

Comparative study of *Abies pindrow*, *Aloe barbadensis*, *Bixa orellana* and *Hibiscus rosa*.

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ABSTRACT :-

Abies pindrow, the pindrow fir or west Himalayan fir, could be a fir local to the western Himalaya and adjoining mountance, from northeast Afghanistan east through northern Pakistan and India to central Nepal. Aloe Vera infers from the Arabic word "alloe" meaning "shining severe substance", while "Vera" in Latin implies "true". 2000 year prior, the greek researchers respected aloe Vera as the all inclusive nostrum. *Bixa orellana*, commonly called annatto or achiote, is an evergreen tropical bush or little tree that's local to tropical parts of Central and South America. *Hibiscus rosa-sinensis*, known colloquially as Chinese hibiscus, China rose, Hawaiian hibiscus, rose mallow and shoeblack plant, may be a species of tropical hibiscus, a blossoming plant within the Hibiscus tribe of the family Malvaceae.

Key word:-*Abies pindrow*, *Aloe barbadensis* (Aloe vera), *Bixa orellana* and *Hibiscus rosa*.

I. INTRODUCTION:- ABIES PINDROW:-

Trees to 60 m tall and 300 cm DBH, typically with a single straight, round trunk, short branches and a narrow, conical crown. Bark first smooth and gray, becoming thick, gray-brown and longitudinally furrowed. Buds globose, large, and resinous. Twigs stiff, pinkish to pale brown, soon fading to pale gray, glabrous, lightly ridged, with circular leaf scars. Leaves spirally arranged but appearing roughly 2-ranked on shade foliage, the upper leaves somewhat shorter than the lower, 3-6 cm × 1.3-2 mm, twisted at base, flattened, grooved and dark green above, with 2 gray stomatal bands below; no stomata on upper surface; apex bifid or emarginate or obtuse, but acute on coning shoots. Pollen cones lateral, numerous, on underside of shoots, 10-15 mm long, yellow- brown when active. Seed cones lateral, erect, on short peduncles, cylindrical with obtuse apex, 10-14 × 5-6 cm, first violet blue, at maturity dark red-brown, with flabellate seed scales 25-35 × 30-40 mm having a slightly striated surface and entire upper

margin; bracts hidden. Seeds 10-12 long with a 15-20 mm brown wing ([Vidakovic 1991](#), [Farjon 2010](#)).

Aloe vera:-

Aloe vera is a natural product that is now a day frequently used in the field of cosmetology. Though there are various indications for its use, controlled trials are needed to determine its real efficacy. The aloe vera plant, its properties, mechanism of action and clinical uses are briefly reviewed in this article.

Bixa orellana:-

Bixa orellana is a perennial, tall shrub that can reach 6–10 m (20–33 ft) high. It bears clusters of 5 cm (2 in) bright white or pink flowers, resembling single wild roses that appear at the tips of the branches. The fruits of the *Bixa orellana* are globular, ovoid capsules arranged in clusters resembling spiky looking red-brown seed pods covered in soft spines. Each capsule, or pod, contains 30–45 cone-shaped seeds covered in a thin waxy blood-red aril. When fully mature, the pod dries, hardens, and splits open, exposing the seeds.

Hibiscus rosa:-

Hibiscus rosa-sinensis is a bushy, evergreen shrub or small tree growing 2.5–5 m (8–16 ft) tall and 1.5–3 m (5–10 ft) wide, with glossy leaves and solitary, brilliant red flowers in summer and autumn. The 5-petaled flowers are 10 cm (4 in) in diameter, with prominent orange-tipped red anthers. The flowers are large, conspicuous, and trumpet-shaped, with five petals and their colors can be white to pink, red, orange, peach, and yellow or purple that are 4–18 cm broad. The flowers from various cultivars and hybrids can be either a single flower or a double flower.

ABIES PINDROW



Synonym: -Abiloelsis carrier, Abies Himalaynesis, Abies Webbina var

Common name: - West Himalayan fir, pindrow fir

Family: - Pinaceae

Biological source :-

Sr.No	Disease	Plant part use
1.	Antidibetic	Plant
2	Anti-inflammatory Analgesics	Leaves
3	Ant periodic	Leaf juice
4	Antispasmodic	Leaves
5	Reamedy of fever	Leaf Powder
6	Asthma	Leaves
7	Bronchitis	Leaves
8	Cough And Bronchitis	Bark Extracts
9	Infants fever	Leaf Extracts
10	Headache	Gum
11	Intoxification	Plant + rose oil
12	Stomachic	Leaves
13	Bladder catarrh	Leaves
14	Cough asthma	Leaves powder
15	Tonic	Leaves

It is used as a tonic for bronchitis, haemoptysis, asthma, inflammatory conditions, fever and hypoglycemia. It is also reported as expectorant, astringent, carminative, tonic, antiperiodic, antispasmodic and stomachic.

