



## Therapeutic value of medicinal plants of Arid zone w.s.r. to Zygophyllaceae family

Gagan deep kour<sup>1</sup>, D. C. Singh<sup>2</sup>, Suresh Chaubey<sup>3</sup>, Ramesh Chandra Tewari<sup>4</sup>

<sup>1</sup>PG Scholar, PG Dept. of Dravyaguna, Rishikul Campus Uttarakhand Ayurveda University, Haridwar.

Email : [saniyar.sethi@gmail.com](mailto:saniyar.sethi@gmail.com) , Contact Number +918439135965

<sup>2</sup>Professor & HOD, PG Dept. of Dravyaguna, Rishikul Campus Uttarakhand Ayurveda University, Haridwar.

<sup>3</sup>Associate Professor, PG Dept. of Dravyaguna, Rishikul Campus Uttarakhand Ayurveda University, Haridwar.

<sup>4</sup>Associate Professor, Dept. of Agadtantra, Rishikul Campus - Uttarakhand Ayurveda University, Haridwar, Uttarakhand, India.

### **ABSTRACT:**

Plants have provided man with all his needs in terms of shelter, clothing, food, flavours and fragrances as not the least, medicines. The plants as medicine are used in different systems of medicine such as in Ayurveda, Allopath, Unani, Homeopathy and even in other systems. Medicinal plants are distributed across diverse habitats and landscape. A large number of medicinally important species are present in the arid zones. Of the total land area in the world, arid zones cover 18.8%. In total, 11.8% of the country is under a hot arid environment. In arid zones, vegetation is typically sparse, and is comprised of perennial and annual grasses, other herbaceous plants, shrubs and small trees. Arid zone of Rajasthan is fortunately gifted with 628 species belonging to 352 genera and 87 families. The prominent families to which the majority of the medicinal plants of the arid zones belong are *Amaryllidaceae*, *Asclepiadaceae*, *Capparidaceae*, *Chenopodiaceae*, *Compositae*, *Cucurbitaceae*, *Labiatae*, *Leguminosae*, *Liliaceae*, *Solanaceae*, *Zygophyllaceae* and *Umbelliferae*. Plants of *Zygophyllaceae* family taken in this paper have high therapeutic value and some important medicinal uses of these plants are mentioned in different Ayurveda Treatise but this traditional medicine needs to be evaluated, given due recognition and developed so as to improve its efficacy, safety, availability and wider application at low cost. Some of the medicinal uses given in Ayurveda Treatise are still in the books only. These uses still need to be evaluated so as to make them more practicable in the present health era. So this paper is an attempt of the author to create greater awareness amongst the people as a whole about the medicinal values of these plants of Arid zone, so that this heritage may be wisely used and conserved and perpetuated through judicious management in Health sector.

**KEY WORDS :** Arid zone, *Zygophyllaceae*, Medicinal plants, *Dhanvyasa*, *Gokshuru*, *Harmala*

### **INTRODUCTION:**

Plants have provided man with all his needs in terms of shelter, clothing, food, flavors and fragrances as not the least, medicines. Plants have formed the basis of sophisticated traditional medicine systems. The plants as medicine are used in different systems of medicine such as in Ayurveda, Allopathy, Unani, Homoeopathy and even in other systems. But the theoretical foundation and the insight and in-depth understanding of the practice of medicine that we find in Ayurveda is much superior among organized ancient system of medicine. Medicinal plants are distributed across diverse habitats and landscape. A large number of medicinally important species are present in the arid zones. Around 70 per cent of India's medicinal plants are found in tropical areas. Although less than 30 per cent of the medicinal plants are found in the temperate, alpine areas and higher altitudes which include species of high medicinal value. Previous studies have showed that a larger percentage of the known medicinal plants occur in the dry and moist deciduous vegetation as

compared to the evergreen or temperate habitats.<sup>1</sup> Of the total land area in the world, arid zones cover 18.8%. In total, 11.8% of the country is under a hot arid environment. Two zones of semi-arid climate are recognized in India, one in the north contiguous with the desert of Thar, extending into Rajasthan, the Punjab and North Gujarat and the other in parts of the Deccan and Madras State in the south.<sup>2</sup>

