International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 1 Jan-Feb 2023, pp: 1583-1590 www.ijprajournal.com ISSN: 2249-7781

A review of phytochemical constituents and pharmacological activity of thuja species

Chaudhari Shubham Rajendra*, Shelke Mayuri, Kesekar Suvarna
Department of pharmacy,vidyaniketan institute of pharmacy and research center,bota, Maharashtra, India

Submitted: 01-02-2023 Accepted: 10-02-2023

ABSTRACT:
Our medical system depends on traditional health services. The primary application of this herb by the locals is in the treatment of different illnesses. Thuja is a part of the family of cupressaceae. This is a traditional Ayurvedic application of medicine. The genus Thuja contains five different species. three from Eastern Asia and two from NorthAmerica. Reisolved genomic studies T. standishii and T. koraiensis, two sister sets and T. plicata, T. ocidentalis, and T. sutchuenensis T. occidentalis is T. sutuenensis's sister. This The use of alternative medicine is growing. Thuja species are generally gaining popularity. Antiviral, antibacterial, antifungal, anti-HIV, anti-cancer, and anti-antidiabetic activity.antiviral effect and Thuja's immunopharmacological activity, as stimulation of cytokines and immune regulation Myeloid cell formation and activation are both increased. having undergone various tests.It contain about 0.6% basic oils, 2.07% dimishing sugar, 4.9% water dissolvable polysaccharides, 2.11% water Solvent minerals, 1.67% free cossosive and 1.31% tannic operators.

KEYWORDS: Thuja, Morpankhi, Phytochemistry, pharmacological Activity

I. INTRODUCTION:

An old Indian philosophy called Ayurveda is recognised as one of the most important systems of alternative and complementary therapies. The majority of treatments are based on regional herbs, just like in other herbal systems. The interest in traditional medicines has greatly increased in recent years. In addition, western nations favour it and are doing several studies on plant-based therapies.[1]

Originally originating in Northwest China, Thuja orientalis is a common ornamental evergreen tree that belongs to the Cupressaceae. It is quite fragrant and resinous.shrub that is abundantly grown in gardens situated in semi-arid and temperate climates Thuja large evergreen shrubs or tiny, robust orientalis medium-sized trees, rarely growing taller than 20 metres nature. It is shaped like a dense pyramid, although frequently demonstrates a more open, spreading form. It chooses soil with good drainage and full light. There is bark. a thin but deep shade of grey with brown accents furrows. The bark has an appealing roughness about it. specifically on mature, big specimens.[2]

Thuja are petite, slender, and distal. The females' tiny, green or purple cones are far shorter than the males' big, reddish or yellowish cones. It is a spacious, humid area with abundant plants and a propensity for budding shrubs.[3]

Thuja is an evergreen tree with a reddish brown crust that can grow to be 10 to 200 feet tall.The needles are often scaly, like in the first year, and the leaves are typically 1 to 10 mm long.Most often, attractive plants are grown. In place of decoupage, the leaves are placed on the branches in four rows, two by two. The blossoms are symmetrical (only a few are male or female, although both genders can be found on the same plant), and the wind cross-pollinated them. Typically, male and female flowers grow on different branches or twigs.[4]

TAXONOMICAL CLASSIFICATION:
Domain: Eukaryota
Kingdom: Plantae
Subkingdom: Viridaeplantae
Phylum: Pinophyta
Subphylum: Euphyllophytina
Infraphylum: Radiatopses
Class: Pinopsida
Order: Pinales
Family: Cupressaceae
Tribe: Spiraeeae
Genus: Thuja
Vernacular Names:
Hindi: Morpankhi.
Marathi: Thuja, Morphankhi
Chinese: Baishu, Xiangbai, Cebai, Bianbai
Italian: Tuiaorientale
Japanese: Konotegashiwa
Spanish: Uya De La China

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 1 Jan-Feb 2023, pp: 1583-1590 www.ijprajournal.com ISSN: 2249-7781

Trade Name: Chinese arborvitae
English: Thuja orientalis, Biota, Tree of life, Book leaf pine.
French: Thuya oriental, ThuyaD'orient, Thuya De Chine
German: Morgenlaendischer Lebensbaum, Chinesiche Thuja, Lebensbaum,
Scientific Synonyms:
Cupressus pendula Thunb.
Platycladus stricta Spach
Thuja acuta Moench
Thuja decora Salisb.
Thuja orientalis L.
The five species of Thuja are-
Thuja koraiensis- Korean Thuja
Thuja occidentalis- Eastern Arborvitae, Northern White cedar
Thuja plicata- Western Red cedar
Thuja standishii- Japanese Thuja
Thuja sutchuenensis- Sichuan Thuja
Thuja koraiensis:

