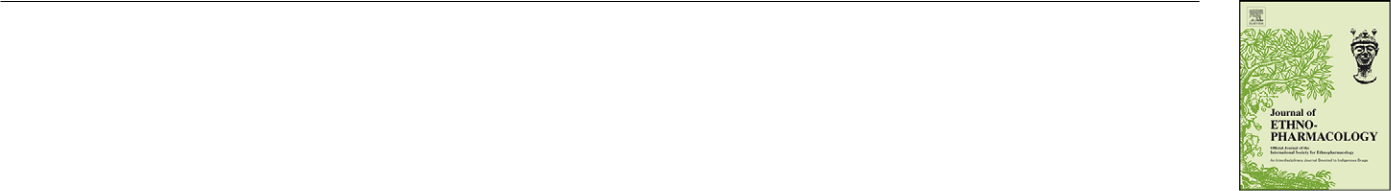
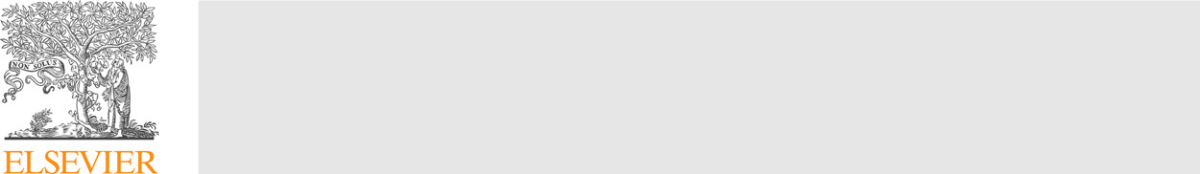
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Contents lists available at ScienceDirect



Journal of Ethnopharmacology

j o u r n a l h o m e p a g e : w w w . e l s e v i e r . c o m / l o c a t e / j e t h p h a r m

Ethnobotanical survey of antidiarrhoeal plants of Parinche valley, Pune district, Maharashtra, India

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a r t i c l e i n f o

*Article history:*

Received 19 November 2008

Received in revised form 11 February 2009 Accepted 13 March 2009 Available online 24 March 2009

*Keywords:*

Antidiarrhoeal plants

Ethnobotany

India

Medicinal plants

a b s t r a c t

*Ethnopharmacological relevance:* Maharashtra is the third largest state in India with a large tribalpopulation. Documentation of traditional knowledge through ethnobotanical studies is important for conservation and utilization of indigenous knowledge. Diarrhoeal diseases are the second largest cause of morbidity in rural India. Medicinal plants given by the traditional healers of Parinche in Pune district, Maharashtra are known to be efficacious for many common ailments, including diarrhoeal diseases.

*Aim of the study:* Ethnobotanical survey of antidiarrhoeal plants from Parinche valley towards the docu-mentation and conservation of traditional knowledge.

*Materials and methods:* Interviews and inquiries were conducted amongst traditional healers, indigenouscommunities and village elders.

*Results:* One hundred and eighty two plants used by tribes and natives for different ailments were docu-mented of which 28 flowering plants were for diarrhoea. Leaf was the most preferred plant part. Amongst the 28 plants, antidiarrhoeal activity of five plants viz., *Caesalpinia sepiaria*, *Dioscorea pentaphylla*, *Launaea* *pinnatifida*, *Syzygium rubicundum* and *Ziziphus jujuba* has not been reported previously. Two species viz., *Ziziphus xylopyra* and *Syzygium rubicundum* are endemic to India.

*Conclusion:* Parinche valley is an ethnobotanically rich area with abundant availability and knowledge ofmedicinal plants that can serve as a model for low cost health care.

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**1. Introduction**

Water quality and its accessibility affect substantial numbers of the world population (Bartram et al., 2005) and water borne diseases disturb the whole fabric of society. The disease burden worldwide from water, sanitation and hygiene together has been calculated to be 4% of all deaths and 5.7% of the total disease bur-den (Pruss et al., 2002). Amongst the many known water borne diseases, diarrhoeal diseases (including cholera) kill more than 1.8 million people every year, mostly children from developing coun-tries (WHO, 2004).

Indian subcontinent is a known hot spot for diarrhoeal epi-demics as evident by the number of epidemics reported (Kang et al., 2001; Kelkar et al., 2004; Phukan et al., 2004). Developmen-tal and technical interventions to improve drinking water quality and related policy decisions have so far met with limited success (Tambe et al., 2008) and diarrhoeal diseases continue to be a major cause of morbidity (Parashar et al., 2003). Traditional societies have

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0378-8741/$ – see front matter © 2009 Elsevier Ireland Ltd. All rights reserved. doi:10.1016/j.jep.2009.03.013

evolved ethnobotanical practices for countering the diarrhoeal dis-ease burden.

