

PHARMACOLOGICAL PROPERTIES OF NORTH INDIAN HERBS OF RUMEX

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ABSTRACT:

The genus Polygonaceae includes more than 200 species of annual, biennial and perennial herbaceous plants. Some species of this genus are found all over the world, some of them are cultivated. They are mainly distributed in the northern hemisphere and the countries of Europe, Asia, America and Africa. These species are traditionally used for culinary and medicinal purposes. The aerial parts, leaves and roots of plants in this genus are used as vegetables to treat various health problems such as mild diabetes, constipation, infections, diarrhea, edema, jaundice, hepatobiliary disorders and inflammation. Pharmacological activities have been studied in these species, including anti-inflammatory, antioxidant, antitumor, antibacterial, antiviral and antifungal properties. In their phytochemical studies, accumulations of anthraquinones, 1,8-naphthalenediol, flavonoids and stilbenes were found. *R. Acetosa*, *R. acetosella*, *R. thyrsiflorus* and *R. vesicarius* are known for their various ethnomedical uses. Although the genus contains more than 200 species, only more than 50 species have been studied phytochemically and pharmacologically. Moreover, the hepatoprotective, antiviral and antidiabetic activities of *R. cerevisiae* are a priority for future pharmacological studies. This review aims to describe the pharmacological and phytochemical properties of *Rumex*.

INTRODUCTION:

In Polygonaceae (buckwheat) family *Rumex* is the second largest genus which contains more than 200 species [1]. *Rumex*, which refers to the form of the leaves, is a name that is derived from the Greek words "dart" and "spear" and is mostly distributed in the northern areas at an altitude of above 1000m [2]. This genus contains more perennial herbs along with strong roots, indeterminate inflorescence (racemose

inflorescence), and fruits that are covered with a large inner perianth. The eligible parts of leaves (used as food in the form of sour soup, sauces, and salads) flowers, and seeds are taken as vegetables and medicinal herbs also [3]. The flowers are small, green or red in color, branched clusters are present at the terminal and it grows in the month of April to May. The seeds become mature from the month of May to June [4]. Consuming large amounts of oxalic acid and hydroxy anthracene derivatives that are present in this genus rumex plant and make the food digest. Oxalic acid forms a calcium oxalate stone in the kidney and decreases iron absorption [5]. If the leaves are not cooked properly it can cause vomiting, nausea, stomach cramp, and headache [6]. Because of the resemblance in their morphology, the species belonging to this genus are very hard to differentiate between themselves [7]. It is a good source of primary nutritional compounds like vitamins, fat, sugar, protein, and minerals [8]. These plants are rich in biologically active secondary metabolites like polyphenols, anthraquinones, flavonoids, tannins, quinones, glycosides, tocopherols, terpenoids, glucosinolates, carotenoids, diterpene alkaloids, proanthocyanidins stilbenes and lignans [9]. It exhibits pharmacological action like antiviral, antitumor, antidiabetic, anti-inflammatory, antiulcer, antibacterial, antifungal, anti-aging, phytotoxic, cytotoxic, dysenteric, anticoagulant, anti-diarrheal, antiemetic, anti-suppressive agents, anti-mutagenic, anti-hypertensive, anticancer, hepatoprotective, gastrointestinal and cardiovascular protective effects [10]. Some plants are used as natural colourants, paints, cosmetics, toys and textile industries [11].

BIOLOGICAL SOURCE:

Kingdom: Plantae

Class : Magnoliopsida

Phylum: Tracheophyta

Order: Caryophyllales
Family: Polygonaceae
Subfamily: Polygonoideae
Genus : Rumex [12]



Fig:1. Rumex Plant



Fig:1. Rumex Flower

GEOGRAPHICAL SOURCE:

Rumex species plays a crucial role in global folk medicine in Southern Africa, India, America, China and Turkey. It is also distributed in France, Italy, Kazakhstan, New Zealand, Norway, Germany, Finland, Europe, Australia, Denmark, United Kingdom, Russia, Ukraine, Switzerland and Sweden [13].

MEDICINAL USES:

Rumex species were first used medicinally in China in "Shennong's Herbal Classic," which is used in the treatment of fever, gynecological illnesses, scabies, and head lice [14]. Rumex roots, commonly known as dock roots, are used to treat bacterial infections, jaundice, constipation, inflammation, tumors, and cardiovascular problems. Some of the Rumex species are used as herbal medicine in the treatment of urinary inflammation, dysentery, skin burn, laxative, diuretic, chronic cutaneous diseases, astringent, osteomyelitis skin treatment, hepatitis sedative properties, gallstones, and liver diseases. Leaves and roots of *Rumex maritimus* are used as CNS depressants, Cathartic, Antipruritic, Purgative, and Antidiarrheal [15].

