

## Urban Development: A Threat to Wild Species of Medicinal and Aromatic Plants

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**Abstract:** Medicinal and aromatic plants have played a vital role in alleviating human sufferings since times immemorial. As traditional knowledge is being lost in many cultures, so are the traditional medicinal plants. The major causes for the decline of wild medicinal plant species are rapid urban development, industrial boom, over-population and pollution, shrinking forest cover, habitat loss, over-harvesting and destructive harvesting. This paper reports the results of a survey conducted in Delhi (India) and adjoining areas and provides the information that habitat destruction due to urban development coupled with invasion by exotic species, pollution and overharvesting have resulted in severe loss of biodiversity, including the diversity of medicinal plants, commonly used in the Indian Systems of Medicine (ISM) like *Ayurveda*, *Unani* and *Siddha* and in some folk and tribal forms. Given the rapid rate of urban development and habitat loss, this region could lose a sizeable amount of medicinally important plant species in the near future. The present study reports that the natural populations of two important plant species *viz.*, *Cassia tora* and *Citrullus colocynthis* have declined to serious extent, hence, need effective strategy for immediate conservation.

**Key words:** Urban development • Habitat loss • Medicinal plants • *Cassia tora* • *Citrullus colocynthis*

### INTRODUCTION

In this era of modernization, urbanisation is growing at a faster rate and exerts negative impact on the quality and quantity of natural resources, particularly the resources of plant species, mainly due to increased land being used for city development and constructions of highways, resulting in to the loss of forests. Deforestation leads to loss of biodiversity including the diversity of medicinal and aromatic plants. Some important medicinal plants are not finding a way to protect themselves from this ecological threat. Few species of plants are dwindling in population due to habitat destruction [1], invasion by exotics [2, 3] and over-harvesting [4] for the drug industry and for folk remedies. The herbal drugs are obtained from various plant parts like stem, bark, leaves, flowers, fruits, seeds, root and a variety of plant products like gum, oil, resins etc. Very few medicinal plants which are being traded are under cultivation, though cultivation techniques are being developed for a few species [5]. About 90% of the medicinal plants for trade are harvested from the wild [6, 7] and the demand for traditional medicinal plants is increasing rapidly [8, 9]. Continuous

exploitation of several medicinal plant species from the wild without proper replenishment has resulted in the population decline of the concerned species [10-12]. The factors like urbanization, over-harvesting and destructive harvesting have worsen the situation and most of these plants are now under the threat of extinction.

This erosion of plant biodiversity is a matter of concern and requires the use of new developments to conserve the germplasm of the vanishing species and prevent their permanent extinction. Therefore, it has become imperative to create proper awareness among the people and initiate the plans of conservation of such threat facing plants. Cultivation is the effective way of conservation and it ensures a steady supply. In an effort to aware the people particularly the scientific community about the threat to the medicinal germplasm due to urbanization and overharvesting, we conducted a survey in Delhi and Haryana (India). Traditionally, Delhi has been rich in floral diversity owing nearer to *Aravali Range* and favourable climatic conditions. A large variety of medicinal herbs used in traditional systems of medicine growing in the wild state are the specialty of this region [13].

**MATERIALS AND METHODS**

**Study Area:** The present study was conducted in Delhi state of India (Figure 1). It is situated at 28°38' N latitude and 77°11' E longitude at an altitude of 228 m above the mean sea level. The climate of the study area is semiarid and subtropical with extreme weather conditions during summer and winter. The mean annual rainfall is about 650 mm. 80% of precipitation occurs during a short span of three months from July to September. The weather condition for the study area is given in Table 1.

**Data Collection:** Extensive field surveys were conducted in the study area during the years 2007-2008 in different seasons (rainy, winter and summer) to assess the availability of medicinal and aromatic plants. We interviewed twenty persons who were in some way attached currently or in past to medicinal plants and were most likely to report accurately on the availability or decline of medicinal plants in the selected area. The studied medicinal plants were those used by the traditional healers and locals in their health care systems.