Indian scientific literature offers a rich wealth of antidiarrhoeal publications. A check list of antidiarrhoeal plants used in alter-native medical systems of India reveals 560 species of flowering plants (unpublished data). Caraka, the ancient Hindu physician and the author of the Great Ayurvedic treatise, “*Caraka Samhita*”, devoted an entire chapter to *Atisara* which means diarrhoea, which he attributed to diminution of *Agni* or power of digestion (Sharma and Dash, 1997). Folk medicine is the mother of the healing sys-tems of India (Valiathan, 2006). It is universally accepted now that traditional health care systems have their unique strengths and are worth exploring for their potential preventive and curative properties. A literature survey undertaken for the state of Maha-rashtra in relation to water borne diseases revealed that there is a dearth of documented information in relation to antidiarrhoeal plants (Sharma and Lakshminarasimhan, 1986; Kirtikar and Basu, 1993; Kulkarni and Kumbhojkar, 1997; Kulkarni et al., 2003; Sharma and Mujumdar, 2003). It is increasingly felt that documenting such information is urgent and necessary since many tribal rich regions in the vicinity of cities are being converted into semi-urban areas and traditional knowledge is lost in the process of urbanization.

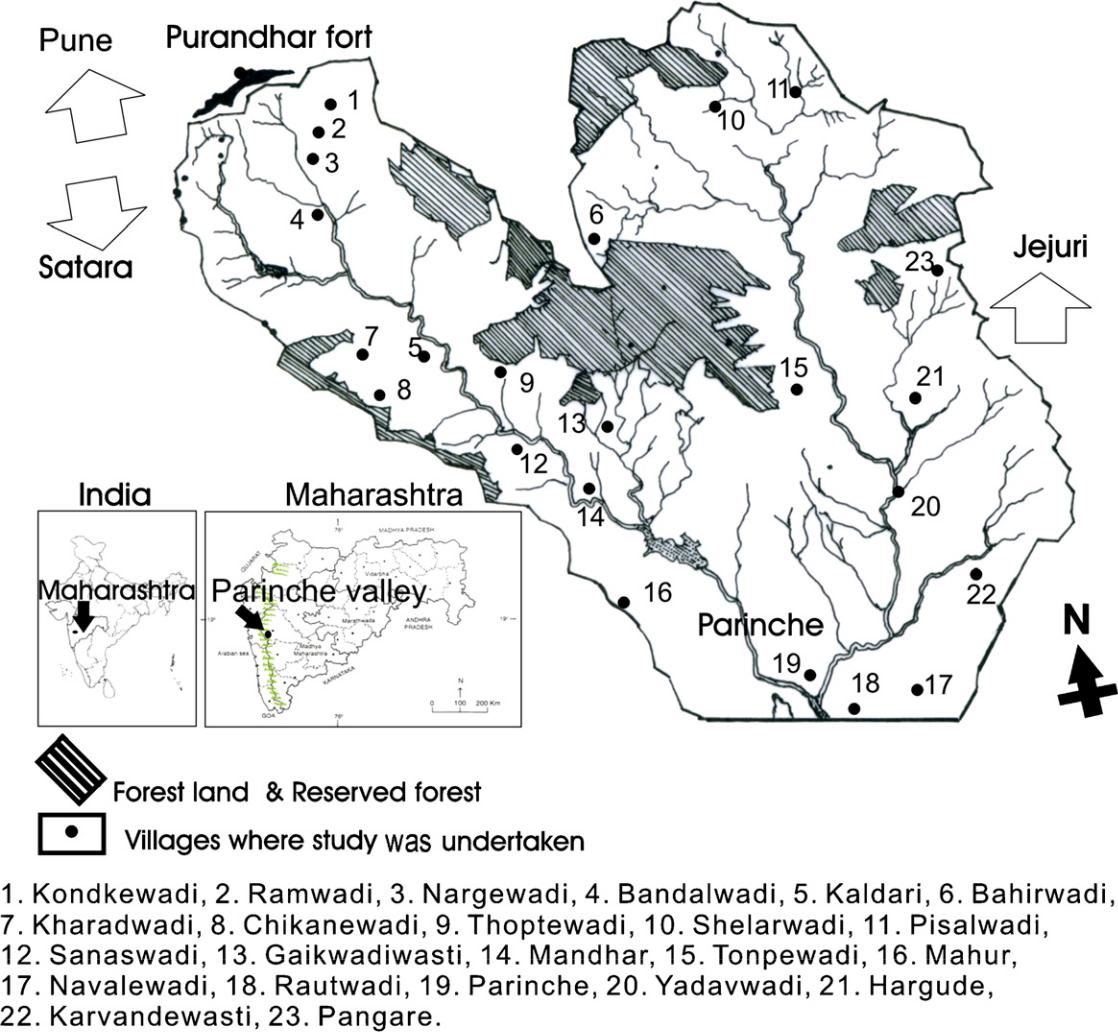
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Maharashtra is the third largest state of India and is rich in tribes and other traditional populations. According to the latest government census (2001) 19% of the total population of Maharashtra consists of tribes. Pune district has only 3.9% (0.216 million) tribes. The aim of the present study was to document ethnobotanical information of antidiarrhoeal plants in the Parinche valley, a geographically iso-lated region near Pune, which is one of the fastest growing cities of India.

