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An Overview of Biological, Phytochemical, and Pharmacological Values of *Abies pindrow*

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ABSTRACT

The overview explains the biological, phytochemical and pharmacological values of *Abies pindrow* plant. From the data it is cleared that *A. pindrow* plants have many significant ethnopharmacological applications. It chiefly contains numerous phytochemical like triterpenoids [lanosta-7,9(11)-dienes], various flavonoids [Okaniin; Okaniin-4'-O-b-d-glucopyranoside; Butein-4'-O-b-d-glucopyranoside and 2',3',4',3,4- Pentahydroxychalcone-4'-(1- arabinofuranosyla -1-4-b -d-glucopyranoside)] carbohydrates, fatty acids, pinitol and maltol [3-hydroxy-2-methyl-4H-pyran-4-one C₆H₆O₃]. These phytochemicals possess many pharmacological uses in remedy of gigantic number of diseases due to the presence of antioxidant activities.

Keywords: *Abies pindrow*, Economic Importance, Pharmacology, Phytochemistry

1. Introduction

Abies pindrow Royle is recognizable as West Himalayan Fir/Silver fir but in Pakistan it is known as partal or palundar and 'talispatra' plant in Sanskrit, whereas in Hindi it is morinda. *A. pindrow* leaves have many applications in Ayurvedic scheme of medication as Taalisa and in Unani organization of drug as Zarnab. It mainly habitat in Himalayas deciduous forests^[1]. Nasir^[2] stated that. *A. pindrow* habitat ranges from 2000 m - 3000 m beginning from Afghanistan to Nepal all over the western Himalaya (Plate-I). In North of Western Himalayas *Abies pindrow* occurs at an elevation of 3000-4500 m.

Abies pindrow plant has narrow pyramidal shape and height of 30 m tall or more, whereas, it is light grey to brown in colour has fissured bark. Leaves are 1-4 cm long and spiral in shape (Plate II) with grooved on upper surface, shiny and dark green. Male cones have two linear sporangia which have winged microspores and cones are 1 to 2 cm long located axillary, reddish-green in colour. Female cones are introverted or in pairs, hardly oblong, 8 to 12 cm long, have violet purple coloration and bear megasporophyll which is 2 cm elongated. Seeds winged two times and 1 to 1.2 cm long^[3].

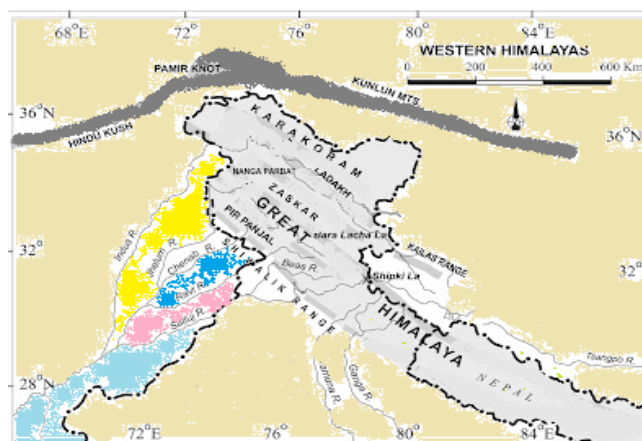


Plate I: Map showing

Himalaya region



Plate II: *Abies pindrow* branch bearing spiral leaves
Abies pindrow Ethnopharmacological values

From nineteen species of *Abies* almost 277 compounds were isolated which have many biological activities^[4]. It mostly contains chemical constituents like flavonoids, terpenoids and lignans, together with minor constituents of phenols, steroids, and others. Antihypertensive, antiulcerogenic, antitumor, anti-

inflammatory, antimicrobial, antitussive, insect juvenile hormone and CNS (central nervous system) activities have been found to be present in crude extract and primary and secondary metabolites of *Abies* plants. *Abies pindrow* has many ethnopharmacological values which are represented in Table 1.

