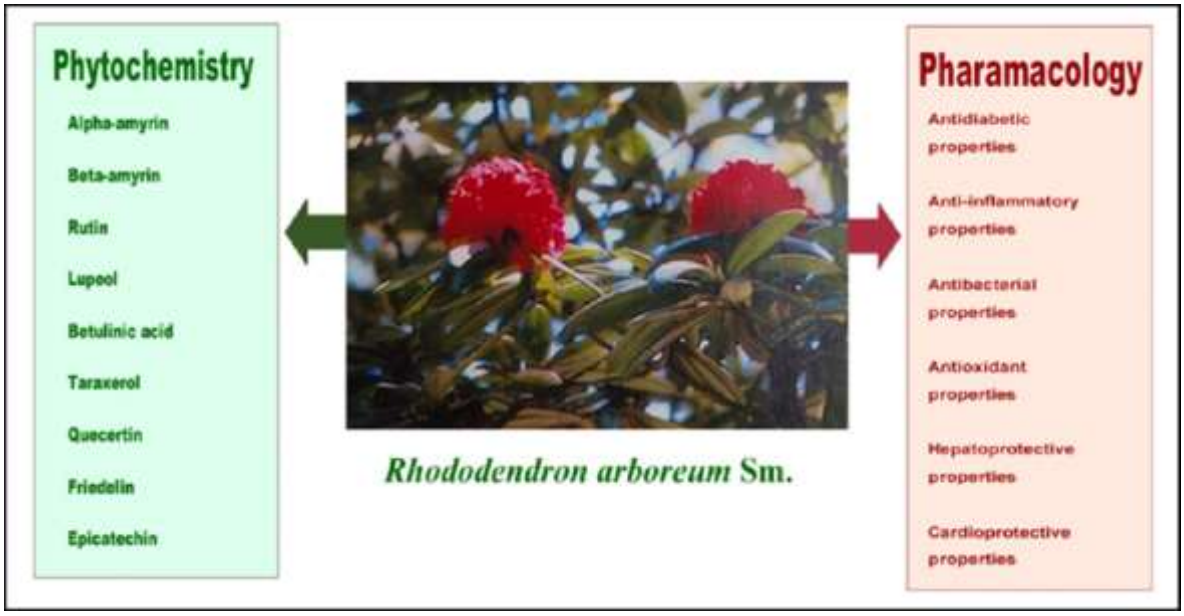


Fig. 1.2: This fig represent phytochemistry and pharmacology.

Tree rhododendron may grow in a variety of settings with varying environmental requirements, as seen by its distribution. Tree rhododendron may spread its distributional range in response to global warming, according to the observed bloom-advancing effect of high temperatures during this period and the current trend of rising winter-spring temperatures **(et al Luedeling 2024).**[6]

1.2 HISTORY

The first of many Rhododendron which were to come from southeastern Asia was the tree species, R. arboreum, with blood red flowers, which was discovered by Captain Hardwicke in 1799 and arrived from India in 1811 .in 1821 Don introduce R.anthopogen and R.setosum from Asia.

1.3 CLASSIFICATION AND DISTRIBUTION

Taxonomists have made different classifications based on morphological data, i.e., flowers, leaves, hair, etc due to different species of its kind. Rhododendron, the largest genus of the **Ericaceous** family, includes 1200 species which is distributed throughout the Northeast Asia and Eurasia Western Europe and North America.

Rhododendron, a most famous horticulture plant, has become one of most popular plant in the garden and as avenue tree and has also been widely cultivated in different part of the world due to its ethical uses, commercial and medicinal values it covers a vast section of South-eastern Asia between the north –western Himalaya through Nepal, Sikkim, Eastern Tibet, Bhutan, Arunachal Pardesh and upper Burma western and central China.

1.4 NOMENCLATURE

Kingdom : planate

Order : Ericales

Family : Ericaceae

Genus : Rhododendron

Species : R.arboreum

1.5 COMMON NAME

English : Rose tree, Rhododendron

Tamil : billu

Punjabi : adrawal

1.6 HABIT AND HABITAT

Altitude 1200-3600 m

Mean annual temperature 12-17 degree C

Mean annual rainfall 200-1800 mm

Soil type : The plant prefers light (sandy) and medium (loamy) soils require well drained soil. The plant prefers acid soils and can grow in very acid soil. It can require moist soil.