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. 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. A. pindrow leaves are in use as an Ayurvedic therapy for respiratory, hypoglycemic, inflammatory conditions and fever. It also has utilization in diverse clinical conditions like haemoptysis, asthma fever and bronchitis in Indian scheme of remediation. In Ayurvedic formulation the leaves form a significant component used in oral contraceptive.

Cultivation & collection:-

Plant materials: The fresh aerial parts (needles and stems) of A. pindrow were collected from Okhalkanda (Nainital) of Uttarakhand India. Botanical authentication of the plant materials was carried out at taxonomy department of CIMAP Research Centre Pantnagar by one of the authors (Dr. Amit Chauhan). The herbarium specimen of the plant has been retained in the department.

Extraction of essential oils: Freshly harvested samples (needle and stem, 100 g each) were hydrodistilled separately in a Clevenger apparatus for 3 h for extraction of essential oil. The oils were collected, measured, dehydrated by anhydrous sodium sulfate (Na₂SO₄) and stored in amber vials in a cool and dark place prior to analysis. The extraction yield was calculated in mL of oil per 100 g of aerial parts on a fresh weight basis.

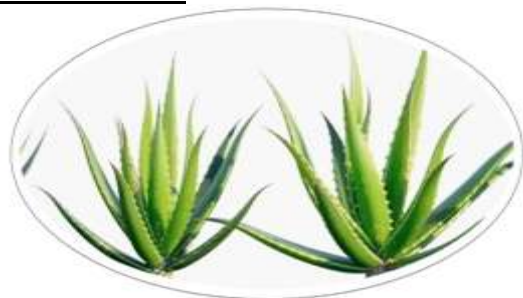
Chemical constituents :-

Sr.no	Class compounds	Constituted Name
1	Triterpenoid	Ianosta-7,9(11)-dienes
2	Flavonoids	Okanin
3	Carbohydrate	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%)
4	Fatty acids	n-Tetradecanoic acid, 14- methylPentadecanoic acid, n-Pentadecanoic acid, 14-Methylhexadecanoic acid, 16- Methylheptadecanoic acid, Cis-9 Octadecenoic acid, 5,9 Octadecadienoic acid, Cyclopentane Undecenoic acid, 17- Methyl-octadecanoic acid, Docosanoic acid Tetracosic acid,
5	Maltol (heterocyclic aromatic compound having Food additive flavor and antioxidant property)	3-hydroxy-2-methyl-4H-pyran-4-one C ₆ H ₆ O ₃

Pharmacological uses:-

- The pindrow fir is used to a small extent for timber in its native range. It is occasionally grown as an ornamental tree in large gardens in Western Europe, but demands high humidity and rainfall to grow well.
- The name pindrow derives from the tree's name in Nepali.
- It is used as a tonic for bronchitis, haemoptysis, asthma, inflammatory conditions, fever and hypoglycaemia.
- It is also reported as expectorant, astringent, carminative, tonic, antiperiodic, antispasmodic and stomachic.

Aloe barbadensis



Synonym: - Aloe, musabbar, Aloe indica Royle

Common name: - Barbados aloe **Family:** - Asphodelaceae

Biological source:-

- Aloes is obtained from the dried juice of the leaves of
- Aloe barbadensis Miller, known as Curacao aloes, (Aloe Vera).
- Aloe perryi Baker, known as Socotrine aloes.

Aloe ferox Miller and hybrids of this species with Aloe africana Miller and Aloe spicata Baker, known as Cape aloes, belonging to family Liliaceous.

Cultivation & collection:-

Aloes' thick, tapered, green, spiny leaves grow from a short stalk near ground level. Aloe is closely related to other members of the Lily family such as onions, leeks, garlic, tulips, turnips and asparagus. Though, Aloe is native to North Africa and Spain, the plant is now also grown in the hot dry regions of Asia, Europe and America. Aloe plant survives for more than 7 years without water.