**2. Materials and methods**

*2.1. Study area*

Parinche valley (Fig. 1) is situated between 73◦10 and 74◦10 latitudes and 18◦10 and 18◦55 longitudes in the Pune district of Maharashtra state about 53 km to the South East of Pune city. The region comprises of the inaccessible rear part of the Purand-har fort and its surrounding valley region. The total area of the valley region is about 132 sq. km. Parinche is the biggest village comprising a total of 43 villages and hamlets; forests cover only 15.8% of the total area. At the time of this study (2003), the total population was 14,930 belonging to 33 castes (communities); there were 36 traditional health care practitioners and 68 other types of healers; the tribes constituted about 9.65% (Tahsil office, Purandhar). The important tribal communities were *Mahadeo Kolis*,



*Dhangars* and *Ramoshi*. Tribal hamlets are concentrated mostlynear Purandhar fort of the Kaldari zone, which is also popularly known as Ghera Purandhar. Perennial springs in the sacred groves (Waghchaure et al., 2006) and the government forest land are the main sources of drinking water; a number of other options such as bore wells, check dams and reservoirs are also avail-able.

A cadre of women community health workers (CHW), selected through a participative process of community consensus and trained by the Foundation for Research in Community Health (FRCH, located in Pune) in preventive, promotive and curative aspects of health/medical care are functional in this area. These CHW provide equitable and accessible primary health care in their neighbor-hoods. The close contact of the CHW with their village community was critical in the project staff gaining access and trust of the com-munities.

*2.2. Ethnobotanical survey*

An ethnobotanical study of antidiarrhoeal plants was conducted from October 2002 to June 2006. The data was recorded following the standard procedures (Jain, 1989, 1991; Jain and Mudgal, 1999). The survey aimed to interact with maximum number of traditional communities, particularly the tribes. To achieve this, we opted for three different approaches.

**Fig. 1.** Study area—Parinche valley located in Maharashtra, India.

|  |  |
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In the first approach we targeted medicine men or herbal doctors (*Vaidus*). They were approached and explained that the objective of the study was to document the antidiarrhoeal plants of the Parinche valley and only those who consented were further interviewed. An ethnobotanist as well as a CHW accompanied the medicine men (who agreed to take part in interviews) to the forests during the interviews to confirm the species identity. The plant specimens were collected in triplicate and their taxonomic identification was confirmed. The voucher specimens were deposited in the Botanical survey of India (BSI), Western circle, Pune or Naoroji Godrej Centre for Plant Research (NGCPR) herbaria.

The second approach was to conduct surveys at the family level in the villages. This was on the basis of information received from the CHW who identified families which used medicinal plants widely. The third approach was to involve school teachers. Questionnaires were circulated to students and they were asked to collect information from their elders regarding antidiarrhoeal plants. The response to the third type of survey was good though the information received often lacked accuracy and most of the plants disclosed during this survey are described in standard Ayurvedic literature. Nevertheless, the last two approaches helped in iden-tifying individuals with extensive knowledge of medicinal plants who were subsequently interviewed.

*2.3. Interviews*

During the survey and with the help of CHWs, we identified a total of 115 individuals (27 amongst them were *Vaidus*) who were frequently visited by the locals to seek a cure for different ailments. These individuals were respected by the locals for their knowledge of local medicinal plants and their ability to cure patients approach-ing them. These medicinal plant ‘experts’ due to their extensive knowledge on medicinal plants were interviewed. The ethnobotan-ical information was noted down on a data sheet specially prepared for the purpose. The interviews were simultaneously tape recorded for better analysis. The data sheet for the interviews has been repro-duced in Box 1 .

*2.4. Enumeration of plant species*

All plants were recorded with at least one vernacular name. Uniformity, with regards to repeated usage of vernacular names in different villages or regions and also amongst different commu-nities, in citation of plants was an indication that the said species are generally well known remedies.

*2.5. Recording of antidiarrhoeal recipe*

On return from the fields, the local terminology for the dosage of the antidiarrhoeal recipe as cited during the interviews was worked out in terms of ml, g, mg and cm for record purpose.

**3. Results**

The survey documented 182 plant species that were used by the locals for various ailments. Amongst the 115 individuals inter-viewed, 24 respondents cited a total of 28 plants for the treatment of diarrhoeal diseases. Their definition of diarrhoea included stomach upset and frequent stools. In addition, they could also distinguish bloody, watery forms as well as diarrhoea with mucilage. Symptoms such as stomach ache, general weakness, back ache and shivering were also known to them to be associated with diarrhoea.