One of the coniferous or evergreen shrubs in the genus Thuja, which is a constituent of the evergreen family, is known by the widespread name "tree of life" (William and Jackson, 1967). Native Americans and early European physicians used thuja leaves, which are rich in vitamin C, to treat scurvy. The leaves are used to treat rheumatism.The plant commonly used to cure warts, the genitalia, and the human papillomavirus (HPV) is referred to as a curiosity. 3 to 10 metres in height.The leaves grow in a flat form with huge, 2 to 4 mm (or up to 15 mm) long leaves that are dark green on top and have dark white waxy stripes on the reverse. Oval, yellow-green, ripe, reddish-brown, and measuring 7-11 mm long by 4-5 mm wide are the cones.[5]


Figure 1: Plant of Thuja Koraiensis

Thuja occidentalis

Thuja occidentalis is most commonly known by the names Northern White Cedar, Thuiercedre, Cedre-Thuya occidental, and Eastern White Cedar.Eastern or American arborvitae White of the North The monoecious conifer cedar grows to a height of About 15 to 38 metres, susceptible to obstruction or prostrate in a cold, harsh environment. occasionally the divided into a few auxiliary stems, the trunk Frequently imitating downed treesThe surface is fibrous, reddish brown or grey, 6 to 9 mm thick, and matted. Eggplant leaves range in size from 1.5 to 3.5 mm. Both surfaces are yellow-green and pointy. Pollen 1-2 ellipsoidal, red, 9–14 mm long blooms brown. [3]


Figure 2: Plant of Thuja Occidentalis

Thuja plicata:

Thuja plicata, a species of Thuja, is also known as a huge arborvitae, a western arborvitae, a Pacific arborvitae, or a western red cedar.or cedar, shinglewoodIt is not authentic in the least. cedar from the Cedrus genus. Among them is Thuja plicata. the largest trees found in the Pacific Northwest. It shares a family tree with western hemlock and Douglas fir. in numerous locations where it grows. It is successful at the range of heights from sea level to a maximum of 2,290 m. Crater Lake in Oregon is about 7,510 feet above sea level. Oregon. Despite progress in wealthy Western red cedar is found in forests and on mountain sides. also a riparian tree, growing in numerous Within its range are stream beds and wooded marshes. The Tree is a covertly open-minded and creative individual. under a dense canopy.[7]

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 1 Jan-Feb 2023, pp: 1583-1590 www.ijprajournal.com ISSN: 2249-7781

Figure 3: Thuja plicata

Thuja standishii:

Japanese thuja, also known as nezuko or kurobe, is a species of thuja. On the islands of Honshu and Shikoku in southern Japan, it can be found close by. It is a medium-sized tree that stands 20–35 metres tall and has a trunk that may reach 1 metre in height. The foliage is arranged in level showers and has narrow, white stomatal clusters beneath scale-like, 2-4 mm long, matte green leaves on top. The cones are round, yellow-green with a reddish-heart center, 6-12 mm long, 4-5 mm wide (expanding to 8 mm wide), and covered in 6-10 scales. It is a prominent lumber tree in Japan, valued for its sturdy, water-resistant, seductively perfumed wood. There is some evidence that focuses on this. biological diversity T standishii. [6]

Figure 4: Plant of Thuja Standishi

Thuja sutchuenensis:

The Sichuan thuja, or Thuja sutchuenensis, is a species of coniferous evergreen tree in the Cupressaceae family of cypresses. It is specific to China, where it is an endemic disease that poses a concern, On the southern level of Chengkou County Mountains of Daba This tree is small to medium-sized. rising up at maybe 20 m tall, yet there are no trees. are currently known to begin at this size.the trees buildings sprinkled with leaves that resemble scales 1.5–4 mm long with a tight white border and a green top. Stomatal clusters beneath Cones are round. oval, naturally shaded green, 5-8 mm 3–4.2 mm in length and broad (opening to 7 mm wide), with scales ranging from 8 to 10.[8]

Figure 5: Plant of Thuja Sutchuenensis

PHYTOCHEMISTRY:

Approximately 0.6% of the plant's essential oil (EO), 2.07% of reducing sugars, 4.9% of polysaccharides, 2.11% of minerals, 1.67% of free acids, and 1.31% of tannins are present in the fresh plant.[9] The preponderance of the monoterpenes found in the EO extracted from fresh leaves are thujone (65%), isothujone (8%), and It contains 2% -pinene, 5% sabinene, and 8% fenchone.Other monoterpenes that have been identified include carvotanacetone, origanol, origanes,myrcene,andcamphene.Furthermore, it has been demonstrated that high-molecular-weight glycoproteins or polysaccharides are especially pertinent for plant action. The dry plant contains between 1.4 and 4% EO, which is made up of the following compounds: borneol, camphene, fenchone, limonene, myricene, -terpine, terpinolene, thujone, and thujyl alcohol. The primary component of the EO made from the dry plant, thujone, which comprises 85% thujone and 15% thujone, is present in amounts ranging from 0.76 to 2.4%. The dry plant also contains coumarins, which are symbolized by p-coumaric acid.[10,11,12]

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 1 Jan-Feb 2023, pp: 1583-1590 www.ijprajournal.com ISSN: 2249-7781

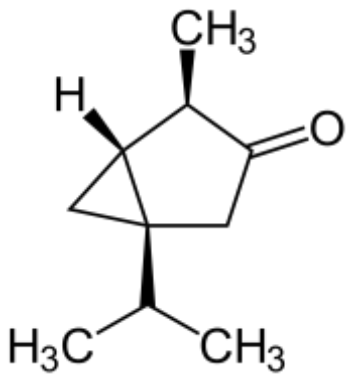

Figure 6: Thujone

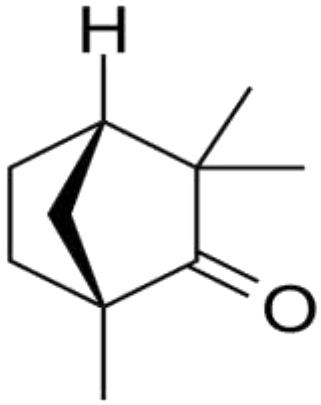

Figure 7: Fenchone

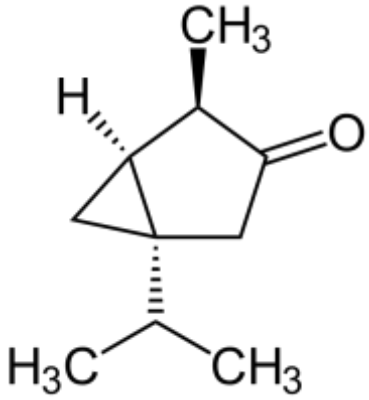

Figure 8: Isothujone

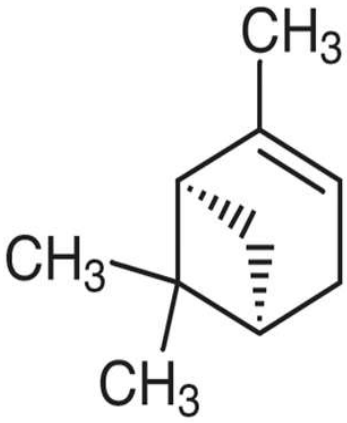

Figure 9: Alpha-Pinene

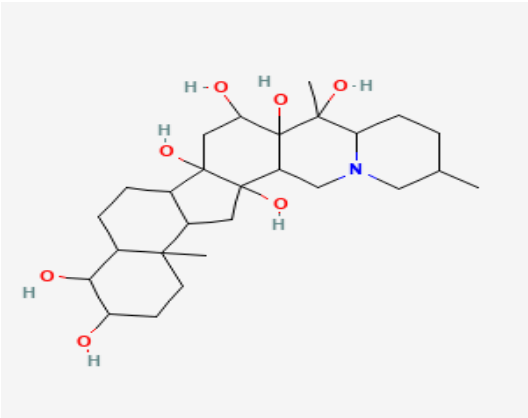

Figure 10: Sabine

Table 1 : The dried Thuja occidentalis herb having following constituents.[3,8]

Sr. No.	Secondary Metabolites	Active Constituents
1.	Flavonoids	Kaempherol Catechine Gallocatechine Alpha-rhamnoside Mearnsitrin Myricitrin Quercetin Quercitrin
2.	Tannins	Catechine Gallocatechine
3.	Coumarins	P-coumaric acid Umbelliferone
4.	Essential oils	Borneal Comphene Fenchone Limonene Alpha – terpene Thujone Terpinolene
5.	Proanthocynides	Procynidine beta-3 Prodelphinidine