### **VEGETATION IN ARID ZONE :**

The arid regions of Rajasthan, Gujarat, Punjab and Harayana together constitute the great Indian desert, better known as the Thar Desert. In arid zones, vegetation is typically sparse, and is comprised of perennial and annual grasses, other herbaceous plants, shrubs and small trees. The native plant species have adaptations that enable them to reproduce, grow and survive in the most inhospitable edaphoclimatic conditions. Some plants have evolved special root systems while other have unique leaf characteristics that allow them to withstand prolonged periods of drought. Many woody species simply lose their leaves when soil moisture conditions become too dry. In general, the plant species of arid zones have xeromorphological leaf structures, physiological control of transpiration and metabolism, moisture and nutrient storage organs, and thorns.<sup>3</sup> It is widely accepted that desert horticultural produce are of explicit quality with great nutritional, medicinal, organoleptic, economic and traditional importance.

Arid zone of Rajasthan is fortunately gifted with 628 species belonging to 352 genera and 87 families.<sup>4</sup> Thar Desert is very rich in medicinal plant wealth. The medicinal plants of this region have great potential to be used in drug and pharmaceutical industries.<sup>5</sup> Medicinal plants of arid zones are good source of phytochemicals. However, supply of these plants are becoming difficult due to their limitation in conservation of the environment, technical and economical problems in cultivation and increasing labour costs. The important and common plant species of arid and semi-arid regions belongs to *Salvadora*, *Tribulus*, *Fagonia*, *Zizyphus*, *Balanites*, *Calligonum*, *Acacia*, *Azadirachta*, *Prosopis*, *Euphorbia*, *Eucalyptus* and *Aegle*. These plants can survive in high range in temperature, slight frost and low rain-fall. Their roots penetrate deeply up to ground water level and so they do not compete for water with crop plants.<sup>6</sup>

The prominent families to which the majority of the medicinal plants of the arid zones belong are: Acanthaceae, Amaryllidaceae, Asclepiadaceae, Cactaceae, Capparidaceae, Chenopodiaceae, Compositae, Cucurbitaceae, Labiatae, Leguminosae, Liliaceae, Solanaceae, Solanaceae, Zygophyllaceae and Umbelliferae. This paper is an attempt of the author to give a review on therapeutic uses of plants of Zygophyllaceae family which are mentioned in Ayurveda Treatise and the current research going on these plants.

### **Characteristics of Zygophyllaceae<sup>7,8</sup>:**

- A family of about 22 genera and 285 species; pantropical but extending into temperate regions of both hemispheres. The family is particularly abundant in arid regions of the Mediterranean.
- Annual or perennial herbs, sub-shrubs or shrubs, rarely trees, largely xerophytes or halophytes; branches sometimes jointed at the nodes.
- Leaves opposite, alternate or clustered, stipulate, often fleshy, bifid or pinnate, rarely simple or ternate; lobes usually entire.
- Inflorescences in terminal cymes or flowers in pairs or solitary and axillary. Flowers actinomorphic, bisexual, 4–5-merous. Sepals joined at the base, often imbricate, rarely valvate, persistent. Petals imbricate or contorted. Stamens free, usually 2–3 times as many as the petals, in 1–3 whorls, the outer whorl opposite the petals; filaments often with a scale-like basal appendage; anthers 2-celled, dorsifixed or basifixed, dehiscence latrorse.
- Disc usually present. Carpels 3–5, fused; ovary superior, often angled or winged; placentation axile; ovules pendulous, with more than one per loculus; style simple; stigma capitate or lobed. Fruit a loculicidal capsule, indehiscent nut, schizocarp or, rarely, a drupe, often winged or with thorns. Seed with or without endosperm.