Table 1 gives the botanical and common names of the antidiar-rhoeal plants along with the names of their families and the status of domestication. Table 2 covers information on the number of time(s) the plant was quoted for its antidiarrhoeal activity, the plant

**Box 1: Interview data sheet—Parinche Valley.**

1. Date of survey:
2. Name of the person: Address: At/po:

Tal: Purandhar Dist: Pune Photograph

1. Source of information-restricted to
   1. Community:
   2. Family:
   3. Individual:
   4. Region:
2. Ethno Botanical Information: Vernacular name: Botanical name:

Family: Sub-family: Habit: Herb Distribution:

1. Description:
2. Important or interesting characters if any:
3. Used alone or mixed with other plants or chemicals:
4. Plant details:

Plant parts used

Harvesting procedure

Uses

Processing

Preparation

Dosage

Precautions

Contraindications

Results

Other information (toxicity, etc.)

part, the antidiarrhoeal recipe along with the worked out dosage and selected references (with plant part) pertaining to its antidiar-rhoeal/antidysenteric activity. It was noted that most of the plants have been reported earlier in literature, though at times the plant part cited was different. To the best of our knowledge antidiarrhoeal activity of five plants viz., *Caesalpinia sepiaria*, *Dioscorea pentaphylla*, *Launaea pinnatifida*, *Syzygium rubicundum* and *Ziziphus jujuba* hasnot been reported before, indicating that the usage of these plants may be restricted to Parinche valley and its neighboring areas.

*Ziziphus xylopyra* and *Syzygium rubicundum* are the two endemicspecies found in India; and their distribution is rare in the study area. Other species commonly found along the village environs such as *Lantana camara*, *Psidium guajava*, *Jatropha curcas* and *Punica* *granatum* are cultivated exotics, while *Launaea pinnatifida* and *Tri-dax procumbens* are exotic weeds and *Cyperus rotundus* is a widelydistributed weed of cultivated fields.

In addition to the information covered in Tables 1 and 2, certain interesting and important observations of the locals for a few plants have been tabulated in Table 3. It should be noted that though the efficacy of *Vitex negundo* for snake bites is widely known (Kirtikar and Basu, 1993), the same has also been covered in Table 3 as this gives additional credence to the existing knowledge about this plant.

**4. Discussion**

Local traditional plant knowledge, is the combined knowledge based on the lifestyle, beliefs and trial and error practices of the communities which is passed on from generation to generation. It is being increasingly felt that this indigenous knowledge not only needs to be preserved but also documented.

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| **Table 1** |  |  |  |
| Antidiarrhoeal plants in the study area. |  |  |  |
|  |  |  |  |
| Botanical name (herbarium number) | Common names | Family | Status of domesticationa |
| *Aegle marmelos* (L) Corr. (BSI-124675) | Bilva, bel, bael | Rutaceae | W/C |
| *Bombax ceiba* L. (NGCPR-632) | Saur, Kate-savar | Bombacaceae | W |
| *Caesalpinia sepiaria* Roxb. (NGCPR-625) | Chilar | Leguminosae | W/C |
| *Capparis zeylanica* L. (NGCPR-644) | Waghati | Capparaceae | W |
| *Cassia fistula* L. (NGCPR-646) | Bahava | Leguminosae | W/C |
| *Cocculus hirsutus* Diels (NGCPR-617) | Katvel, Wasansad | Menispermaceae | W |
| *Cyperus rotundus* L. (BSI-124666) | Lavala, Motha | Cyperaceae | W |
| *Dalbergia sissoo* Roxb. (BSI-124673) | Sisvi, Shisav | Fabaceae | W/C |
| *Dichrostachys cinerea* Wt. & Arn. (NGCPR-615) | Durangi babhul | Leguminosae | W |
| *Dioscorea pentaphylla* L. (NGCPR-648) | Shendvel | Dioscoreaceae | W |
| *Eclipta prostrata* L. (NGCPR-670) | Bhangara, Maka | Asteraceae | W |
| *Hemidesmus indicus* Br. (NGCPR-630) | Kavli, Shatawari, | Asclepiadaceae | W |
| *Jatropha curcas* L. (NGCPR-621) | Mogali arand | Euphorbiaceae | C, N |
| *Lantana camara* L. (NGCPR-634) | Tantani | Verbenaceae | N |
| *Launaea pinnatifida* Cass. (NGCPR-636) | Ranpatri | Asteraceae | N |
| *Mangifera indica* L. (NGCPR-619) | Amba | Anacardiaceae | W/C |
| *Pongamia pinnata* L. (BSI-124677) | Karanj | Leguminosae | W/C |
| *Protoasparagus racemosus* L. (NGCPR-627) | Shatavari | Liliaceae | W/C |
| *Psidium guajava* L. (BSI-124672) | Peru, Jamb | Myrtaceae | C |
| *Punica granatum* L. (BSI-124667) | Dalimb | Punicaceae | C |
| *Semicarpus anacardium* L. (NGCPR-623) | Bibba | Anacardiaceae | W/C |
| *Syzygium rubicundum* Wight & Arn. (NGCPR-650) | Ledi jambha | Myrtaceae | W |
| *Tinospora cordifolia* Miers. (NGCPR-638) | Gulvel, Garudve | Menispermaceae | W/C |
| *Tridax procumbens* L. (NGCPR-628) | Kutkuti | Asteraceae | N |
| *Vitex negundo* L. *var.* (BSI-124674) | Nirgudi | Verbenaceae | W/C |
| *Zingiber officinale* Rose. (NGCPR-642) | Aale, Sunthi | Zingiberaceae | C |
| *Ziziphus jujuba* Mill. (BSI-124669) | Ber, bera, bhor | Rhamnaceae | W/C |
| *Ziziphus xylopyra* (Retz.) Willd. (BSI-124668) | Guti | Rhamnaceae | W |
|  |  |  |  |