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 1 Jan-Feb 2023, pp: 1583-1590 www.ijprajournal.com ISSN: 2249-7781

PHARMACOLOGICAL ACTIVITY:

The biological action of aromatic and therapeutic plants is mostly mediated by mono- and sesquiterpenes, which also include phenols, alcohols, ethers, aldehydes, and ketones. Internal use of Thuja orientalis is used to treat a variety of conditions, including coughs, hemorrhages, heavy periods, bronchitis, asthma, skin infections, mumps, bacterial dysentery, arthritic pains, and premature blandness. The leaves have stomachic, emmenagogue, emollient, expectorant, antipyretic, astringent, diuretic, and emollient properties. [15,16] Their use is supposed to enhance hair growth. The seed is sedative, aperient, and lenitive. It is administered internally to treat geriatric constipation, sleeplessness, neurological disorders, and palpitations. Burns and scalds are treated with bark. The stems are used to cure rheumatism, diarrhea, coughs, colds, and parasitic skin conditions. [17,18,19]

Table 2: Pharmacological Activity with Phytoconstituents-

Sr. No	Pharmacological Acitivity	Species	Plant Part	Mode of action	Phyto chemistry	Ref.
1.	Antimicrobial	T.koraiensis	Leaves	Decrease the activity of gram negative and positive bacteria	Alpha- thujone Gamma-terpinene Terpinolene Methyl hexadecanoate	[21,23]
2.	Antiviral	T.koraiensis	Leaves	Inhibition of HIV 1	Alpha- thujone gamma-terpinene acetate	[21]
3.	Antibacterial	T.occidentalis	Leaves	Decrease the activity of negative and positive bacteria	Thujone 85% alpha thujone 15% beta thujone	[22]
4.	Anticancer	T.occidentalis	Leaves	Increase ROS generation,increase DNA fragmentation	Longifolone Myrtenyl acetate 3-cyclohexidine Beta- pinene Estragole	[23,24, 25, 26]
5.	Anti-HIV	T.occidentalis	Leaves	Inhibited HIV at a concentration of 625 ug/ml	Thujone 85% alpha thujone 15% beta thujone	[27,28]
6.	Gastroprotective	T.occidentalis	Leaves	Anti -ulcer action Regeneration of the gastric epithelium Decrease ulcer index Decrease gastric acid production	Borneal isothujone Camphene Limonene Alpha-thujone Beta- thujone	[32]
7.	Antioxidant	T.occidentalis	Leaves	Increase DPPH,NO ,increase anti-LPO activity	Beta-pinene Limonene Linalool 4-terpinol	[22,27, 28, 29]
8.	Antidiabetics	T.occidentalis	leaves	Improve glucose homeostasis in alloxaninduced diabetes Exhibited significant anti-	Borneal Camphene Limonene Alpha-thujone Beta- thujone	[28]

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 1 Jan-Feb 2023, pp: 1583-1590 www.ijprajournal.com ISSN: 2249-7781

				hyperglycemic activity		
9.	Radioprotective	T.occidentalis	Leaves	Induced activity of TNF-alpha,IL-6 &IL-1 exibit protective action	Thujone 85% alpha thujone 15% beta thujone	[26]
10.	Antiatherosclerosis	T.occidentalis	Leaves	Upregulation of reactive oxygen species induced by DES implantation affects endothelial cells	Alpha- thujone Gamma-terpinene Terpinolene Methyl hexadecanoate	[28]
11.	Sedative	T.occidentalis	Leaves	Suppress the immune response	Thujone 85% alpha thujone 15% beta thujone	[29]
12.	Antifungal	T.occidentalis	Leaves	Inhibitory activity against the fungal causing keratitis	Alpha- thujone Gamma-terpinene Terpinolene Methyl hexadecanoate	[30]
13.	Antipyretic	T.orientalis	Leaves	Reduces the fever & normalized body temperature	Borneal Camphene Limonene Alpha-thujone Beta- thujone	[31]

II. CONCLUSION:

The current literature leads to the conclusion that T orientalis & their substituents has excellent potential against a variety of health issues, including bacterial,fungal, and worm infections.it contain anti-inflammatory, antioxidant, antiviral, insecticidal, nematocidal,and pesticidal properties. it has recently demonstrated antidiabetic properties and liver protective properties.