Table 1: Utilization of different parts of *Abies pindrow* in treatment of diseases. Diseases are arranged alphabetically

S. No.	Diseases	Plant part used	Research References
1	Antidiabetic	Plant	[11]
2	Antiulcerogenic, anti-inflammatory, analgesic and hypnotic effects in rats, attenuated and hypotension in dogs	Leaves	[8 & 10]
3	Antiperiodic	Leaf Juice	[12 & 13]
4	Antispasmodic	Leaves	[13-15]
5	Remedy of fever	Leaf powder	[13 & 16]
6	Asthma	Leaves	[12, 15 & 17]
7	Bronchitis	Leaves	[15-17]
8	Stomachic, Carminative, Expectorant and astringent	Leaves	[12-14]
9	Bladder catarrh	Leaves	[13, 16 & 17]
10	Cough and bronchitis	Bark extract	[18]
11	Cough, Phthisis	Leaves	[13 & 14]
12	Infants fever	Leaf Juice	[15-17]
13	Headache	Gum	[12 & 16]
14	Hypoglycemic activity	Leaves	[19]
15	Cough, haemoptysis and asthma, aids digestion, increases appetite, stops vomiting, reduce diarrhea, dyspepsia, normalizes spleen, lung complaints,	Product name Talisadadya Churna	[16 & 17]
16	Intoxification	Plant + Roses/oils	[12 & 16]
17	Mast cell stabilizing action, Provide protection from aspirin-induced ulcers (rat) and has broncho protective activity in guinea-pigs	Leaves extract	[9]
18	Pulmonary affections	Leaves	[16 & 17]
19	Cough, asthma and haemoptysis	Leaves powder + <i>Adhatoda vasica</i> juice	[13, 16 & 17]
20	For fever, bronchitis, hypoglycaemia, haemoptysis, asthma and inflammatory conditions	Plant leaves	[5-7]
21	Tonic	Leaves	[12-16]

22	Tonic in parturition	Leaves Juice	[11, 13 & 17]
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It is used as a tonic for bronchitis, haemoptysis, asthma, inflammatory conditions, fever and hypoglycaemia^[5-7]. It is also reported as expectorant, astringent, carminative, tonic, antiperiodic, antispasmodic and stomachic^[3]. Leaves of *A. pindrow* have verified analgesic, antiulcerogenic, anti-inflammatory and hypnotic action in rats, attenuated stress of swim in mice and hypotension in dogs^[8-9]. Leaves extract of *A. pindrow* were also give mast cell stabilizing deed, provide protection from aspirin-induced ulcers (rats) and in guinea-pigs offer bronchoprotective activity in opposition to histamine challenge^[10]. *A. pindrow* leaves are in use as an Ayurvedic therapy for respiratory, hypoglycaemic, inflammatory conditions and fever^[5]. It also has utilization in diverse clinical conditions like haemoptysis, asthma fever and bronchitis in Indian scheme of remediation^[6]. In Ayurvedic formulation the leaves form a significant component used in oral contraceptive^[1]. Some Basic uses of *Abies pindrow* in literature are summarized in Table.1

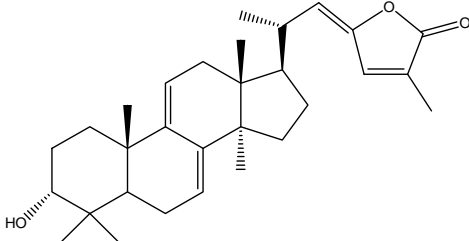
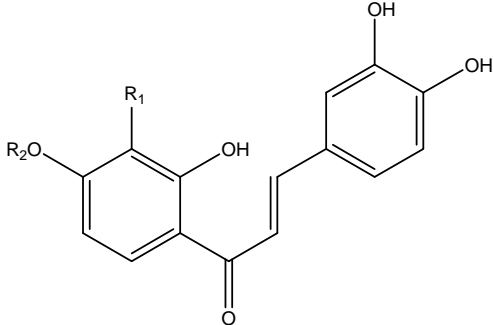
Abies pindrow Phytochemistry