* W = wild type; C = cultivated; N = naturalized exotics.

**Table 2**

Details of the antidiarrhoeal plants in the study area.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Plant | Number of | Part cited in the | Antidiarrhoeal recipe/dosage | Reported antidiarrhoeal/antidysenteric |
|  | times quoteda | present survey |  | activityb |
| *Aegle marmelos* | 2 | Unripe fruit pulp | Two table spoons full of fine powder is | Unripe fruit pulp (Satyavati et al., |
|  |  |  | mixed in 25 ml water or 5 mg honey; | 1976–1987); roots (Majumdar et al., |
|  |  |  | administered orally thrice a day for 3 | 2006) |
|  |  |  | days |  |
| *Bombax ceiba* | 2 | Roots | Pieces of young roots, 30–45 cm long | Roots (Warrier et al., 1993–1996; |
|  |  |  | and 3–5 cm diameter; root bark is | Sharma et al., 2000–2002); gum |
|  |  |  | peeled with a sharp knife and the inner | (Sharma et al., 2000–2002) |
|  |  |  | white portion is crushed and made into |  |
|  |  |  | a fine paste. The paste is then added to |  |
|  |  |  | 30–50 ml of water and administered in |  |
|  |  |  | the morning, preferably on an empty |  |
|  |  |  | stomach for 2 days |  |
| *Caesalpinia sepiaria* | 1 | Seeds | Seeds are finely powdered and stored | No reference found |
|  |  |  | in air tight containers; one tablespoon |  |
|  |  |  | full of powder is mixed in 200–250 ml |  |
|  |  |  | water or with a cup of tea, |  |
|  |  |  | administered orally twice–thrice for a |  |
|  |  |  | week |  |
| *Capparis zeylanica* | 1 | Mature leaves | Green and mature leaves (before | Root bark (Satyavati et al., 1976–1987) |
|  |  |  | turning red); leaf paste is mixed in |  |
|  |  |  | 50–70 ml water and administered |  |
|  |  |  | thrice a day for 2 days |  |
| *Cassia fistula* | 2 | Pods | Pods are open dried under sun. Dried | Bark and wood (Kirtikar and Basu, |
|  |  |  | seeds are finely powdered and stored. | 1993) |
|  |  |  | Two pinches of powder mixed in |  |
|  |  |  | 200–250 ml water or a cup of tea, |  |
|  |  |  | administered internally twice a day for |  |
|  |  |  | 3 days |  |
| *Cocculus hirsutus* | 3 | Leaves | Infusion is made from a handful of | Leaves (Girach et al., 1996)c ; |
|  |  |  | leaves in a cup of water; this is | unspecified part (Singh, 2000)c |
|  |  |  | administered orally thrice a day for |  |
|  |  |  | three days |  |
| *Cyperus rotundus* | 1 | Tubers | Fresh or dried tubers after clearing root | Tubers (Sharma et al., 2000–2002; |
|  |  |  | fibers along with green ginger, almost | Daswani et al., 2001) |
|  |  |  | in equal proportions pounded together |  |
|  |  |  | and mixed in honey to make a paste. A |  |
|  |  |  | tablespoonful of paste is administered |  |
|  |  |  | internally thrice a day for 3 days |  |
| *Dalbergia sissoo* | 5 | Mature leaves | Mature leaflets (3–5) are orally | Leaves (Sharma et al., 2000–2002; |
|  |  |  | administered twice–thrice only for a | Brijesh et al.*,* 2006a) |
|  |  |  | single day |  |
|  |  |  |  |  |