ACKNOWLEDGEMENT:

The authors are grateful of the department of pharmacy,vidyaniketan institute of pharmacy and research center,bota, Sangamner, Maharastra, India for their support during review work.

REFERENCES:

[1]. Prabuseenivasan S, Jayakumar M, Ignacimuthu S. In vitro antibacterial activity of some plant essential oils. BMC Complement Altern Med 2006;6:39. 21:1199-12

[2]. Sharma PC, Yelne MB and Dennis TJ: Database on medicinal Plants used in Ayurveda. Central Council for Research in Ayurveda and Siddha, Department of ISM and H, Ministry of Health and Family Welfare (Govt. of India), New Delhi, Vol. 2.

[3]. Joseph A Antos, Cosmin N Filipescu, Roderick W Negrave. Ecology of western redcedar (Thuja plicata): Implications for management of a high-value multiple-use resource. Forest Ecology and Management2016;375:211-22.

[4]. Devprakash, Rohan Tembare, Suhas Gurav, Senthil Kumar G.P, T. Tamizh Mani. An Review of Phytochemical Constituents & Phamacological Activity of Plumeria Species. Int J Curr Pharm Res2012;4:1-6.

[5]. Meenu Bhan ―Pharmacognosy and phytochemistry of Thuja occidentalis Linn. Int. J. Adv. Sci 2016;1:6-7

[6]. XueyingGuo et.al ―Chemical constituents of the trunks and roots of Thuja sutchuenensis‖ Fitoterapia 2019;134:264-269.

[7]. Xiao-Wan Zhang, Yeong-Ho Choe, Youn-Jin Park, Byeong-Soo Kim ―Effect of Korean arbor vitae (Thuja koraiensis) extract on antimicrobial and antiviral activity‖ Afr. J. Pharm. Pharmacol2014;8:274-77.

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 1 Jan-Feb 2023, pp: 1583-1590 www.ijprajournal.com ISSN: 2249-7781