**RESULTS AND DISCUSSION**

Several important medicinal plants are found in this region, as per the literature [14] and the persons who were interviewed (Table 2). However, overharvesting, urbanization, loss of habitat, shrinking of shrub-lands, invasion by exotics (*Parthenium hysterophorus* L. and *Lantana camara* L.) and vehicular pollution etc. has led to decline in population of these important medicinal plants. Few plant species have declined to serious extent. Very few individuals of *C. tora* and *C. colocynthis* were found in the area under study. The interviewees attributed this decline to the ongoing urbanization, habitat destruction, overharvesting and loss of effective conservation measures, both at government and individual levels.

**Cassia tora L.**

**General:** *Cassia tora* (family: Caesalpiniaceae) is an annual herb up to 90 cm tall and occurs as wasteland rainy season weed in India. It grows along road sides or in open waste places; often become aggressive on unused ground. Leaves are pinnate, up to 10 cm long, rachis

Table 1: Weather Chart of the Study Area.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T <sub>max</sub>	21	24	30	36	41	40	35	34	34	35	29	23
T <sub>min</sub>	7	10	15	21	27	29	27	26	25	19	12	8
R <sub>avg</sub>	25	22	17	7	8	65	211	173	150	31	1	5

(R: Rainfall, mm; T: Temperature, °C)



Fig. 1: Map of India showing the study area (Delhi).

Table 2: List of the Major Medicinal and Aromatic Plants Commonly Observed in the Study Area