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| Table 2 (*Continued* ) |  |  |  |  |
|  |  |  |  |  |
| Plant | Number of | Part cited in the | Antidiarrhoeal recipe/dosage | Reported antidiarrhoeal/antidysenteric |
|  | times quoteda | present survey |  | activityb |
| *Dichrostachys cinerea* | 1 | Mature leaves | One tablespoon of infusion is added to | Roots (Warrier et al., 1993–1996) |
|  |  |  | 50 ml goat’s milk and administered |  |
|  |  |  | orally twice a day for 3 days |  |
| *Dioscorea pentaphylla* | 2 | Tuberous roots | The tuber is thoroughly washed in | No reference found |
|  |  |  | water till the soil is removed. The outer |  |
|  |  |  | skin (epidermis) with all prickly roots |  |
|  |  |  | is peeled with the help of a blade or |  |
|  |  |  | knife. The tubers are crushed with a |  |
|  |  |  | pestle in a suitable bowl and eaten raw. |  |
|  |  |  | The tubers are eaten early in the |  |
|  |  |  | morning before sun rise, on empty |  |
|  |  |  | stomach. The root material is |  |
|  |  |  | administered continuously for 15 days |  |
| *Eclipta prostrata* | 1 | Leaves | 3–5 leaves crushed and made into a | Leaves (Girach et al., 1996)c |
|  |  |  | paste. The paste is administered orally |  |
|  |  |  | twice a day for 3 days |  |
| *Hemidesmus indicus* | 1 | Leaves | A fresh extract of about 4–12 leaves is | Roots (Sharma et al., 2000–2002; Das |
|  |  |  | prepared by crushing and pounding | et al*.,* 2003) |
|  |  |  | them. The extracted juice is |  |
|  |  |  | administered orally. A dosage of 3–5 ml |  |
|  |  |  | is recommended twice–thrice a day for |  |
|  |  |  | 3 days |  |
| *Jatropha curcas* | 1 | Sap from the stem | One and half table spoons full of sap is | Fruits (Kirtikar and Basu, 1993) |
|  |  |  | extracted from the stem cuttings. The |  |
|  |  |  | greenish yellow sap is mixed in one |  |
|  |  |  | glass of cow milk (250 ml) after boiling. |  |
|  |  |  | Only one dose is administered in the |  |
|  |  |  | morning time, preferably on empty |  |
|  |  |  | stomach |  |
| *Lantana camara* | 2 | Leaves | About 5 g leaves is crushed in 25 ml | Leaves (Sagar et al., 2005); roots |
|  |  |  | water and the filtered extract is | (Warrier et al., 1993–1996) |
|  |  |  | administered thrice a day for 3 days |  |
| *Launaea pinnatifida* | 4 | Leaves | About 3–5 freshly collected leaves are | No reference found |
|  |  |  | crushed and the paste is orally |  |
|  |  |  | administered twice a day for 3 days |  |
| *Mangifera indica* | 2 | Kernel | An extract is prepared from 8 to 10 | Kernel (Satyavati et al., 1976–1987); |
|  |  |  | mature leaves of *Ziziphus mauritiana* in | seeds (Sairam et al., 2003) |
|  |  |  | 15–25 ml water and mashed kernels of |  |
|  |  |  | mango are added to it. The drug is |  |
|  |  |  | administered orally thrice a day for 2 |  |
|  |  |  | days |  |
| *Pongamia pinnata* | 3 | Mature leaves | Two fresh and mature leaflets are taken | Leaves (Brijesh et al., 2006b); oil as |
|  |  |  | internally with a pinch of sugar | stomachic (Satyavati et al., 1976–1987) |
| *Protoasparagus racemosus* | 1 | Tuberous roots | Tuberous roots are dried in the partially | Roots (Kirtikar and Basu, 1993) |
|  |  |  | shaded areas with sufficient light and |  |
|  |  |  | ventilation. The roots are grounded and |  |
|  |  |  | made into powder. One spoon full of |  |
|  |  |  | powder is thoroughly stirred in cup of |  |
|  |  |  | milk (100 ml) and taken internally |  |
|  |  |  | before sleeping for 15 days |  |
| *Psidium guajava* | 2 | Mature leaves | Two mature leaves are either chewed | Leaves (Satyavati et al., 1976–1987; Lin |
|  |  |  | one at a time or the extract prepared | et al., 2002) |
|  |  |  | by crushing the leaves in water is taken |  |
|  |  |  | orally thrice a day for 3 days |  |
| *Punica granatum* | 2 | Fruit rind | One table spoonful of infusion is orally | Fruit rind (CHEMEXCIL, 1992); seed |
|  |  |  | administered twice a day for 2 days | (Das et al*.,* 1999) |
| *Semicarpus anacardium* | 1 | Nut | A needle is pierced from any side into | Rind of the fruit (Kirtikar and Basu, |
|  |  |  | the dried nut. One or two drops of the | 1993) |
|  |  |  | liquid thus obtained is mixed in 250 ml |  |
|  |  |  | cow milk and taken orally |  |
| *Syzygium rubicundum* | 1 | Leaves | Equal amounts of fresh leaves of | No reference found |
|  |  |  | *Syzygium rubicundum* and *Mangifera* |  |
|  |  |  | *indica* are grounded together in fresh |  |
|  |  |  | cow milk (without boiling). The decant |  |
|  |  |  | after filtering is administered to cattle |  |
|  |  |  | suffering from diarrhoea with the help |  |
|  |  |  | of a bamboo pipe specially made for |  |
|  |  |  | this purpose. For calves and goats: one |  |
|  |  |  | glass (250 ml). For Lambs: one cup |  |
|  |  |  | (100 ml). For mature cattle: two glasses |  |
|  |  |  | full (500 ml). \*The dosage is given |  |
|  |  |  | orally once a day, in the morning time |  |
|  |  |  | for 3 days |  |
|  |  |  |  |  |

