IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Phyto-constituents and Pharmacological activity of Pinus roxburghii-Sarg.

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❖ Abstract

Pinus roxburghii Sarg. (syn. Pinus longifolia Roxb.) (Pinaceae), found in the Himalayan region, furnishes an oleoresin which is useasbinsecticides,disinfectants and liver disorders. The Pinus roxburghii Sarg (Pinaceae) is commonly known as chir pine. The taxonomy of P.roxburghii is Kingdom: plantae, division: pinophyta, class: pinopsida, family: pinaceae, genius: pinus, species: roxburghii. The Pinus roxburghii is an economically valuable species,it is also planted in the garden for ornamental purpose. The plant also shows beneficial effects in the treatment of cough, ulceration and genito-urinary disorders. Traditional uses of Plant is sweet, bitter, pungent, intestinal antiseptic, antidyslipidemic and antioxidant and is used in eye, ear, throat, blood , skin, bronchitis, ulcer, inflammations and itching . Pharmacological activity of wood oil is used for hepatoprotective. Resins is used as antibacterial, leaves having wound healing and analgesic activity, bark having anticonvulsant. Cone is used in treatment of fungal infection.

❖ **Keyword**: Pinus roxburghii, Pinaceae, Pharmacological activities,phytochemical constituents.

❖ Introduction

P. roxburghii also has numerous traditional medicinal uses(e.g., antiseptic, diuretic, diaphoretic, alcohol, vermifuge and rubefacient), as well as artistic uses(e.g., watercolor, color, pesticide, resin and wood).. It's also planted in the theater for cosmetic purpose. The tapping of the stem produces a clear, transparent oleo- resin with the pungent and bitter taste. It's employed in the manufacturing of fireworks, germicides and detergents and enters into certain slicking compositions, hair fixing and nail polishing medications(Anonymous, 2003). It's used in medication of ointments and poultices and in numerous products similar as biting goo, polishes, and varnishes, but is a common cause of contact mislike. In publishing essay assiduity rosin gives cohesion, face smoothness, hardness, antiblocking and other parcels. Rosin has a good electric insulation, being used as oil painting in lines for high voltage electricity. The resin acts to remove the common inflammation caused by rheumatism, which helps to restore movement and to palliate pain. The Costanoan Indians gained these benefits by biting on the goo- suchlike resin.

❖ Distribution

A altitudinous tree with a spreading crown is set up in the Himalayas from Kashmir to Bhutan and in the Siwalik hills at mound of 450- 2,400 m. It comes up serviceably well in the fields likewise and is in some cases planted in auditoriums for elaborate purposes. The chir pine happens in the Himalayas simply in the external pitches and denes , which get the lesser part of the rush amid the thunderstorm.

❖ Cultivation

➢ **There is two types of cultivation.**

1. **Natural Regeneration**

   It takes places through seeds. Under ordinary timber conditions, trees lower than 30- time old infrequently bear cones. The cones start to open amid April- May of the third time, i.e., around 24 months after their appearance and the seeds get scattered amid April- July. Under regular conditions, the seeds develop when acceptable moistness isaccessible.The germination commences at the morning of the thunderstorm. A number of factors similar as light, failure, tonography and soil have considerable influence upon the extent and quality of natural rejuvenescence(Anonymous, 2003).

   2. Artificial Regeneration

   It's needed broadcasting nursery- raised seedlings or by coordinate sowing. The mature cones are collected from the trees during March- April and are placed in the hot sun to loosen the scales, and later the seeds sifted are out. The seeds are sown in the nursery during March- April in shallow drills 15 cm piecemeal. The seedlings are chosen out in July. One- or two- time old seedlings are typically scattered at the morning of the rains(Anonymous, 2003).

❖ VERNACULAR NAMES

The vernacular names of P. roxburghii are Bhadradaru, Manojna in Sanskrit; Chil, Chir,Salla in Hindi; Saralgachha in Bengali;Saraladeodara in Gujarati; Salla, Charalam inMalayalam; Simaidevadari in Tamil and Devadaru in Telugu.

❖ MORPHOLOGY

❖ Roots

P. roxburghii having the branches with restricted growth and relatively short life called the short or dwarf roots. Some of their root branch dichoto-mously, have an ectotrophic mycorrhiza and are termed as mycorrhizal roots.

❖ Leaves

They are also known as needles. Adult leaves are 20-30 cm long, they are triquetrous, long, narrow (acicular), tough and light green persisting on an average for a year and a half. The foliage leaves which appears only on the dwarf shoot. They are of smooth surface and borne on dwarf shoots in fascicles of 2-5. The needles are straight on youngshoots but spread outwards or drop down in older shoots. The scale leaves are brown membraneous, protective in function found on dwarf shoots10-11.