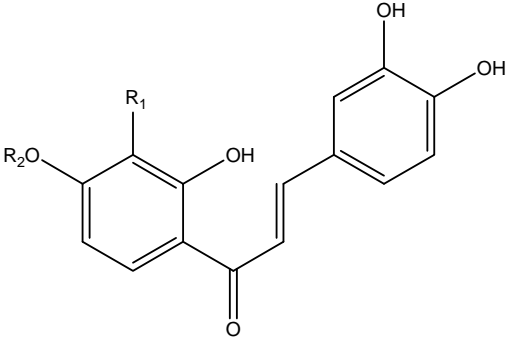
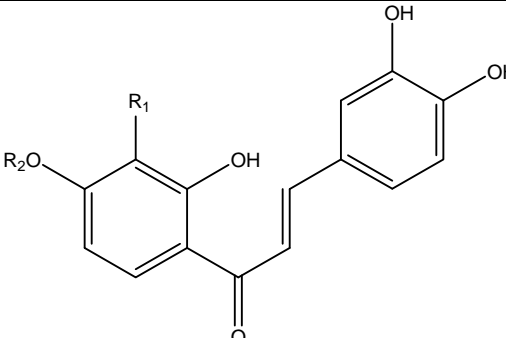
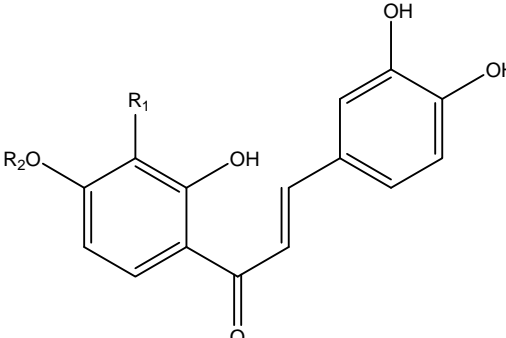
Tiwari and Minocha^[20] reported that ethanol extract of *A. pindrow* dried stem has phytochemical like hydroxyl-flavanone, Glucopyranoside and chalcone glycoside, whereas, leaves were investigated to have bioflavonoids, flavonoids, pindrolactone, pentacyclic triterpenoids, phenolic compounds, pinitol^[6, 21-23] Maltol which is heterocyclic scent complex^[24] and carbohydrates were also reported as a component of *Abies pindrow*. Pharmaceutical and therapeutic values of *A. pindrow* were confirmed by delving deep into phytochemistry and

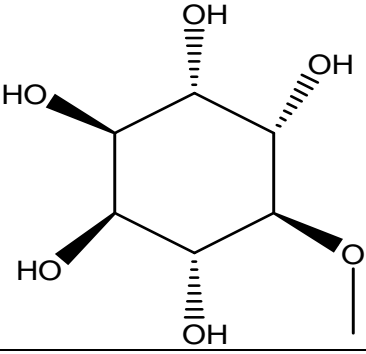
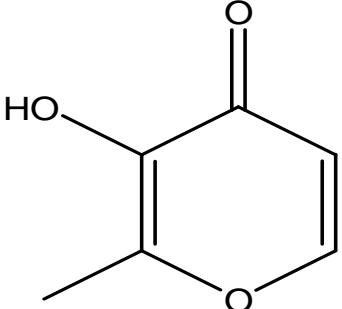
antioxidant study plant parts.

Burdi *et al.*,^[3] by GC-MS procedure revealed that eleven fatty acids ranging from C14-C24 among them 8 saturated and 3 unsaturated fatty acids were present in *Abies pindrow* leaves. The quantity of fatty acids was much superior to unsaturated ones. The percentage of saturated fatty acids was in greater fraction (36.06%) than unsaturated acids which had only 20.08%. Isopalmitic acid (16.33%) was the most prominent saturated fatty acid but the Oleic acid (14.46%) was the principal unsaturated acid. Respectively, (+)-14-Methyl palmitic acid and (+)-Isosteric acid ((5.79%, 5.44%) were the next privileged saturated and unsaturated fatty acids (Table 2). Similarly, like fatty acids saturated hydrocarbons (95.6%) were present in much greater amount than unsaturated hydrocarbons (2.2%) while, two percent hydrocarbons were unidentified in *Abies pindrow* plants^[24]. The most important hydrocarbons were heneicosane, tetracosane, octadecane, Tricosane, docosane, eicosane, and nonadecane while, 1-octadecene and 1-docosene, as the chief unsaturated hydrocarbons. The other elevated saturated hydrocarbons were 0.6% of 2,6,10,14-tetramethylhexadecane and 0.8% of Heptadecane. The predominant hydrocarbons are 41.2% of tricosane and 23.8% of eicosane^[24]. diterpenoid alkane is Phytane-(2,6,10,14-tetramethylhexadecane), which constitute 0.6% of *Abies pindrow*. Due to its structural affiliation with steroids and terpenes and its constant isoprenoid unit characteristics, it is used as natural marker in chemistry of outer space material and organic geochemistry.