### **1. *Fagonia cretica* Linn. (*Dhanvyasa*):**

A small spiny undershrub with stiff branches often more or less prostrate. Leaves are opposite, 1-3 foliate, about 12 by 2.5mm, entire, linear or elliptic, petiole very variable, 0.3cm long; stipules transformed into sharp slender spines upto 1.2cm long, persistent and continue growing long after the fall of the leaves. Flowers are solitary and rose coloured or pinkish violet in colour, arising from between the stipules. Fruits are 5mm long, of 5 1-seeded cocci.9 (Fig.1)



#### Vernacular names<sup>10</sup> :

Damasa, Damahan (Hindi) ; Dusparsha , Dhanvayaasa, Dhanvayavaasa, Dhanvayaasaka, Duraalabhaa, Samudraantaa. Gaandhaari, Kachhuraa, Anantaa, (*Alhagi pseudalhagi* is used as a substitute for *F. cretica*.)

#### Distribution<sup>11</sup>:

On loose sandy soils in hotter parts and hill-side dunes. It is found in Western India, upper Gangetic plains and Peninsular India, also distributed in western Rajasthan, Punjab and westwards to Afghanistan, in Deccan, west Khandesh, Kutch ; also in Sindh, Waziristan and Baluchistan.

#### Chemical constituents:

The aerial parts contain several triterpenoid saponins which gave sapogenin, nahagenin, oleanolic acid. Aerial parts also gave diterpenes, fagonone and its derivatives, besides flavonoids. The flavonoids, quercetin and kaempferol, isolated from the leaves and flowers. The fruits are rich in ascorbic acid.<sup>10</sup>

#### Ayurvedic Properties<sup>12</sup>:

It is astringent (*Kashaya*), sweet (*Madhura*) and bitter (*Tikta*) in taste (*rasa*); light (*laghu*) and dry (*ruksha*) in properties (*guna*); cold (*sheeta*) in potency (*virya*) and pungent (*Katu*) in metabolic effect (*vipaka*). Due to these properties, it pacify *Kapha* and *Pitta*.

### **MEDICINAL USES :**

#### **Ayurveda Treatise:**

- Dhanvyasa along with other dugs should be added with equal quantity of Chandana and given with sugar and rice wash for curing Raktapitta (bleeding diseases). (C.S. Chi. 4/75)13
- Decoction of Duralabha with other drugs is beneficial in curing Raktarsha (Haemorrhoids) (C.S. Chi. 14/186)14
- Duralabhasava is an important formulation of Dhanvyasa which is beneficial for curing Grahani (Sprue) (C.S. Chi. 15/152-155)15

- Dhuralabha along with Madhu is taken to cure Kaphaja Chhardi (vomiting) (C.S. Chi. 20/38)<sup>16</sup>
- Sushruta prescribes the leaves and twigs in combination with other drugs for the treatment of snake bite.
- Paste of Duralabha root of the size of Udumbara fruit should be taken along with the diet of milk processed with the Duralabha root for curing Diarrhoea. (S.S. U 40/74)<sup>17</sup>
- Juice of Duralabha can be given for retention of urine. (A.H. Chi. 11/37)<sup>18</sup>
- Decoction of Duralabha mixed with Ghee is given to cure Vertigo. (CD 17/8)<sup>19</sup>
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### **Latest Ayurveda Databases<sup>20,21,22</sup>:**

- Plant is bitter, astringent, tonic, febrifuge, prophylactic against small-pox and useful in dropsy, delirium and any disorder which is caused by poisoning.
- It is also useful in cough, fever, asthma, dysentery, skin diseases and as cooling agent.
- Boiled residue of the plant in water is used for abortion.
- Plant has a great reputation as a suppurative in cases of abscesses, scrofulous glands and wounds. The juice of the leaves can be applied as a dressing for open wounds.
- The smoke of the herb or leaves is useful for inhaling in asthmatic condition.
- In general debility, the infusion of the leaves or whole plant can be given.
- Juice of the plant is used for cooling the mouth in stomatitis.
- The infusion is given in itchy affections and conditions of skin irritability. The plant is pounded, mixed with milk and kept for three days and then rubbed all over the body.
- Bark of the plant is used for dermatosis
- Plant ash can be given to children suffering from anaemia.
- The boiled aqueous plant residue is used to induce abortion and used as a topical paste for tumors and swellings of the neck. An aqueous plant decoction is a popular remedy for cancer in the indigenous system of medicine.
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- The plant leaves are used as antifertility.
- The macerated whole plant is used as antispasmodic, whilst the powdered fruits mixtures with sour milk are taken instantly as antipurgative.