1.7 MACROSCOPIC IDENTIFICATION

1.7.1 Leaves: Leaves glossy green, oblong – lanceolate, 10-20 cm and 3.6 cm wide. Crowed towards the end of branches, petiole covered with white scales when young.

Fig. 1.7.1: This Fig Represent Leaves of R. Arboreum.

1.7.2 Flower: The flower of R.arboreum range in color from a deep scarlet, to red with white makings, to pink bearing up to twenty blossoms in a single truss this rhododendron is a spectacular sight when in full bloom. Bright red forms of this rhododendron are generally found at the lower elevations. Calyx- fine cleft, Corolla – tube spotted funnel shaped, Stamens hypozygnous declining, Filaments – filiform, Anthers – ovate, Style-capitate.

Fig 1.7.2: This Fig Represent Flower of R. Arboreum.

1.7.3 Seeds: Seeds-minute, dark brown, compressed, thin linear having an obvolute membrane.

Fig 1.7.3 this fig represent seeds of R.arboreum.

1.8 ORGANOLAPTIC PROPERTIES

Appearance : liquid

Color : pale yellow

Aroma : sweet herbal, faintly balsamic

1.9 PHYTO-CHEMISTRY

Bark

The petroleum ether extract of bark indicated the presence of a single triterpenoid substance taraxerol (C30H50O) and ursolic acid acetate (C32H50O4). The ether extract of bark following petroleum ether extract showed the identity of betulinic acid (C30H4803). The acetone extract of bark gave the substance leuco-pelargonidin (C15H1406). (Hariharan & Rangaswami, 1966).

Leaves

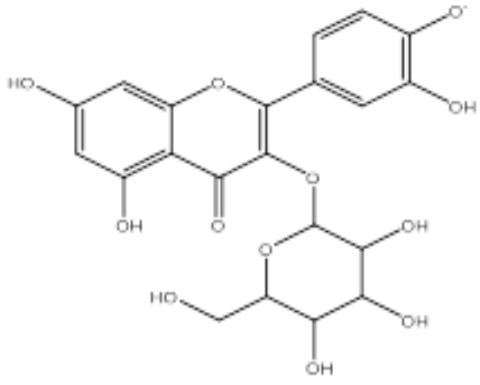
Green leaves are reported to contain glucoside, ericolin(arbutin) (C12H1607), ursolic acid (C30H4804), amyrin(C30H50O), epifriedelinol (C30H520), a new triterpenoid named campanulin, quercetin & hyperoside (C21H20O12) (Orwa at al., 2009). Chemical analysis of the leaves of R.arboreum var. niligiricum revealed the presence of hyperoside (3-D-

galactoside of quercetin), ursolic acid and epifriendelinol, a triterpenoid compound (Rangaswamy & Sambamurthy, 1959). The leaves are also reported to contain the flavone glycoside and dimethyl ester of terephthalic acid and certain flavonoids (Verma et al 2011).

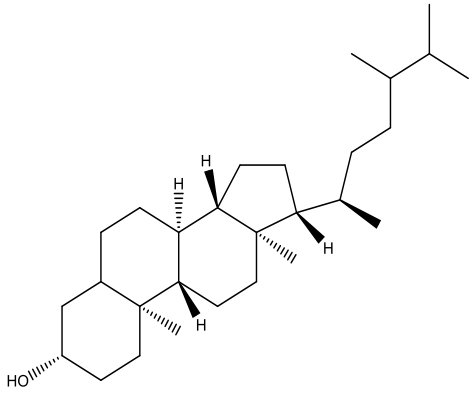
Flower

Quercetin -3-rhamnoside a crystalline chemical compound has been reported from the flower of this species (Rangaswamy & Sambamurthy, 1960). Three biologically active phenolic compound i.e quercetin (C15H10O7), rutin (C27H30O16) and coumaric acid (C9H8O3) have been reported in flower of R. arboreum using high performance thin layer chromatography.