It takes the water it needs for survival and growth from dew collected on the surface of its leaves. It Repel attacking insects, rodents, snakes by means of the bitter Aloin (the yellow colored part of the sap) just beneath the rind. It is a perennial plant, growing to the height of 1½ - 2½

ft. Its leaves are long and thick, juicy with a wheel like phylotaxy. The two sides of the leaves have thorny structure with a thorny tip. The inner substance of the leaves is jelly like, with bad odour and bitter in taste.

The plant will have fully mature leaves in 3 years. Each plant usually has 12-16 leaves that, when mature may weigh up to 3 pounds.

Chemical constituents:-

- Anthracene glycosides (11 to 40%).
- Barbaloin or Aloin, a C glycoside (not easily hydrolysable with dil. Acids and linkage between the sugar and the aglycone is through C-C).
- Isobarbaloin, aloe-emodin and aloesone.
- Aloinosides A and B (only in Cape aloes).
- Resins (resinotannol +cinnamic acid or coumaric acid).
- Also contains Aloetic acid, homonataloin etc.

Pharmacological uses:-

- Purgative
- Laxative
- Used for Ulcers and burns
- Aloe found many uses in cosmetics nowadays like,
- Hair conditioner
- Hand and body lotion
- Moisture base cleanser
- Shampoo and face wash

Bixa orellana



Synonyms: - *Bixa katagensis* Delpierre

Common name: - Annatto **Family:** - Bixaceae

Biological source:-

According to Correa, seeds urucum supplies seeds that have been used as a condiment as well as laxative, cardiogenic, hypertensive, expectorant, and antibiotic. In addition, it has anti-inflammatory activity for bruises and wounds and

has been used for the treatment of bronchitis and for wound healing purposes. Oil is also obtained from this plant. The infusion of the leaves has been shown to be effective against bronchitis, sore throat, and eye inflammation.

The pulp, which includes the seed, is used for soft drinks and febrifuge. Moreover, it can provide valuable dyeing materials such as yellow (orellina) and red (bixin) substances, with the latter constituting a crystallized active ingredient. In the food industry, it is used to color butter, margarine, mayonnaise, sauces, mustard, sausage, soup, juice, ice cream, bakery products, macaroni, and cheese, where it is commonly called "do reinge (of the kingdom), coming from Holland.

It is widely used in the printing industry and due manufacturing Many product. The number of seeds per capsule varies according to the author: Alonso found that each bivalvar capsule may contain from 30 to 60 seeds, on average. The seeds are considered the plant part of commercial importance, since the pericarp (layer that surrounds the seeds) contains the pigments that have wide industrial application. About 80% of this pigment is the carotenoid known as bixin, which has the dye property and can be extracted with vegetable oils or chemical bases. Depending on the cultivar and climatic conditions of the region, the bixin content can vary from 1 to 6% in the seed aril. The remainder is composed of other dyes and inert substances.

Cultivation & collection:-

Annatto is shade-intolerant and must have disturbance or a broken forest canopy to become established. All the naturally growing annatto shrubs in Puerto Rico are found on neglected or abandoned farmland, some of which has grown up to early secondary forest. Rainfall ranges from 1000 mm to 3000 mm per year in areas where the species grows naturally or under cultivation.

Soils with textures from sands to clays are colonized. The species tolerates relatively low base saturation and moderate compaction. Annatto is vulnerable to overtopping and smothering by trees, shrubs, vines, and grass. Plants that have become overtopped and shaded cease to flower and bear fruit. The species is frost sensitive (von Carlowitz 1991).

Scarification was reported to improve germination of fresh seeds in another study. Mechanical scarification proved superior to acid or hot water treatments (Amaral and others 1995). Air-dry fruits collected in Puerto Rico weighed an

average of 1.701 + 0.078 g. Seeds from that collection averaged 0.029 + 0.008 g/seed or 35,000 seeds/kg. Of these seeds that received no peregrination treatment, 60 percent germinated between 11 and 110 days after sowing. The resulting plants were ready to prick out (10 cm in height) about 3 months after germination. Success in air layering of shoots ranged from 93 to 100 percent except when sawdust was used as substrate (7 percent) (Barbosa e Silva and others 1993). Stem cuttings rooted (up to 60 percent) when treated with IAA or IBA.