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| Table 2 (*Continued* ) |  |  |  |  |
|  |  |  |  |  |
| Plant | Number of | Part cited in the | Antidiarrhoeal recipe/dosage | Reported antidiarrhoeal/antidysenteric |
|  | times quoteda | present survey |  | activityb |
| *Tinospora cordifolia* | 2 | Stem | Freshly collected stem is cut into small | Stem (Kirtikar and Basu, 1993) |
|  |  |  | pieces of about 4–6 cm in size. About |  |
|  |  |  | 50 g of these pieces and 25 g sugar are |  |
|  |  |  | mixed together and crushed |  |
|  |  |  | thoroughly by adding 75 ml water. The |  |
|  |  |  | material is filtered through a muslin |  |
|  |  |  | cloth. The extract is given orally to |  |
|  |  |  | patients in the morning time on empty |  |
|  |  |  | stomach for a period of 3 days |  |
| *Tridax procumbens* | 2 | Leaves | Infusion of leaves is administered | Leaves (Anonymous, 1985) |
|  |  |  | internally thrice a day for 3 days |  |
| *Vitex neguno* | 1 | Flowers | One fist full of flowers with or without | Roots (Warrier et al., 1993–1996) |
|  |  |  | peduncle is collected from a healthy |  |
|  |  |  | tree. They are crushed in 20–25 ml |  |
|  |  |  | water. The extract is filtered through a |  |
|  |  |  | muslin cloth. The filtered extract is |  |
|  |  |  | orally administered twice–thrice a day |  |
|  |  |  | for 2 days |  |
| *Zingiber officinale* | 2 | Rhizome | One tablespoonful of powder is added | Rhizome (Sharma et al., 2000–2002; |
|  |  |  | to 25 ml or a cup of hot water is | Borrelli et al., 2004) |
|  |  |  | administered internally thrice a day for |  |
|  |  |  | 3 days |  |
| *Ziziphus jujuba* | 1 | Mature leaves | An extract is prepared from 8 to 10 | No reference found |
|  |  |  | mature leaves in 15–25 ml water and |  |
|  |  |  | mashed kernels of mango are added to |  |
|  |  |  | it. The drug is administered orally |  |
|  |  |  | thrice a day for 2 days |  |
| *Ziziphus xylopyra* | 1 | Seeds | The dried seeds are pounded to make a | Unspecified part (Dash and Padhy, |
|  |  |  | fine powder and kept in air tight | 2006) |
|  |  |  | containers. One table spoon full of |  |
|  |  |  | powder is mixed in a cup of (50 ml) |  |
|  |  |  | water or boiled milk or even in tea and |  |
|  |  |  | taken orally in case of diarrhoea. The |  |
|  |  |  | medicine is administered thrice a day, |  |
|  |  |  | for 2 days |  |
|  |  |  |  |  |

* Obtained from 24 respondents (out of 115 interviewed) that cited plants with antidiarrhoeal activity. b Selected references only.

c Reference from ethnobotanical/ethnopharmacological study.

Maharashtra is the third largest state of India with diverse geo-graphical and climatic conditions resulting in a heterogeneous floral composition. Pune, one of the fastest growing cities of India, is amongst the floristically affluent districts of this state. Parinche valley, just 53 km away from Pune city, is rich in floristic as well as ethnic diversity. Despite its closeness to the city, large segments of the area are inaccessible and modern health care facilities do not reach a majority of the population. Thus the community mainly relies on traditional health care practitioners and other types of healers. Poverty, modern civilization, resettlements, deforestation, industrialization and urbanization are some of the factors affecting the traditional knowledge base in Parinche valley. These parame-ters coupled with the fact that no comprehensive ethnobotanical data is available for Parinche, the present study was seen as a unique opportunity to explore the floristics of this valley. This paper focuses on documenting the ethnobotanical aspects of antidiar-rhoeal plants. This was important since the diarrhoeal morbidity in the area was also high ranging from 152 to 248 diarrhoeal cases per 1000 population during the period 2003–2006 (data not shown) and a study of the potability of the water from various sources revealed a high incidence of coliform contamination (Tambe et al., 2008).