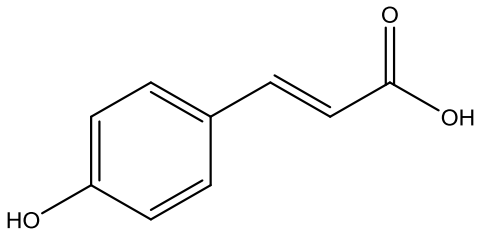
1.10 Chemical structure of compound that are found in "RHODODENDRON ARBOREUM"



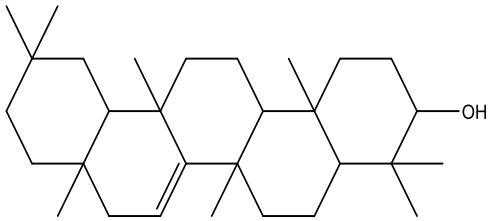
Hyperine



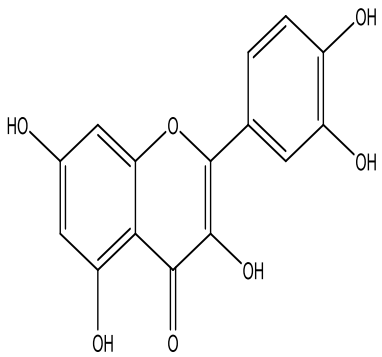
Sitosterol



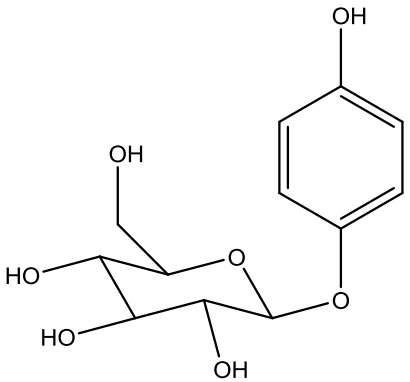
Coumaric Acid



Tarexerol



Quercetin



Arbutin

1.11 PHARMACOLOGY

1.11.1 Hepatoprotective activity

Hepatoprotective agents are those compounds, which mitigate the liver injury caused by hepatotoxic agents thus can prevent damage to the liver.

The ethyl acetate fraction of Rhododendron arboreum exhibited significance hepatoprotective potential against carbon tetrachloride (CCL4)-induced liver damage in preventive and curative models. Fraction at dose of 100, 200, and 400 mg/kg is administered orally once daily for 14 days in CCL4-treated groups (II, III, IV, V AND VI).

1.11.2 Cardioprotective activity

It refers to any intervention which seeks to decrease the risk of developing adverse cardiovascular event.

1.11.3 Adaptogenic behaviour

The past several decades have seen an increase in the medicinal usefulness of plants due to a variety of secondary metabolites with antioxidant potential that act as a plant's defense strategy against insects, herbivores, and microbes. According to Som et al. (2019), compounds isolated from Rhododendron sp. that have been found to contain diterpenes, triterpenes, flavonoids, steroids, tannin, phenolics, saponin, glycosides, alkaloids, tannin, quercetin, and gallic acid, among other things, have strong anti-oxidant and potent anti-stress properties, suggesting that they may be responsible for adaptogenic activity.

1.11.4 Antidiarrheal properties

Rhododendron arboretum flowers exhibited strong antidiarrheal properties in their ethyl acetate fraction. The amount of diarrheal feces in the castor oil-induced diarrhea was considerably reduced by the fraction.

1.11.5 Anti-tumor action

Significant, dose-dependent efficacy was demonstrated by ethanol leaf extract against potato disc tumors generated by Agrobacterium tumefaciens. The anticancer activity of isolated compounds rutin and quercetin may be the cause.