Chemical constituents:-

Currently, more than two dozen substances have been isolated from the seeds of *Bixa orellana*. Besides bixin and norbixin, other compounds such as isobixin, beta carotene, cryptoxanthin, lutein, zeaxanthin, orellin, bixein, bixol, crocetin, ishwarane, ellagic acid, salicylic acid, threonine, tomentosic acid, tryptophan, and phenylalanine have been found in the seeds of annatto.

In addition, the following compounds, in their respective concentrations, are found in these seeds: 40 to 45% cellulose, 3.5 to 5.5% sugars, 0.3 to 0.9% essential oils, 3% fixed oils, 1.0 to 4.5% pigments, and 13 to 16% proteins and alpha and beta-carotene, as well as tannins and saponins. Mercadante et al. Isolated eight apocarotenoids from annatto seeds: methyl (7Z, 9Z, 9'Z)-apo-6' lycopenoate, methyl (9Z)-apo-8' lycopenoate, methyl 1(all-E)-apo-8'-lycopenoate, methyl (all-E)-8-apo-beta carotene-8'-oate, methyl (all-E)-apo-6'-lycopenoate, 6 geranylgeranyl-8'-methyl-6,8'diapocaroten-6-8'dioate, 6'-geranylgeranyl-6'-methyl-(9Z)-6,6'-diapocaroten-6-6' dioate, and 6-geranylgeranyl-6'-methyl-6-6' diapocaroten-6-6'-dioate.

More than 100 volatile compounds have been detected in aqueous and organic extracts, where 50 of these have already been identified (e.g., bornyl acetate, x caryophyllene, copaene, a-cubebene, (+)-cyclosativene, geranyl phenylacetate, 1-heptanetriol, 3-methylpyridine, 4-methylpyridine γ -elemene, β -humulene, isodene, β pinene, seline-6-en-4-ol, 6-selinene, (-)-spathulenol, and (+)-ylangene). Because annatto is a rich source of carotenoids it is of great commercial importance. In fact, the therapeutic properties of annatto (e.g., antioxidant and hypoglycemic) have been attributed to its high levels of carotenoids.

Pharmacological uses :-

- Brazil is the world's largest exporter (Katzer 1999). Not only was the dye used anciently to color food, but also to dye cloth and paint the skin (which is still done today).
- The species is also planted as an ornamental, particularly the varieties with bright pink pods. Branches with the dry pods are used in dry floral arrangements (Warren 1997).
- Bees collect nectar from its flowers to make honey. The wood is lightweight (specific gravity 0.4), weak, and not durable. It was used in former times to start fires by friction. Ropes and twine were made from the fibrous bark (Little and others 1974).
- The pulp surrounding the seeds is widely used in herbal medicine to treat burns, bleeding, dysentery, gonorrhea, constipation, and fever (Parrotta 2001).
- Extracts of leaves, bark, and roots are reported to be antidotes for poisoning from *Manihot esculenta* Crantz, *Jatropha curcas* L., and *Hura crepitans* L. (Liogier 1990).

Hibiscus Rosa



Synonym: - Chinese Hibiscus, China Rose

Common name: - Hibiscus rosa-sinensis **Family:** - Malvaceae-mallows, mauves

Biological source:-
In medicine, the red flowered variety was preferred. Roots and leaves, were anodyne and emmenagogue. They were used to regulate menstruation and stimulate blood circulation. Leaves were also used as abortifacient and to stimulate expulsion of placenta after childbirth. Flowers were used for regulation of menstrual cycle, for liver disorders, high blood pressure as antitussive, in stomach pain, for eye problems, as abortifacient and as an aphrodisiac. Young leaves and flowers were used in headache.

Decoction of leaves, root Chemical constituents, pharmacological effects and therapeutic importance of Hibiscus rosa-. 102 and fruits were helpful in treatments of arthritis, boils

and coughs. Fruits were employed externally in cases of sprains, wounds and ulcers. The leaves of *Hibiscus rosa-sinensis* were used for the treatment of dysentery and diarrhea, to promote draining of abscesses and as analgesic in the traditional medicine of Cook Islands, Haiti, Japan and Mexico. Flowers of the plant were used in diabetes, epilepsy, bronchial catarrh and leprosy.