EXTRACTIONS:

- Leaves, roots, flowers, and seeds are collected
- washed and dried at room temperature or dark place
- Cut into small pieces then carefully loaded in a paper bag.
- 100g of Rumex species are extracted in 70% hydro-methanol at room temperature 27°C.
- Filtered and evaporated at 55°C.

- Again, dried to obtain dried gum [16].

CHEMICAL CONSTITUENTS:

The acid plays a crucial role in *Rumex* species that mostly contain fatty acids like Linoleic acid, steric acids, benzoic acid, Ferulic acid and palmitic acids, which are separated from *R. indurates*. Likewise, Oxalic acid from *R. abyssinicus* and tartaric acid, citric acid from species of *R. nervosus*. Antifungal activity has been detected in the presence of Chrysophanic acid are separated from *R. abissinicus* and *R. nepalensis*. Similarly, *rumex* species root contains ferulic acid and leave contain ascorbic acids act as antitumor and antioxidants agent [17]. More numbers of species are rich source of quinones, which are present in root including anthraquinones, anthraquinones, seco-anthraquinones. They are three significant anthraquinones, 1,5-dihydroxy-3-methyl anthraquinone, 1,3,5-trihydroxy-6-hydroxymethyl anthraquinone, and 1,5-dihydroxy-3-methoxy-7-methyl anthraquinone were isolated from the roots of *R. crispus* through chemical analysis of pharmaceutically important anthraquinones. These substances are used to treat constipation and purify the blood in cases of skin complaints [18]. Most of the flavonoids are obtained from kaempferol and quercetin associated with rhamnosyl, arabinosyl, glucosyl and galactosyl at different positions [19]. A chromone glucoside, 2,5-dimethyl-7-hydroxy chromone-7-O- β -D-glucoside were separated from the root of *R. gmelini*, and five chromones, 5,7-dihydroxy-1(3H)-chromone, 5-methoxy-7-hydroxy-1(3H)-chromone, 2,5-dimethyl-7-hydroxy chromone-7-O- β -D-glucoside, 7-hydroxy-2,3-dimethyl-chromone and 2,5-dimethyl-7-hydroxy chromone were separated from *R. gmelinites*, *R. nepalensis*, *R. patientia* and *R. cristatus* [20]. The aerial segments of *R. acetosa* were extracted using acetone and water, and the EtOAc fraction of that extract proved that *R. acetosa* was high in tannins. By using LC-

MS methods, the chemical constituents of Rumex species were also examined. Mostly on flowers and stems of *R. tetanus*, untargeted metabolomic profiling employing UHPLC-Q-TOF-MS analysis confirmed the presence of 60 compounds. The most common phenolic compound in flowers has been identified as quercetin-3-O-D-glucuronide and in stems epicatechin-3-O-gallate. The highest content of hydroxycinnamic acids are present in *R. acetosella* leaves (18 mg g⁻¹), proanthocyanids from leaves of *R. crispus*, *R. obtusifolius*, and *R. sanguineus* (6.4 to 7.2 mg g⁻¹) and catechins are found in *R. sanguineus* leaves (11 mg g⁻¹). Isolation of rumex species produce six stilbenes that are Resveratrol, 5,4'-dihydroxy-stilbene-3-O- α -arabinoside, (Z)-resveratrol, 5,4'-Dihydroxy-3-methoxystilbene, polydatin and 3,5-dihydroxy-4'-methoxystilbene. These stilbenes are used as antioxidants agent and cardiovascular protective. 6-hydroxy-11-deoxy-13-dehydrohetisane, 7,11,14-trihydroxy-2,13-dioxohetisane and 6,13,15-trihydroxyhetisan are synthesized from tetra- or pentacyclic diterpenes that are present in the *Rumex pictus* [21]. The steroids stigmastane, α -cholestanol and β -cholestanol are separated from *R.induratus*, likewise, β -sitosterol-3-O- β -D-glycoside and β -cholestane are isolated from *R. patientia* [22].

PHARMACOLOGICAL ACTIVITY:

Rumex species are used as food and medicine. These species have more pharmacological and phytochemistry properties. The parts of plants are collected, washed, and dried, and extract from the chemical constituents. Through the chemical constitution pharmacological properties are identified that are used for treating disease and developing modern science [23].