Table 2: Representation of phytochemical compounds of *Abies pindrow* with their structure.

No	Class of compounds	Constituents names	Structure	References
1	Triterpenoid (pindrolactone)	lanosta-7,9(11)-dienes		[22 & 23]
2	Flavonoids. (chalcones)	Okanin	 R ₁ =OH R ₂ =H	[20]

3	Flavonoids. (chalcones)	Okainin-4'-O-b-d-glucopyranoside	 <p>R₁=OH R₂=Glc</p>	[20]
4	Flavonoids. (Chalcones)	Butein-4'-O-b-d-glucopyranoside	 <p>R₁=H R₂=Glc</p>	[20]
5	Flavonoids. (chalcones)	2',3',4',3,4-Pentahydroxychalcone-4'-(1-arabinofuranosyl)-14-b-d-glucopyranoside	 <p>R₁=OH R₂=Ara-(1→4)-Glc</p>	[20]
6	Carbohydrates	Tricosane (41.2%) Eicosane (23.8%) Heneicosane (11.5%) Docosane (6.2%) Tetracosane (5.6%) Nonadecane (3.1%) Octadecane (2.8%) 1-Docosene (1.4%) Heptadecane (0.8) 1-Octadecene (0.8%) 2,6,10,14-Tetramethylhexadecane (0.6%)	-----	[24]
7	Fatty acids	<i>n</i> -Tetradecanoic acid, 14-methyl-Pentadecanoic acid, <i>n</i> -Pentadecanoic acid, 14-Methyl-hexadecanoic acid, 16-Methyl-heptadecanoic acid, <i>Cis</i> -9 Octadecenoic acid, 5,9 Octadecadienoic	-----	[3]

		acid, Cyclopentane Undecenoic acid, 17- Methyl-octadecanoic acid, Docosanoic acid Tetracosic acid,		
8	Other (+)-pinitol			[10]
	Maltol (heterocyclic aroma compound having Food additive flavor and antioxidant property)	3-hydroxy-2-methyl- 4H-pyran-4-one C ₆ H ₆ O ₃		[24]

Abies pindrow Pharmacological actions

Abies plant has too many diverse pharmacological actions which are proved by number of different scientists. Singh *et al.*,^[8] stated that leaves extract of *Abies* lot of analgesic, anti-inflammatory, hypotension, antiulcerogenic effect in rats and dogs. The *Abies* plants are useful in the treatment of aspirin induced ulcer in rats and bronchospasm effect dissimilar animal models^[9].

Chemical analysis of *Abies* extracts confirmed the occurrence of polar substances like flavonoids and terpenoids in acetone/ethanol extracts which are useful in acute inflammation, whereas, steroids/glycoside which are effective against chronic inflammation are non-polar components and these are present in petroleum ether/benzene extracts^[21]. Prostaglandins, mucus secretion and blood flow is rapidly increased by flavonoids. Similarly, other extracts (Petroleum ether extract, acetone extract, chloroform extract, ethanol extract and benzene extract) of *Abies* also showed considerable analgesic outcome in rat, give anti-depressant action, ulcers shielding upshot in cold stress. But on other side ethanol extract cause potentiate immobility due to the absence of anti-depressant effect^[8].

Studies of Gupta *et al.*,^[25] showed that *Abies pindrow* leaves have antioxidants, for example, acetone extract contain high quantity of phenol and flavinoid contents but methanol extract has more antioxidant activity.

Conclusions

From the above data it is cleared that due to the presence of large number of chemical compounds in *Abies pindrow*, it has many important applications in pharmacology and

ethnobotany. Leaves, bark and gums of the *Abies* are very important from pharmacological point of view.

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