S.No.	Botanical Name	Local Name	Family
1	<i>Abrus precatorius</i> L.	ratti/ghungchi	Fabaceae
2	<i>Abutilon indicum</i> (L.) Sweet	kanghi-buti	Malvaceae
3	<i>Acalypha indica</i> L.	kuppi	Euphorbiaceae
4	<i>Achyranthes aspera</i> L.	chirchira	Amaranthaceae
5	<i>Adhatoda zeylanica</i> Medic.	arusa	Acanthaceae
6	<i>Ageratum conyzoides</i> L.	bhakumbhar	Asteraceae
7	<i>Anagallis arvensis</i> L.	anaghalis/buchbucha	Myrsinaceae
8	<i>Argemone mexicana</i> L.	Kateli	Papaveraceae
9	<i>Artemisia scoparia</i> Waldst	barna	Asteraceae
10	<i>Bacopa monnieri</i> (L.) Pennell	neem-jal	Scrophulariaceae
11	<i>Barleria cristata</i> L.	tadrelu	Acanthaceae
12	<i>Boerhavia diffusa</i> L.	punarnava	Nyctaginaceae
13	<i>Calotropis procera</i> (Aiton) W.T. Aiton	madar	Asclepiadaceae
14	<i>Cannabis sativa</i> L.	bhang	Cannabaceae
15	<i>Capparis decidua</i> (Forsk.) Edgew.	kair	Capparaceae
16	<i>Carissa spinarum</i> L.	jangli-karaunda	Apocyanaceae
17	<i>Cassia occidentalis</i> L.	kasaundi	Caesalpiniaceae
18	<i>Cassia tora</i> Linn.	chakunda/panwar	Caesalpiniaceae
19	<i>Citrullus colocynthis</i> (L.) Schrad.	indrayan	Cucurbitaceae
20	<i>Cleome viscosa</i> L.	hurhur	Cleomaceae
21	<i>Clerodendrum phlomidis</i> L. f.	arni	Verbenaceae
22	<i>Coccinia cordifolia</i> (L.) Cogn.	kundru	Cucurbitaceae
23	<i>Convolvulus arvensis</i> L.	hirankhuri	Convolvulaceae
24	<i>Corchorus depressus</i> (L.) Stocks	bohphali	Tiliaceae
25	<i>Cressa cretica</i> L.	nunki	Convolvulaceae
26	<i>Cuscuta reflexa</i> Roxb.	amarbel	Convolvulaceae
27	<i>Datura innoxia</i> Mill.	dhatura	Solanaceae
28	<i>Eclipta alba</i> (L.) Hassk.	bhangra	Asteraceae
29	<i>Euphorbia hirta</i> L.	dudhi-kalan	Euphorbiaceae
30	<i>Euphorbia thymifolia</i> L.	dudhi-khurd	Euphorbiaceae
31	<i>Evolvulus alsinoides</i> L.	Sankhpuspi	Convolvulaceae
32	<i>Flacourtia indica</i> (Burm.f.) Merr.	khatai	Salicaceae
33	<i>Fumaria indica</i> (Haussk) Pugsley	shahtara	Papaveraceae
34	<i>Gynandropsis gynandra</i> (L.) Brig.	hulhul	Capparaceae
35	<i>Indigofera tinctoria</i> L.	neel	Fabaceae
36	<i>Launaea nudicalis</i> Hook. f.	gobi	Asteraceae
37	<i>Lawsonia inermis</i> L.	henna	Lythraceae
38	<i>Lycium europaeum</i> L.	khtai	Solanaceae
39	<i>Medicago sativa</i> L.	rijka	Fabaceae
40	<i>Oxalis corniculata</i> L.	khatti-buti	Oxalidaceae
41	<i>Pedaliium murex</i> L.	bara-gokhru	Pedaliaceae
42	<i>Peristrophe bicalyculata</i> (Retz.) Nees	missi	Acanthaceae
43	<i>Phyllanthus fraternus</i> Webster	bhumi-amla	Phyllanthaceae
44	<i>Pluchea lanceolata</i> Cl.	rasna	Asteraceae
45	<i>Plumbago zeylanica</i> L.	chitrak	Plumbaginaceae
46	<i>Ricinus communis</i> L.	arand	Euphorbiaceae
47	<i>Sida cordifolia</i> L.	bijband	Malvaceae
48	<i>Sida rhombifolia</i> L.	sehdevi	Malvaceae
49	<i>Sisymbrium irio</i> L.	khub-kalan	Brassicaceae
50	<i>Solanum nigrum</i> L.	mokoh	Solanaceae
51	<i>Solanum xanthocarpum</i> Schrad. and Wendl.	kateli	Solanaceae
52	<i>Sonchus oleraceus</i> L.	pili-dudhi	Asteraceae
53	<i>Tephrosia purpurea</i> (L.) Pers.	sarphonka	Fabaceae
54	<i>Tinospora cordifolia</i> (Willd.) Miers	gilo	Menispermaceae
55	<i>Trianthema portulacastrum</i> L.	santh	Aizoaceae
56	<i>Tribulus terrestris</i> L.	gokhru	Zygophyllaceae
57	<i>Urena lobata</i> L.	vilayti-san	Malvaceae
58	<i>Withania somnifera</i> (L.) Dunal.	asgand	Solanaceae
59	<i>Xanthium strumarium</i> L.	bichhu	Asteraceae

grooved, conical gland between each of the two lowest pairs of leaflet; leaflets in 3 pairs, opposite, obovate, oblong and base oblique. The leaflets are triangular and broader at one end, looking like fenugreek. During night the leaflets get closed and open again in the morning. Flowers are bright yellow and are present in pair in the axils of leaves having five petals. Seed are rhombohedral in shape. It flowers after the monsoon rains in Indian conditions. Pods are 15-25 cm, stout, obliquely septate. The seeds are blackish brown, shiny, pointed at one end and hard to touch. Fruits remain from September to December. Hundred seeds of the plant weigh 1.88 g.

**Medicinal Properties and Uses:** Leaves, roots and seeds of this plant are medicinally used. According to *Ayurveda*, the leaves and seeds are acrid, laxative, antiperiodic, anthelmintic, ophthalmic, liver tonic, cardiogenic and expectorant. The leaves and seeds are useful in leprosy, ringworm, flatulence, colic, dyspepsia, constipation, cough, bronchitis and cardiac disorders [15]. In *Unani* system of medicine, the seeds are considered blood purifier, detergent, frequently used in skin ailments and blood disorders i.e., leprosy, itching, leucoderma and psoriasis. Its usefulness is more in curing ringworms [16].