### **CURRENT RESEARCH:**

Aqueous extract of *Fagonia cretica* Linn. contain potential anti-cancer agents acting either singly or in combination against breast cancer cell proliferation via DNA damage-induced FOXO3a and p53 expression. It induces DNA Damage, Cell Cycle Arrest and Apoptosis in Breast Cancer Cells via FOXO3a and p53 Expression.<sup>23</sup>

The aqueous extract of the whole plant of *Fagonia cretica* L. possess a significant anti hyperlipidemic effect at the doses of 250 and 500mg/kg body weights. These effects are due to the presence of active constituents which are present in whole plant of *Fagonia cretica* L.<sup>24</sup>

### **2. Tribulus terrestris Linn. (Gokshuru):**

#### **Morphology:**

*Tribulus terrestris* L. (*Zygophyllaceae*) is commonly known as devil's thorn, cat head, puncture vine, goat head and caltrop. It is a herbaceous, annual, prostrate or semierect, diffusely branched herb. Stem and branches are pilose; young parts silky villous. Leaves are opposite, abruptly pinnate, one of each pair usually smaller than the other. Stipules are lanceolate and hairy. Leaflets are 3-6 pairs, 6-12mm. long, slender, oblong, mucronate with appressed hairs beneath and more or less on the upper surface. Flowers are axillary or leaf opposed and solitary. Fruits are globose consisting of 5 hairy or nearly glabrous, woody cocci, each with 2 pairs of hard, sharp spines, one pair longer than the other.<sup>25,26</sup> (Fig. 2)



**Vernacular names<sup>27,28</sup> :**

Gokhm, Kanti, Konti; Chota-gokhru (Hindi); Land-Caltrops and Puncture Vine in English; Gokshura, Gokshuraka, Kshudra (Laghu) Gokharu, Shvadamshtara, Swaadu-kantaka, Triakanta, Triakantaka in Sanskrita. (Larger var. is equated with *Pedaliium murex* Linn. The fruits of both the varieties are conical and have four spines, not three as the synonyms denote. Hence, *Acanthospermum hispidum* DC. And *Martynia annua* Linn. have been suggested as the source of Triakantaka.) *Tribulus terrestris* L. variety is also known as mitha (sweet) gokhru as distinguished from kadva or moto gokhru (*Pedaliium murex*).

Distribution<sup>29</sup> :

On sandy plains or gravelly soil, commonly throughout India.

**Chemical constituents:**

*T. terrestris* contains steroids, saponins, estradiol, flavonoids, alkaloids, unsaturated fatty acids, vitamins, tannins, resins, nitrate potassium, aspartic acid and glutamic acid. The plant contains saponins, which on hydrolysis yield sapogenins—diosgenin, gitogenin, chlorogenin, ruscogenin, 25D-spirosta-3,5 -diene, among others. Flavonoids—rutin, quercetin, kaempferol, kaempferol-3-glucoside and-rutinoside, and tribuloside have been isolated from the leaves and fruits. The seeds contain carboline alkaloids— harmane and harmine. Harmol is also reported from the herb.<sup>30,28</sup>

**Ayurvedic Properties :**

It is sweet (*madhura*) in taste (*rasa*); heavy (*guru*) and ununctuous (*snigdha*) in properties (*guna*); cold (*sheeta*) in potency (*virya*) and sweet (*madhura*) in metabolic effect (*vipaka*). Due to these properties, it pacify *Vata* and *Pitta*.<sup>31</sup>

**MEDICINAL USES :**

**Ayurveda Treatise:**

**Calculi:**

- Roots of Gokshuru, Kokilaksha, Eranda and two types of Brihati are pounded together with milk and dissolved in sweet curd for a week. It breaks calculus. (C.S. Chi. 26/62)<sup>32</sup>
- Ghrita cooked eight times with decoction of Gokshuru and milk should be taken for curing calculi. (C.S. Chi. 26/74)
- Powder of seeds of Gokshuru mixed with honey and taken with sheep milk for a week breaks calculus.<sup>33</sup>