[8]. Benjamin A Harlow, Remko Duursma and John D Marshall ―Leaf longevity of western red cedar (Thuja plicata) increases with depth in the canopy‖ Heron Publishing Victoria, Canada2005;25:557-62.
[9]. Harnischfeger, G.; Stolze, H. Bewährte Pflanzendrogen in Wipssenschaft und Medizin; Notamed Verlag: Bad Homburg/Melsungen, Germany, 1983; pp. 250–259.
[10]. 10.Witte, L.; Berlin, J.; Wray, V.; Schubert, W.; Kohl, W.; Höfle, G.; Hammer, J. Monound diterpenes from cell cultures of Thuja occidentalis. Planta Med. 1983, 49, 216–221. [CrossRef]
[11]. Neth, R.; Drize, N.; Gohla, S.; Offergeld, R.; Reski, R.; Schruhm, S. Phytotherapeutische Forschung: Thuja occidentalis L. Z. Allg. 1995, 71, 522–530.
[12]. Naser, B.; Bodinet, C.; Tegtmeier, M.; Lindequist, U. Thuja occidentalis (Arborvitae): A review of its pharmaceutical, pharmacological and clinical properties. Evid. Based Complement. Alternat. Med. 2005, 2, 69–78.
[13]. EMEA-The European Agency for the Evaluation of Medicinal Products. Committee for Veterinary MedicinalProducts-ThujaOccidentalis.Available online: https://www.ema.europa.eu/en/documents/mrl-report/thujaoccidentalis-summary-report-committee-veterinary-medicinal-products_en.p
[14]. Schubert, W. Die Inhaltsstoffe von Thuja Occidentalis. Ph.D. Thesis, TU Braunschweig, Braunschweig, Germany, 1987
[15]. Perry, N. B., Anderson, R. E., Brennan, N. J., Douglas, M. H., Heaney, A. J., McGimpsey, J. A. and Smallfield, B. M. 1999. "Essential Oils from Dalmatian Sage (Salvia officinalis L.): Variations among Individuals, Plant Parts, Seasons, and Sites". J Agric Food Chem 47(5): 2048–2054
[16]. Sokovic M., Glamoclija J., Marin P.D., Brkic D., and van Griensven LJLD. 2010. Antibacterial effects of the essential oils of commonly consumed medicinal herbs using an in vitro model. Molecules 15: 7532 - 7546; doi: 10.3390 / molecules15117532.
[17]. Bown, D. 1995. Encyclopedia of Herbs and their Uses. ISBN-0-7513-020-31.
[18]. Yeung. Him-Che, 1985. Handbook of Chinese Herbs and Formulas. Institute of Chinese medicine, Los Angeles.
[19]. Duke, J. A. and Ayensu (1985). Medicinal plants of China. Reference Publications Inc. Michigan.
[20]. Greenberg, J. H., Mellors, A. & McGowan, J. C. 1978. Molar volume relationships and the specific inhibition of a synaptosomal enzyme by psychoactive cannabinoids. J. Med. Chem., 21: 1208.
[21]. Gohla, S.H.; Zeman, R.A.; Bogel, M.; Jurkiewicz, E.; Schrum, S.; Haubeck, H.D.; Schmitz, H.; Hunsmann, G.; Neth, R.D. Modification of the in vitro replication of the Human Immunodeficiency Virus HIV-1 by TPSg, a Polysaccaride Fraction Isolated from the Cupressaceae Thuja occidentalis L. (Arborvitae). Haematol. Blood Transfus. 1992, 35, 140–149
[22]. Bellili, S.; Aouadhi, C.; Dhifi, W.; Ghazghazi, H.; Jlassi, C.; Sadaka, C.; El Beyrouthy, M.; Maaroufi, A.; Cherif, A.; Mnif, W. The influence of organs on biochemical properties of tunisian Thuja occidentalis essential oils. Symmetry 2018, 10, 649
[23]. Biswas, R.; Mandal, S.K.; Dutta, S.; Bhattacharyya, S.S.; Boujedaini, N.; Khuda-Bukhsh, A.R. Thujone-rich fraction of Thuja occidentalis demonstrates major anti-cancer potentials: Evidences from in vitro studies on A375 cells. Evid. Based Complement. Altern. Med. 2011, 2011, 1–16.
[24]. Torres, A.; Vargas, Y.; Uribe, D.; Carrasco, C.; Torres, C.; Rocha, R.; Oyarzun, C.; Martin, R.S.; Quezada, C. Pro-apoptotic and anti-angiogenic properties of the α/β-thujone fraction from Thuja occidentalis on glioblastoma cells. J. Neurooncol. 2016, 128, 9–19.
[25]. Sunila, E.S.; Hamsa, T.P.; Kuttan, G. Effect of Thuja occidentalis and its polysaccharide on cell-mediated immune responses and cytokine levels of metastatic tumor-bearing animals. Pharm. Biol. 2011, 49, 1065–1073.
[26]. Sunila, E.S.; Kuttan, G. A preliminary study on antimetastatic activity of Thuja

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 1 Jan-Feb 2023, pp: 1583-1590 www.ijprajournal.com ISSN: 2249-7781

occidentalis L. in mice model. Immunopharmacol. Immunotoxicol. 2006, 28, 269–280.

[27]. Nazir, M.Z.; Chandel, S.; Sehgal, A. In vitro screening of antioxidant potential of Thuja occidentalis. J. Chem. Pharm. Sci. 2016, 8, 283–286.

[28]. Dubey, S.K.; Barta, A. Antioxidant activities of Thuja occidentalis Linn. Asian J. Pharm. Clin. Res. 2009, 2, 73–76.

[29]. Yogesh, K.; Ali, J. Antioxidant potential of thuja (Thuja occidentalis) cones and peach (Prunus persia) seeds in raw chicken ground meat during refrigerated (4 ± 1 ◦C) storage. J. Food Sci. Technol. 2014, 51, 1547–1553.

[30]. Asha, R.; Nisha, P.; Suneer, K.; Mythili, A.; Shafeeq Hassan, A.; Panneer Selvam, K.; Manikandan, P.; Shobana, C.S. In vitro activity of various potencies of homeopathic drug Thuja against molds involved in mycotic keratitis. Internat. J. Pharm. Pharm. Sci. 2014, 6, 555–559.

[31]. Aziz, A.; Khan, I.A.; Ahmed, M.B.; Munawar, S.H.; Manzoor, Z.; Bashir, S.; Raza, M.A. Evaluation of antipyretic activity of Thuja occidentalis Linn. in PGE1 and TAB-vaccine induced spyrexia models in rabbits. Int. J. Pharm. Sci. 2014, 4, 481–484

[32]. Das,s;Rani,R.Antioxidant and gastroprotective properties of the fruited of thuja ocidentalis Linn. Asian j.Biochem. pharm .Res.2013,3,80-87