1.12.1 MATERIALS AND METHODS

Plant materials, pathogen isolates, and sampling

The study "Nova Zembla" rhododendron leaves were lacerated using a sterile scalpel tip. 30 µl of zoospore suspensions at a concentration of 1 × 104 ml–1 were dripped into the wound to initiate the inoculation process. As a control, deionized water was utilized. For each species of phytopthora, ten leaves were used. The inoculated leaves were arranged on trays with plastic net and sterile, wet blotting paper covering them. The trays were then sealed in polyethylene foil and incubated at 22°C for 12/12 hours of light and dark. Every day, sterile distilled water was gently sprayed on the inoculated leaves Following a 14-day period, the leaves were cleaned using deionized water, and portions of the leaves comprising approximately 3/4 diseased and 1/4 healthy tissue were crushed in a mortar with a liquid nitrogen pestle. Next, samples of 100 or 200 mg of infected tissue were taken for DNA extraction in accordance with the isolation methodology. Placing 5 × 5 mm of necrotic tissues onto the PARP (Pimaricin + Ampicilin + Rifampicin + Pentachloronitro) allowed for the confirmation of infection.

1.12.2 Procedure and Extraction

The four DNA extraction methods are contrasted below based on quantity and quality:

I. The extraction procedure outlined by Aljanabi and Martinez (1997) (AM) was used with the exception that, rather than homogenizing the tissue in a Polytron Tissue Homogenizer, 100 mg of fresh weight of tissue was crushed in liquid nitrogen using a mortar and pestle.

II. The extraction process followed the manufacturer's instructions (www.qiagen.com) and used a commercial DNA extraction kit, the DNeasy Plant Mini Kit (Qiagen) (Q), with 100 mg of fresh weight of tissue.

III. Using the unmodified Doyle and Doyle (1987) technique, 200 mg of fresh tissue weight and CTAB (Cetyltrimethylammonium bromide) buffer were utilized. Comparing the CTAB buffer amount to the original, which used 500–1,000 mg of fresh tissue, it was proportionately less.

IV. The following changes were made to the Doyle and Doyle (1987) (DDm) protocol: (i) 200 mg of fresh weight of tissue was used to extract DNA, rather than 500–1,000 mg; (ii) 500 µl of CTAB buffer was used; (iii) nucleic acid precipitation was done at –20°C rather than room temperature; (iv) precipitation time was one hour rather than several hours; (v) nucleic acid washed with 70% ethyl alcohol rather than a wash buffer containing 76% ethyl alcohol and 10 mM ammonium acetate without centrifugation but only gently pipetted.

Following extraction, methods I, III, and IV incubated for one hour at 37°C with RNase A added to a final concentration of 10 µg· ml–1.

1.13 Toxicity and Antimicrobial activity

Significant cytotoxicity was seen in the leaves, with moderate effects from the stem and roots and minimal relevance from the bark. The extract's glycosides, alkaloids, and flavonoids may be what give it its activity. The R. arboreum flower, leaf, stem, and root methanolic crude extracts showed considerable efficacy against B. subtilus, Salmonella typhi, and S. aureus. According to Prakash, leaf extract outperformed floral extract in terms of effectiveness. The zone of inhibition for S. aureus, Klebsiella pneumoniae, Streptococcus pyogene, and E. coli in methanol and aqueous leaf extracts. According to Sharma, ethanolic floral extract shown remarkable efficacy against Escherichia coli, B. subtilis, S. aureus, and Salmonella typhi.

The least effective concentrations of ethanol, methanol extract, and isolated quercetin were observed against S. Aureus and E. Coli. In a different study, the water extract demonstrated significant results against Candida albicans, Aspergillus parasiticus, and Aspergillus flavus, while the ethanolic flower extract demonstrated significant role against E. coli, S. epidermidis, and S. aureus, respectively, and also showed antifungal activity against Aspergillus flavus, Candida albicans, and Aspergillus flavus. Effective antifungal activity against Fusarium solani, Aspergillus niger, Microsporum canis, Cantharellus flavus, Candida albacan, and Candida glaberata was demonstrated using methanol and the ethyl acetate extract. The hydrophilic properties of betulin and 3-acetoxyurs-11, 12-epoxy-13β may be the reason for their high activity. Chauhan reported that aqueous leaf extract and methanol were efficient against Candida and Trichoderma viride fungi.