The study revealed rich ethnobotanical information and recorded 182 plants used by tribes and natives for different ail-ments; 28 flowering plants were documented for use in diarrhoea. Amongst these, the antidiarrhoeal activity of five plants has not been previously reported. Interestingly, one of these plants viz., *Ziziphus jujuba* has been recently reported to be an effective and

safe treatment for chronic constipation in a controlled clinical trial (Naftali et al., 2009). Thus the fruit extract of *Ziziphus jujuba*, as tested in this trial, is a remedy for constipation and the leaf extract of this plant when mixed with mango kernels, as stated during this survey (Table 2), renders this plant an antidiarrhoeal.

Nine of the 28 plants viz., *Aegle marmelos*, *Bombax ceiba*, *Cassia* *fistula*, *Cocculus hirsutus*, *Cyperus rotundus*, *Dalbergia sissoo*, *Psid-ium guajava*, *Tinospora cordifolia* and *Ziziphus xylopyra* found by uswere also recorded to be used for diarrhoea in an ethnobotanical survey amongst the tribes inhabiting certain forest areas of Uttar Pradesh in Northern India (Singh, 2000). Similarly, use of *Cocculus* *hirsutus* and *Eclipta prostrata* by the rural population of Bhadrak dis-trict, Orissa, India (Girach et al., 1996), *Cocculus hirsutus* and *Lantana* *camera* in Southern Western Ghats of India (Henry and Ravikumar,1996) and *Tridax procumbens* from Rayalaseema region of Southern Eastern Ghats in Andhra Pradesh, India (Rao et al., 2006) are exam-ples of common findings. On the other hand, none of the 28 plants revealed in the present survey were similar to the 29 reported for stomach disorders in a recent study amongst the tribes of western Himalayan, India (Singh and Lal, 2008).

We recorded leaves of 13 species used in formulations for antidiarrhoeal drugs (Table 2). This indicates that local commu-nities and practitioners follow prudence in selecting the type of plant species as well as harvesting methods; the harvesting proce-dures being largely non-destructive in nature. A similar observation was also made in another survey carried out by Ayyanar and Ignacimuthu (2005) in a tribal community in Tamil Nadu, India and also in the study by Singh and Lal (2008). The latter study also

|  |  |
| --- | --- |
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**Table 3**

Additional information obtained during the interviews.

|  |  |
| --- | --- |
| Plant | Additional remarks |
| *Aegle marmelos* | The harvesting stage of the fruit is important, as the |
|  | pulp of ripe fruit is a laxative. |
| *Caesalpinia sepiaria* | The seeds collected from the dried fruits should be |
|  | pounded using mortar and pestle. Machines especially |
|  | mixer should not be used for grindinga . |
| *Cocculus hirsutus* | This plant remedy may not be useful in cases of |
|  | epidemics. |
| *Dalbergia sissoo* | The leaves of this plant can cure human as well as |
|  | veterinary diarrhoea; the only difference being that in |
|  | case of humans, leaves are eaten directly while for |
|  | cattle diarrhoea, the pounded leaf paste is mixed with |
|  | water and given orally. |
| *Dichrostachys cinerea* | The leaves should be freshly collected. |
| *Dioscorea pentaphylla* | The tubers can cure as many as 72 diseases, which |
|  | includes cancer. |
| *Pongamia pinnata* | This is the most commonly used antidiarrhoeal plant |
|  | medicine by the *Warkaris* (pilgrims) during the |
|  | Pandaripur *yatra* (pilgrimage). One should not |
|  | consume more than 1–2 leaves of this plant at one |
|  | time. |
| *Punica granatum* | This tree is cultivated on a large scale for its fruits. A |
|  | number of cultivars and varieties are grown in |
|  | Maharashtra state. “Ganesh” is the most popular |
|  | variety cultivated in this region. |
| *Semicarpus anacardium* | Marking nut to prepare the antidiarrhoeal recipe |
|  | causes allergy. |
| *Tridax procumbens* | Quick relief is observed in certain cases of diarrhoea. |
| *Vitex negundo* | This plant is highly recommended for common snake |
|  | bites (non poisonous); however specific names of the |
|  | snakes were not disclosed. |
|  |  |

* According to the informer, it’s a traditional belief that the efficacy of the drug will be reduced if grinding is done with an electric mixer.

noted diarrhoeal diseases to be a cause of major concern in the study area.

Abundant availability of these plants in the study area offers low cost health care. However, such ethnobotanical studies need to be supported by pharmacological studies for scientific valida-tion.

**Acknowledgements**

We thank Mr. Sanjay Kulkarni, Research Assistant, NGCPR, for technical assistance. We gratefully acknowledge the help rendered by Aviansh Gurav, Santosh Jangam, Meena Poman and the other staff of FRCH towards collection of information. This work has been supported by grant No. 91283 from the Department of Science and Technology, Ministry of Science and Technology, Government of India.

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