❖ **Bark**

Occurs as a typically layers of scaly flakes, thick, cracked, brown in color and scented by the resin. Some pine tree species have a thin flaky bark, when on close observation chunks of bark can be seen just hanging on or flaking off. Thickness of bark varies; it is about 0.2 inch in young saplings to an average of about 2 inches in mature trees10.(Fig. 2B)

❖ **Flowers.**

Male flowers are about 1.5 cm long and arranged in the form of cones. They are produced in clusters. These are generally born on the lower branches of the tree. Each male cone is composed of spirally arranged leaf-like structures called scales or micro-sporophylls10-11. The female flowers are much larger than the male cones. These are usually found on the upper branches. Each female cone is also made of spirally arranged scales which are called megas-porophylls. Female cones are solitary or 2-5 together. They are ovoid in shape having size 10-20×7.5×13 cm10-11.(Fig. 2C and D)

❖ **Seeds**

The seeds are with a wing and are wind-dispersed. Without wing they are of 7.5-130 ×5×6.5 mm size 10**.**

❖ **Stem**

The main stem erects woody and covered with rugged scaly bark which peels off. The dwarf shoots with limited growth .The dwarf shoots are also called short shoots, brachyblast or foliar spurs, are borne on long shoots and arise in the axil of scale leaves. Each dwarf shoot bears two opposite scaly leaves, called propphyls followed by 4-13, spirally arranged scaly cataphylls. The needle number is three in P. roxburghii10. the methanol extract of the bark of P. roxburghii13. The bark is reported to contain 7-10 % of tannins, α-limonene, α-phellandrene, borneol, longifolene and α-cadinene10(fig. 3). The hydrolyzed fraction of chir pine oleoresin was found to contain two phenolic (ferulic acid, p-coumaric) acids and a lignin (pinoresinol). The structure of chemical constituents present inFig. 3like(1) Borneol (2) a-pinine (3) b- pinene (4) eugenol (5) abietic acid (6) longifolene (7) isopimaric acid (8) neral (9) α-Humulene (10) Car-3--ene (11) linalol (12) α-terpinene (13) geraniol.

CHEMICAL CONSTITUENTS

P. roxburghii contains a variety of phytoconstituents such as vitamin C, tannins, and alkaloids. Study of essential oils from needle, bark, and cone of P. roxburghii reveals the presence a total of 117 components, out of which 111 were, identified1. α-pinene, β-pinene, car-3-ene, abietic acid and iso-pimaric acid was isolated from xylem resin12(fig. 3). Two new xanthone identified as 1, 5-dihydroxy-3,6,7-trimethoxy-8-dimethylallyloxy-xanthone and 1-hydroxy-3,6-dimethoxy-2-β Dglucopyranoxanthone have been isolated from the methanol extract of the bark of P. roxburghii13. The bark is reported to contain 7-10 % of tannins, α-limonene, α-phellandrene, borneol, longifolene and α-cadinene10(fig. 3). The hydrolyzed fraction of chir pine oleoresin was found to contain two phenolic (ferulic acid, p-coumaric) acids and a lignin (pinoresinol). The structure of chemical constituents present inFig. 3like (1) Borneol (2) a-pinine (3) b- pinene (4) eugenol (5) abietic acid (6) longifolene (7) isopimaric acid (8) neral (9) α-Humulene (10) Car-3--ene (11) linalol (12) α-terpinene (13) geraniol14.

Table No.1: Chemical compounds in different parts of P. roxburghii.

Sr.no.	Compound	Leaves	Bark	Cone	Xylem resin
1	Terpenolene	✓	✓	✓	
2	Linalol	✓	✓	✓	
3	trans-Sabinene hydrate	✓	-	✓	
4	isopimaric acid	-	-	-	✓
5	Phenylethyl alcohol	-	-	✓	-
6	Pincarvone	-	-	✓	✓
7	Longifolene	-	✓	✓	✓
8	Terpinen-4-ol	✓	✓	✓	-
9	α-Terpineol	✓	✓	✓	-
10	cis-Piperitol	✓	-	-	-
11	Ceryl alcohol		✓		-
12	β-Pinene	-	-	✓	✓
13	α-Pinene	✓	-	✓	✓
14	Sabinene	✓	-	✓	-
15	Myrcene	✓	-	✓	-
16	Car-3—ene	✓	-	✓	✓
17	α-terpinene	✓	-	✓	-
18	γ-terpinene	✓	-	✓	-
19	Neral	-	✓	-	-
20	Geraniol	✓	✓	-	-

21	Eugenol	-	✓	-	-
22	Methyl eugenol	✓	✓	✓	-
23	α-Humulene	✓	✓	✓	-
24	α-Amorphene	-	✓	-	-
25	Cembrebe	✓	-	-	-
26	Abietic acid	✓	✓	✓	✓

❖ TRADITIONAL USES

The timber of the tree is largely used for various purposes such as house building, furniture, tea chests, sport goods and musical instruments etc. In traditional system of medicine different parts of the plant have been used for cough, cold, influenza, tuberculosis, bronchitis antiseptic, diaphoretic, diuretic, rubefacient, stimulant and vermifuge. Bark paste is used in burns and scalds. Resin is used to relieve cough and gastric troubles. Plant is used as intestinal antiseptic, hypolipidimic, anti-oxidant and is used in the treatment of eyes, ears,throat, blood, skin, bronchitis, diaphoresis, ulcer, inflammations and itching. Also good in dyspepsia, ulcer, diaphoresis, scabies, asthma, chronic bronchitis, ozoena, piles, diseases of liver (hepato protective), spleen, gleet, ear discharge, toothache, lumbago and tuberculous glands..