The physicochemical parameters of the root extract: loss on drying 0.53%; ash values: total ash 7.75%, acid insoluble ash 0.75% and water soluble ash 6.32%; extractive values (chloroform soluble extractive 2.80%, water soluble extractive 5.30%, carbinol soluble extractive 15.60%, ethanol soluble extractive 2.60% and petroleum ether soluble extractive 1.45%) and swelling Index 2.5%

Cultivation & collection:-

The probable origin of the plant was tropical Asia. It was cultivated in China, Japan and the Pacific islands for an equally long time, it was generally thought that it was originated in South China. The plant with deep-red flowers is believed to have an Asian origin, hence the name *rosa-sinensis* meaning 'rose of China'. Now it is widely cultivated.

Chemical constituents:-

The preliminary phytochemical analysis showed that *Hibiscus rosa-sinensis* contained tannins, anthraquinones, quinines, phenols, flavanoides, alkaloids, terpenoids, saponins, cardiac glycosides, protein, free amino acids, carbohydrates, reducing sugars, mucilage, essential oils and steroids. *Hibiscus rosa-sinensis* contained cyclopropanoids, methyl stercolate, methyl-2-hydroxy stercolate, 2-hydroxystercolate, malvalate and beta-sitosterol. The major anthocyanin in the flower was cyanidin 3-sophoroside.

Quantitative phytochemical evaluation of the flowers of *Hibiscus rosa-sinensis* revealed that the amount of flavonoids was 0.171 mg/g, total phenolics 0.092 mg/g, tannins 0.073 mg/g, carbohydrates 0.356 mg/g, protein 0.247 mg/g, thiamine 0.072 mg/g, niacin 0.075 mg/g, ascorbic acid 0.0339 mg/g, riboflavin 0.087 mg/g, calcium 0.0127%, phosphorus 0.4113% and iron 0.771%.

The flower extract of *Hibiscus rosa-sinensis* (Red) contained 0.678±0.14% phenols, 0.51±0.16 % alkaloids and 7.5±0.20 % tannins. While, the flower extract of *Hibiscus rosa-sinensis* (White) contained 0.680±0.11% phenols, 0.50±0.18 % alkaloids and 8.9±0.21 % tannins, and the flower extract of *Hibiscus rosa-sinensis*

(Yellow) contained 0.678±0.16% phenols, 0.48±0.16 % alkaloids and 8.5±0.20% tannins.

Total phenolic contents of leaves and flowers of *Hibiscus rosa-sinensis* were: 301 ± 21 and 735±46 mg gallic acid equivalent /100g respectively, ascorbic acid equivalent antioxidant capacity (AEAC) of the leaves and flowers were 96 ± 35 and 640 ± 56 mg ascorbic acid /100g respectively, total anthocyanin content (TAC) in the flowers was 284 ± 17 mg cyanidin-3-glucoside equivalent/100g, and ferric-reducing power (FRP) of flowers was 4.0 ± 0.3 mg gallic acid equivalent /100g. The flowers contained four types of flavonoids; rutin, quercetin, kaempferol and myricetin, their contents in methanol extract were 4104.0, 7.6, 361.9 and 50.7 µg/g respectively.

The flowers also contained substantial quantities of proanthocyanidins and anthocyanins. Many compounds were isolated from the flowers included cyclopeptide alkaloids, vitamins, thiamine, riboflavin, niacin and ascorbic acid. Crushed red and magenta flower varieties yield dark-purplish dye, anthocyanin pigment and cyanidin diglucoside, while many flavanoids and cyanidin compounds (quercetin-3-diglucoside, quercetin 3,7-diglucoside, kaempferol-3-xylosylglucoside, cyanidin-3,5-diglucoside and cyanidin-3-sophoroside-5-galucoside) were isolated from other varieties.

Fresh flowers of *Hibiscus rosa-sinensis* gave 0.30 - 0.50 v/w % essential oils. Many constituents were identified in the essential oils included: 1-iodoundecane: 50.568%, neopentane: 7.641%, 2,2,4-trimethyl 3-pentanone: 1.556%, 1,2-benzenedicarboxylic acid isodecyl octyl ester: 11.056%, 2-cyclopentylethanol: 2.404%, 2-propeonic acid, 1-4 butanediyl ester: 1.543%, 2-propenamide: 1.543%, 1-tetrazol-2-ylethanone: 3.993%, 4-trifluoroacetoxyoctane: 1.480% and amyl nitrite: 3.993%.

Methanol and ethanol extract of *Hibiscus rosa-sinensis* showed total phenolics 61.45 ± 3.23 and 59.31 ± 4.31 mg/100g as gallic acid equivalent, total flavonoids 53.28 ± 1.93 and 32.25±1.21 mg/100g as catechine equivalent, respectively.