1.14 Traditional use of rhododendron

Historically, Rhododendron arboreum has been used Rhododendron arboreum's exquisite blossom is used in a wide variety of cultural and industrial contexts. Blooms are utilized extensively in bridal bouquets, as well as offered as offerings in hill temples. The bark and flower extract are extracted and utilized as an ingredient in skin conditioner and other commercial cosmetic treatments. This plant's stem wood is used to manufacture firewood, charcoal, gunstocks, gift boxes, furniture, and "khukri" handles.

1.15 Medicinal uses of rhododendron

There are reports of low side effects and medical benefits for rhododendron arboreum. Every component of rhododendron is used to treat a variety of illnesses and has its own therapeutic and helpful qualities. Rhododendron includes a variety of bioactive chemicals in each region of the plant. This plant's stem has compounds called alkanoids, steroids, terpenoids, tannins, glycoside, and reducing sugar that can help stop hay fever, bronchial asthma, and bleeding. The bioactive ingredients are used to treat illnesses and also help to maintain excellent health. This plant's roots have alkanoids, tannins, lowering sugar, steroids, and saponnins that aid in the prevention of cancer and cardiovascular illnesses. The presence of secondary metabolites suggests that rhododendron root has potential medicinal uses anthocyanidins They will assist in the alleviation of lung infection, cough, fever, headache, and toothache. The phenolic compounds, steroids, quercetin, rutin, coumaric acid, saponins, and tannins found in Rhododendron arboreum flowers are beneficial against diabetic nephropathy, diarrhea, and microbes. Additionally, because these flowers have an antidiabetic factor, they can be used as functional foods or nutraceuticals for people with diabetes. This plant's leaves are traditionally used as a poultice, prepared into a paste that is applied to the forehead to treat headaches. The leaves are also astringent.

1.16 Utilization of rhododendron as food and drink

Rhododendron arboreum is used to produce a wide variety of expensive food products. This little tree has several sections that are useful for therapeutic purposes. The blooms on this Due to the sweet and sour taste of plants, a wide variety of food products are made, such as local brew, squash, chutney, jam, jelly, juice, and preserves .Rhododendron has increased in market value and appeal because of its frequently consumed juice, which is made from flowers. It possesses hepatoprotective, anti-inflammatory, anti-incontinence, and antidiarrheal properties. Fresh petals are used in mountainous regions to make "Buransh Ki chutney," a chutney made with mint and other regional spices. This chutney's flavors and scent are quite reviving. This chutney has numerous health advantages, including being high in antioxidants, vitamin C, and beneficial for the heart, aches, and pains. This flower's dried powder is prescribed as a medication to treat "blood dysentery." Three closely related varieties of Rhododendron produce the herbal tea known as "Labrador Tea." Mental retardation is treated using squash that is made from rhododendron. Gout has been treated with a dye made from dried rhododendron leaves.

1.17 Utilization of rhododendron as functional food

Functional foods can be defined as dietary items that, besides providing nutrients and energy, beneficially modulate one or more targeted functions in the body, by enhancing a certain physiological response and/or by reducing the risk of disease. According to Institute of Food and Information Council (IFIC) states that functional foods "provide health benefits beyond basic nutrition. Functional food can be fruits, vegetables, herbs and flowers and they have its own medicinal and beneficial effect.

Burans, belong from Ericaceae family. It consists of 1200 species among which China has the highest number of species that is 571 species. It is a national flower of Nepal and state tree of Uttarakhand. Moringa, the genus moringa belong to the Moringaceae family, the genus comprises of 13 species and it is commonly known as "drumstick", "horseradish". Mallow, this flower consists of 250 genera and 4230 species and it belong to the malvaceaea family. Pansy, it is a genus Viola and it belong to the Violaceaea family. It is short lived plant. Artichokes, this flower is also called French or globe artichoke, it is belonging to the Asteraceae family.

CONCLUSION

The Rhododendron arboretum "a medicinal herb" was Collected, dried and Extracted.

The study of phytoconstituents found in this plant rebels that the plant is having a great potential for utilization as a medicine, the active ingredient found in the plant is already having a wide medicinal value and the study on this plant showing the scope of the plant as medicine in further future prospects.

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