**Haemorrhage:**

- Milk cooked with shatawari and Gokshuru checks haemorrhage particularly urethral. (C.S. Chi. 4/84)<sup>34</sup>
- Milk cooked with Gokshuru and Shatavari checks Haemorrhage. (V.M. 9/18)

### **Dysuria<sup>35</sup>:**

- Gruel prepared with Gokshuru and Kantakari and added with liquid jiggery is useful in Dysuria. (C.S. Su. 2/22)
- Oil cooked with decoction of Gokshuru along with Jaggery, milk and Shunthi should be taken as intake, Anuvasana and Uttaravasti in Dysuria caused by Vata. (S.S. U. 59/19)
- Milk boiled with Gokshuru, Eranda and Shatavari or milk added with ghee and ample jiggery is beneficial in Dysuria. (V.M. 33/9)
- Decoction of Gokshuru seeds mixed with Yavakshara alleviates dysuria, gravels and calculus. (B.P. Chi. 35/33)
- Decoction of whole plant of Gokshuru mixed with sugar and honey alleviates all types of Dysuria and Ushnavata. (B.P. Chi. 36/30)
- Decoction of Gokshuru, varuna and shunthi mixed with honey is an excellent remedy for gravels, calculus and dysuria. (B.P. Chi. 37/51)
- Paste of Gokshuru taken with Coconut water alleviates Dysuria. (V.D. 7/3)

### **Rasayana<sup>36</sup> :**

- One taking powder of Gokshuru, Amlaki and Guduchi with ghee and honey becomes potent, stable, happy, black haired and with full life span. (A.H. U. 39/160)
- Gokshuru rasayana is an important formulation. (A.H. U. 39/56-57)

### **Vajikarana (Aphrodisiac):**

- Gokshuru, Ikshuraka, Shatavari, Kapikachhu, Nagabala and Atibala – this powder taken in night with milk act as a good Aphrodisiac. ( V.M. 70/14)
- Gokshuru alone cooked with milk act as a good aphrodisiac even for the old. (G.N. 3.6/58)<sup>37</sup>

### **Cough:**

- Powder of Gokshuru fruits and Ashwagandha mixed with honey taken with milk alleviates cough. (R.M. 12/3)<sup>35</sup>

### **Aamavata (Rheumatism):**

- Decoction of Shunthi and Gokshuru used regularly in morning digests aama, reduces pain and is thus useful in Rheumatism (Aamavata). (C.D. 25/9)
- Promotes Hair growth:
- Gokshuru and Sesamum flowers are mixed with equal quantity of honey and ghee. This paste applied on head promotes growth of hair. (S.G. 3/11/22)<sup>38</sup>

### **Recent Ayurveda Database<sup>20,21,22</sup>:**

- Fruits are diuretic, tonic, aphrodisiac, useful in urinary discharges and impotency; in the form of infusion useful as a diuretic in gout, kidney diseases and gravel.
- Fruits are demulcent, anti-inflammatory, anabolic, spasmolytic, muscle relaxant, hypotensive, hypoglycaemic and emmenagogue.
- Used in strangury, calculus affections, urolithiasis, crystalluria, urinary discharges, pruritus-ani, as a tonic in sexual inadequacy.
- As a supporting medicine in cough and asthma.
- An infusion of fresh leaves and stem is used as an esteemed remedy for treating Gonorrhoea.
- The juice of the fruits is given in purporeal diseases and for promoting Lochial discharge.
- Leaves are diuretic and haemostatic.
- Root is stomachic and diuretic.
- In addition to all these applications, *The Ayurvedic Pharmacopoeia of India* attributes cardiotonic properties to the root and fruit. A saponin (unidentified) is reported effective for treating angina pectoris in people with coronary heart disease (406 cases were treated). (*NaturalMedicines ComprehensiveDatabase*, 2007.)

- It is used in folk medicine to increase spermatogenesis, for treatment of eye troubles, edema, abdominal distension, leucorrhoea and impotence, as aphrodisiac, galactagogue, antiinflammatory, antidiarrheal and diuretic.