The extracted mucilage was slightly soluble in water and a dispersion of it yielded a brown, slimy solution and it was practically insoluble in ethanol, acetone and chloroform. A 1% w/v suspension of *Hibiscus* mucilage in water gave a pH of 6.5. Mucilage of *Hibiscus rosa-sinensis* contained L-rhamnose, D-galactose, D-galactouronic acid, and D-glucuronic acid.

The metals in decoction of *Hibiscus rosa-sinensis* leaves were determined by atomic absorption spectrophotometer, they were included: Sodium 129.6 - 344.2, Potassium 612.9 - 787.2, Calcium 748.3 - 907.5, Magnesium 574.8 - 877.9, Iron 1.16 - 2.53, Zinc 1.32 - 1.92, Cobalt 1.25 - 1.68, Manganese 0.147 - 0.188, Chromium 0.142 - 0.164, Nickel 0.244 - 0.496, Copper 0.107 - 0.129, Lead 0.087 - 0.122, Cadmium 0.058 - 0.064, Barium 1.67 - 2.45 and Aluminum 0.299 - 0.472 mg/100g. 8-Nonynoic and 9- decynoic acids and their methyl esters were isolated from stem bark . Carotene and taraxeryl acetate and p-sit sterol were isolated from leaves and stem bark of the plant.

Pharmacological uses:-

- In medicine, the red flowered variety was preferred. Roots and leaves, were anodyne and emmenagogue.
- They were used to regulate menstruation and stimulate blood circulation. Leaves were also used as abortifacient and to stimulate expulsion of placenta after childbirth.
- Flowers were used for regulation of menstrual cycle, for liver disorders, high blood pressure as antitussive, in stomach pain, for eye problems, as abortifacient and as an aphrodisiac.
- Young leaves and flowers were used in headache. Decoction of leaves, root and fruits were helpful in treatments of arthritis, boils and coughs.
- Fruits were employed externally in cases of sprains, wounds and ulcers.
- The leaves of *Hibiscus rosa-sinensis* were used for the treatment of dysentery and diarrhea, to promote draining of abscesses and as analgesic in the traditional medicine of Cook Islands, Haiti, Japan and Mexico.
- Flowers of the plant were used in diabetes, epilepsy, bronchial catarrh and leprosy.
- The flowers have been reported in the ancient Indian medicinal literature with beneficial effects in heart diseases.
- They were refrigerant, emollient, demulcent, aphrodisiac and emmenagogue.
- Petals were used to stimulate thicker hair growth and to prevent premature graying, hair loss and scalp disorders.
- It considered as a natural emollient hair conditioner and was used in hair washes, treatments and vinegar rinses for the hair.
- Parts used: Whole plant.

II. CONCLUSION:-

The current review discussed the synonym, common name, family biological source, chemical constituents, pharmacological uses and of *Abies pindrow*, *Aloe barbandesis*, *Bixa orellana*, and *Hibiscus rosa-sinensis* as a promising medicinal plant with wide range of pharmacological activities which could be utilized in several medical applications because of its effectiveness and safety.

REFERENCES :-

- [1]. https://en.wikipedia.org/wiki/Abies_pindrow
- [2]. Journal of Pharmacognosy and Phytochemistry 2013; 2 (4): 182-187
- [3]. SIR-Central Institute of Medicinal and Aromatic Plants (CIMAP), Research Center, Pantnagar- 263 149, Uttarakhand, India 2
- [4]. CSIR-Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow-226 015, Uttar Pradesh, India
- [5]. https://en.wikipedia.org/wiki/Aloe_vera
- [6]. Slide share of aloes mahesha.k shree siddaganga college of pharmacy tumkur (<https://www.slideshare.net/MaheshK148/aloee-aloevera>)
- [7]. https://en.wikipedia.org/wiki/Bixa_orellana
- [8]. John K. Francis, Research Forester, U.S.Department of Agriculture, Forest Service, International Institute of Tropical Forestry, Jardín
- [9]. <https://www.hindawi.com/journals/tswj/2014/857292/>.
- [10]. https://en.wikipedia.org/wiki/Hibiscus_rosa-sinensis
- [11]. Chemical constituents, pharmacological effects and therapeutic importance of *Hibiscus rosa-sinensis*- A review Prof Dr Ali Esmail Al-Snafi Department of Pharmacology, College of Medicine, University of Thi qar, Iraq.