Dried seeds contain protein (up to 24 percent) and are given as a protein rich feed for livestock and birds. Seeds yield tannins and dyes (yellow, blue and red), a gum, which is a good agent for suspending and binding. In organic farming in India, *C. tora* is used as natural pesticide. Fungicidal activity of chrysophanic acid-9-anthrone from *C. tora* has been reported [17].

**Survey Note:** The plant or native herb as “*Panwar*” has been used by local residents of Delhi and Haryana for ailments ranging from ringworm, leprosy to inflammation. As reported by the interviewees, the plant was abundant and found easily in Delhi in 1980-1990 and now the frequency of occurrence of this herb has decreased alarmingly. As the commercial demand increases, the plant runs the risk of being over-harvested. It has becoming an ecologically threatened plant from depletion by habitat loss and urban development.

#### ***Citrullus colocynthis* (L.) Schrad.**

**General:** *Citrullus colocynthis*, a relative of watermelon, is native to tropical Africa and is highly drought tolerant. Productivity is enhanced during dry, sunny periods and reduced during periods of excessive rainfall and high humidity. It prefers sandy soil and it prevents the growth of other plants which grow near the vicinity of colocynthis

plants. It is a perennial trailing herb belonging to family Cucurbitaceae. Leaves are triangular in outline, deeply three lobed, flowers are yellow. The colour of fruit is very attractive, bright-red, striped and smooth externally like a citrus and look like an orange in size. The kernel of the fruit is very bitter and is sold in the drug market under the trade name “*Hanzal*”. Its substitute is also found in the market which is imported in the country in dried form. It is actually “*Qitha-ul-Hammar*”. In English it is called squirting cucumber. Botanically it is named *Ecballium elaterium* (L.) A. Rich. The uses of both the species are similar and are used for one purpose. Hundred seeds of the plant weigh 2.76 g.

**Medicinal Properties and Uses:** Fruit and kernel of the plant are used medicinally. The fresh fruit acts as strong purgative and in dried form it is used for stomach problems [15]. In action the pulp of the fruit is considered a strong aperient. It causes watery-motion. It is useful in jaundice, dropsy, bilious fever, chronic constipation etc. Its use is recommended with tragacanth and almond oil. Its dosage is 125 mg [16].

The fruits are extremely bitter, but the seeds can be removed and roasted as an edible commodity. The seeds are rich in oil, which can be extracted for cooking purposes and the seeds can also be grounded into a powder and used as a soup thickener or flavoring agent [17].

**Survey Note:** The perennial native has been described by local residents as strong purgative. It is very popular in the region among farmers and local healers of the region. Twenty years ago, the plant could be found easily in various areas of Delhi like Badarpur, Tughlaqabad, Faridabad, Mehrauli and Gurgaon. The herb is collected by native people and used in folk remedies. Now the population of this species has declined to serious extent in this region. Urbanization looks the major cause behind the dwindling population of this medicinal plant. Traditionally it is remedy against jaundice by rural communities. Over-exploitation may be one of the causes of its decline.

#### **CONCLUSION**

Urban development has caused habitat destruction resulting in severe loss in the diversity of medicinal plants, commonly used in traditional medicine. Sustainable development encourages the conservation of natural resources. Cultivation is the best and most reliable

measure of conservation. Therefore, it is necessary to create mass awareness among the users about the *ex-situ* conservation of the medicinal plants. Cultivation of *C. tora*, *C. colocynthis* and other medicinal plants would not only provide protection to these species but would also be helpful in increasing the economic status of the farmers of this region. Paying special attention to the medicinal plants found in the area may help to save the plants from permanent extinction in the studied area and save entire ecosystems from permanent destruction.

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