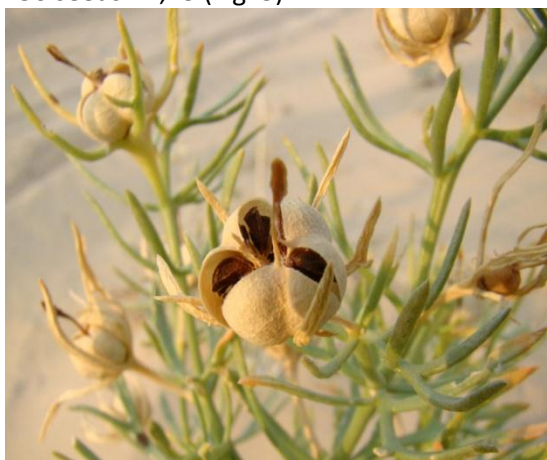
### **CURRENT RESEARCH:**

The researchers have observed that *Tribulus terrestris* has showed significant increase in the number of growing follicles, diameter of mature follicles, endometrial lining cells height and endometrial glands diameter. As concerning the levels of reproductive hormones, although the differences were not significant, but an obvious increase was obtained in FSH and LH and a decrease in estradiol was detected in the study.<sup>39</sup>

Clinical studies have showed that this plant improves reproductive function, including increased concentration of hormones such as estradiol, with testosterone being very slightly influenced, thereby improving reproductive function, libido and ovulation.<sup>40</sup> Diuretic potential of *T. terrestris* has been evaluated in albino rats. The diuretic effect was credited to the presence of potassium salts in high concentration and this action was confirmed of *T. terrestris* with minimal side effect in albino rats. The extract from *T. terrestris* significantly reduce the formation of hydroperoxide, thus implying that this species is powerful natural antioxidants.<sup>41</sup>

### **3. Peganum harmala Linn. (Harmala) :**

Harmala (*Peganum harmala* L. Family Zygophyllaceae) is a perennial, glabrous plant which grows spontaneously in semi-arid conditions, steppe areas and sandy soils, native to eastern Mediterranean region. Plant can grow to about 0.8 m, but normally it is about 0.3 m tall. The roots of the plant can reach a depth of up to 6.1 m, if the soil where it is growing is very dry. It blossoms between June and August in the Northern Hemisphere. The flowers are white and are about 2.5–3.8 cm in diameter. The round seed capsules measure about 1–1.5 cm in diameter, have three chambers and carry more than 50 seeds.<sup>42,43</sup> (Fig. 3)



#### **Vernacular names<sup>20</sup>:**

*Haramal, Isband* in Ayurveda, Wild Rue, Foreign Henna, Syrian Rue in English

#### **Distribution:**

A plant of the mediterranean region found in Northern and North western India but also occurs in Kutch, western Deccan and western Rajasthan; also in Sindh, Baluchistan and Waziristan. Prominent in Indus Valleys from 100-5000m altitude. It is propagated by seeds or cuttings.<sup>44</sup>

#### **Chemical constituents<sup>20</sup> :**

The plant give flavonoids—kaempferol, quercetin and acacetin. Aerial parts and seeds contain alkaloids like harmine, harmaline and harmalol (called harman alkaloids).

#### **Ayurvedic Properties<sup>31</sup>:**

It is bitter (*Tikta*), Pungent (*Katu*) in taste (*rasa*), ; light (*laghu*) and dry (*ruksha*) in properties (*guna*); *ushna* (hot) in potency (*virya*) and pungent (*Katu*) in metabolic effect (*vipaka*). Due to these properties, it alleviates *Pitta*.

The seeds of this plant contain harmala alkaloids which are Monoamine Oxidase inhibitors (MOAI). They have hallucinogenic properties and that is why the plant is a contender for being the Soma of the ancient Persian and Indian shamans who used it to gain a more profound understanding of the meaning of life. The seeds got ripen in September.