❖ Uses in Folklore Medicine

The plant resin is sweet, bitter, pungent; thermogenic; oleagenous and intestinal antiseptic. Internally, the colophony is used as a stomachic and externally as a plaster and is applied to buboes and abscesses for suppuration. It has shown diuretic, emmena gogue, purgative and expectorant actions. It is also useful in inflammations, asthma, chronic bronchitis, piles, diseases of the liver and spleen, urinary discharges, earache, toothache, lumbago, tuberculosis, scabies and epilepsy.

❖ Pharmacological activities

The pharmacological activities of P. roxburghii have been investigated scientiically in animal models to validate the potential of the plant as a treatment for a variety of ailments
as shown below.

❖ Hepatoprotective activity

P. roxburghii wood oil at doses of 200, 300 and 400 mg/kg body weight was studied for hepatoprotective activity on rat liver damage induced by carbon tetrachloride and ethanol.
The noticeably high serum levels of aspartate aminotransferase,alanine aminotransferase,alkaline phosphatase, total bilirubin, malondialdehyde (MDA) and decreased level of reduced glutathione (GSH) and total protein induced by hepatotoxins
were signiicantly restored towards normal levels by the wood oil at doses of 200 and 300 mg/kg
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❖ Antibacterial and antifungal activities

Essential oil of the needles of P. roxburghii showed maximum activity against Staphylococcus aureus and Bacillus subtilis while no activity was observed against
Escherichia coli, Salmonella typhi and Enterobacter aerogenes. In case of antifungal activity, essential oil significantly and dose-dependently inhibited the growth of all the fungi. Antibacterial activity of stem essential oil was observed against S. aureus and B. subtilis while no activity was observed against E. coli and E. aerogenes. Similarly, antifungal activity of P. roxburghii essential oil was also found to be active against Aspergillus lavus, Aspergillus terrus, Aspergillus vessicolor, Aspergillus candidus,

Aspergillus niger and Trichoderma viride . Maximum inhibition was recorded for needle extract of P. roxburghii against Klebsiella pneumonia. Aqueous and alcoholic extracts from P. roxburghii stem, leaves, bark, female cone and male cone were tested for growth-inhibitory activity against the bacterial plant pathogen Only the alcoholic extracts of leaves and female cones were found active against Salmonella arizonae.

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❖ Antidyslipidemic and antioxidant activity

The needles of P. roxburghii were investigated for anti-dyslipidemic activity in high-fat diet-fed hyper-lipidemic golden Syrian hamsters. Antioxidant activity of needles was assessed by trolox equivalent antioxidant capacity assay, and activity was found to be significant in the alcoholic extract as well as in the n-butanol insoluble fractions.

❖ Anticonvulsant activity.

The alcohol extract of P. roxburghii was evaluated for anticonvulsant activity using maximal electroshock- and pentylen etetrazole-induced seizure at various doses (i.e., 100, 300 and 500 mg/kg). The extract reduced all the phases of convulsion significantly. All the animals recovered from seizures completely at all doses of extract.

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❖ Antiasthmatic activity

The alcohol extract of P. roxburghii was evaluated for antiasthmatic activity using guinea pig ileum preparation (in-vitro), histamine-induced bronchospasm in guinea pigs and catalepsy in mice (in-vivo). Anti-allergic activity of the plant was evaluated using milk-induced leukocytosis in mice and passive paw anaphylaxis in rats (in-vivo). The alcoholic extract of P. roxburghii demonstrated signiicant antiasthmatic activities in the tested models

❖ Contact dermatitis

The sawdust of P. roxburghii can cause occupational contact dermatitis.

❖ Cognitive effects

Experiments studying the memory-enhancing activity of volatile oil and chloroform extracts of P. roxburghii failed to demonstrate any improvements in the Morris water .

❖ CONCLUSIONS

Plants give a variety of social assets that traverse the key requirements of sustenance, garments drug and safe house. Home grown mixes have been used therapeutically since some time recently written history in both sorted out (Ayurveda, Unani)and disorderly (society, tribal, indigenous) medicinal traditions. The pharmacological activities of P. roxburghii has a long history of numerous curing many disease like Cytotoxicity, wound healing activity, Spasmolytic action, Analgesic and anti-inflammatory activity etc. The significance of plants in ethno medicincinal rehearses gives intimations to new range of research furthermore, in biodiversity
preservation.

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