ANTI-INFLAMMATORY ACTIVITY:

The high dose of *R. patientia* root (aqueous extract) 150 mg/kg reduced the edema with indomethacin the positive control at 10 mg/kg, 36.6%. Intestinal epithelial cells treated with methanolic extracts of *R. roseus*'s roots and stem indicated anti-inflammatory properties, reducing TNF-induced gene expression of IL-6 and IL-8. *R. crispus* root ethyl acetate extract exhibited anti-inflammatory action by preventing Nitric oxide formation and reducing the release of proinflammatory cytokines [24].

ANTIOXIDANT ACTIVITY:

The antioxidant activity of the rumex sample was evaluated in its capacity to scavenge free radicals using the stable radical DPPH. Each Rumex sample was dissolved in 1 mL of methanol, mixed thoroughly, and then incubated for 15 minutes in the dark at room temperature (25°C) and varying concentration with the same volume of 0.3 mM DPPH in a solution of methanol. Using a UV-visible spectrophotometer to measure the absorption. antioxidant activity was found in *R. acetosa* by the root of 80% methanol extract showing $IC_{50} = 118.8 \mu M$ high scavenging activity to DPPH free radicals and for leaves $IC_{50} = 201.6 \mu M$, flowers and fruits $IC_{50} = 230.1 \mu M$, stems $IC_{50} = 411.2 \mu M$ [25].

ANTIMICROBIAL ACTIVITY:

The agar diffusion assay was done using the process given by Cappuccino and Sherman. The Whatman filter paper discs were sterilized and saturated with 100 μ l of the extract. Inoculation of young cultures on the surface agar plates. Petri dishes are incubated at 37°C for 24 hours. Experiments were performed in triplicate, and the diameter of the inhibition zone were calculated and compared with

DMSO. Antibiotics, penicillin, clotrimazole, and chloramphenicol were utilized. Isolate the root of *R.japonicus* obtained methoxy-styandrone, naphthalenes and torachryson indicate the inhibitory effect on both gram-positive and gram-negative bacteria. *R.sanguineus* and *R.crispus* plant have wound healing properties because they have anti-*Acinetobacter baumannii* activities [26].

ANTIVIRUS ACTIVITY:

R. aquaticus' 1,4-naphthoquinone and naphthalenes exhibited antiviral activity against Vero cells that were infected with HSV-2 (herpes simplex virus type 2) replication. On a conventional virus produce reduction test and qPCR assay, musizin (145) exhibited dose-dependent inhibitory property, resulting in a 2.00 log₁₀ reduction in HSV-2 at a concentration of 6.25 M. It implied that *R. aquaticus* might be used to treat people with HSV-2 infections. *R. acetosa* exhibits antiviral activity through plaque reduction and MTT assay against vero cells [27].

ANTITUMOR ACTIVITY:

Inhibition of cancer cell proliferation by using MTT assays on MCF7 (human breast adenocarcinoma) cell lines, HeLa (human cervical carcinoma) and A431 (skin epidermoid carcinoma) exhibit the *R. acetosa* and *R. thyrsoflorus* properties. *R. vesicarius* shows greater cytotoxic in vitro with nontoxic on zebrafish development (IG50 = 33.45—62.56 μ M) at concentration 30 μ g/mL. When applied to zebrafish embryos, the chloroform extract of the stems prevented the growth of 100% of subintestinal vein blood vessels and around 70% of intersegmental blood vessels. This implies that the chloroform extract of *R. vesicarius* stems has evident anticancer potential [28].

ANTIDIABETIC ACTIVITY:

R. crispus root produces physcion and Chrysophanol and the alcohol extract of *R. acetosella* exhibits Inhibitory activity in α -glucosidase with IG_{50} value, they show anti-diabetic properties. The seed of ethanolic extract of *R. obtusifolius* is administrated through the oral route, increasing glucose tolerance, decreasing the fasting glucose level, and increasing the glycogen level in the liver. It decreases the low-density lipoprotein cholesterol level, liver enzymes level, and total cholesterol level but it increases the high-density lipoprotein cholesterol level. This *R. obtusifolius* plant shows high potential to cure diabetes [29].

CONCLUSION:

The genus *Rumex* is widely distributed in the world, it contains more than 200 species belongs to the family Polygonaceae. *Rumex* species are used in food, medicine and pharmaceutical industries because it is rich in nutrition, secondary metabolites and pharmacological activities. Leaves, roots, seeds, flowers, and some extracts are used to treat many various diseases like kidney disorder, urinary inflammation, jaundice, skin disease, diuretics, laxatives, regulations of digestive system, diabetes, constipation, chronic cutaneous, analgesic, cancer, gallstones. These species have greater potential for regrowth after wound. Some species contains oxalic acid it makes difficult to digest the food and create stone in kidney or digestive problems. The current studies are focused on the bioactive compounds, biosafety, more evaluation in chemical constituents and their efficiency for developing the modern science.

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