### **THERAPEUTIC VALUE :**

#### **Recent Ayurveda Database<sup>20,21</sup>:**

- Decoction of leaves are given in rheumatism.
- Seeds are narcotic, hypnotic, antispasmodic, anodyne and emetic, given in fever, asthma, hiccough, neuralgia, hysteria, dysmenorrhoea and colic; also used as remedy for tapeworm in men. Plant is aphrodisiac, emmenagogue, and abortifacient (properties similar to ergot, savine and rue).
- Plant is effective in the management of laryngitis or the inflammation of the larynx. A decoction of the seeds can be used as a mouthwash.
- A paste of the roots of Harmal plant along with mustard oil should be applied externally for killing head lice.
- Harman alkaloids from the seeds have been suggested for use in nervous diseases, and as coronary dilators and embolic. Harmol exhibits hypertensive activity.
- Harmine, vasicinone, deoxyvasicinone and 8-hydroxy glucosylharmine exhibit antitumour activity.
- The alkaloids, harmine, harmaline and harmol exhibit antibacterial and antifungal activity.
- The aqueous extract of seeds exhibited significant antiviral activity *in vitro* against herpes virus *hominis* type 1, slight activity was also observed against influenza viruses A and B.
- The plant extract exhibits significant analgesic activity.

### **CURRENT RESEARCH:**

#### **Cardiovascular activity:**

*P. harmala* is one of the most frequently used medicinal plants to treat hypertension and cardiac disease worldwide. It has also been shown in various pharmacological studies that *P. harmala* extract or its main active alkaloids, harmine, harmaline, Harman and harmalol, have different cardiovascular effects such as bradycardia, decreasing systemic arterial blood pressure and total peripheral vascular resistance, increasing pulse pressure, peak aortic flow and cardiac contractile force, Vasorelaxant and angiogenic inhibitory effects.<sup>45</sup>

#### **Angiogenic inhibitory effect:**

It was revealed in a study that harmine is a potent angiogenic inhibitor. This substance can significantly decrease the proliferation of vascular endothelial cells and reduce expression of different pro-angiogenic factors such as vascular endothelial growth factor, NO and pro-inflammatory cytokines. Nuclear factor- $\kappa$ B and other transcription factors like cAMP response element-binding (CREB) and Activating transcription factor 2 (ATF-2) involved in angiogenesis were also inhibited by harmine. Moreover, harmine decreased production of other factors by tumor cells, which play a significant role in angiogenesis like cyclooxygenase (COX-2), inducible nitric oxide synthase, and matrix metalloproteases. Harmine inhibits tumour specific neo-vessel formation by regulating VEGF, MMP, TIMP and pro-inflammatory mediators both *in vivo* and *in vitro*.<sup>46</sup>

#### **Abortifacient activity :**

*P. harmala* has been used traditionally as an effective emmenagogue and abortifacient agent in the Middle East, India, and North Africa. It has also been shown that abortion happens frequently among animals that digest this plant in a dry year. Quinazoline alkaloids (e.g., vasicine and vasicinone) within *P. harmala* have been attributed to the abortifacient effect of this plant.<sup>47</sup>



### **TOXICITY<sup>48</sup>:**

- The most common side effects of using *harmal* for medical purposes include weak muscles and hallucinations. It also can cause pregnancy complications. The plant might have a dangerous interaction with other drugs or supplements. Children under the age of 2 and women who are pregnant, nursing or planning to become pregnant are advised not to use it, in most cases.
- There have been also the same symptoms reported in different human cases following ingestions of *P. haramala* seed extract or infusion including: Neuro-sensorial symptoms, visual hallucination, slight elevation of body temperature, cardio-vascular disorder such as bradycardia and low blood pressure, psychomotor agitation, diffuse tremors, ataxia and vomiting.
- *P. haramala* extract is toxic at high-doses and can cause paralysis, liver degeneration, spongiform changes in the central nervous system, euphoria, convulsions, digestive problems (nausea, vomiting), hypothermia and bradycardia.

### **CONCLUSION :**

The arid ecosystem is a rich repository of genetic material of important arid medicinal plant wealth. There is an urgent need to create greater awareness amongst the people as a whole about the medicinal values of these plants, so that this heritage may be wisely used and conserved and perpetuated through judicious management in Health sector. This would ensure eventual conservation of valuable germplasm of medicinal plants. Plants of *Zygophyllaceae* family taken in this paper have high therapeutic value. Some of the medicinal uses given in Ayurveda Treatise are still in the books only. These uses still need to be evaluated, given due recognition and developed so as to make them more practicable in the present health era.

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