



## A Review on *Plumbago zeylanica* Linn. - A Divine Medicinal Plant

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Accepted on: 07-12-2014; Finalized on: 31-01-2015.

### ABSTRACT

*Plumbago zeylanica* Linn. (Plumbaginaceae) commonly called Ceylon leadwort or Chitrak, has good medicinal potential, hence enjoys important place among medicinal plants around the world for treatment of various diseases. It is held in high esteem in both Ayurveda and Unani. It possesses wide range of phytochemicals showing various pharmacological activities. The present review highlights the traditional medicinal uses, phytochemistry, pharmacological activities of *Plumbago zeylanica* Linn. and aims at encouraging and attracting attention of researchers for production of new drugs and extensive use of the plants.

**Keywords:** *Plumbago zeylanica* Linn., Ayurveda, Unani, Medicinal uses, Phytochemical constituents, Pharmacological activities

### INTRODUCTION

Ayurveda (literal meaning -science of life) provides medicine to large section of our population. World Health Organisation is actively encouraging developing countries to use herbal medicines which they have been traditionally used for centuries.<sup>1</sup> Herbal renaissance is happening all over the world. Herbal products are safe in contrast to allopathic synthetic drugs.

*Plumbago zeylanica*, popular medicinal plant in Ayurveda, belongs to family Plumbaginaceae (also referred as "leadwort family" or "Plumbago family").<sup>2</sup> (Figure 1) It is small family of 22 genera and 440 species.<sup>3</sup>

The generic name *Plumbago* is derived from latin word *Plumbum* (=lead),<sup>4,6</sup> referring to its ability to cure lead palsy<sup>4</sup> or the ability of plant sap to create lead coloured stains on skin.<sup>5,6</sup> Hence also called 'leadwort'.<sup>7</sup>

The species name *zeylanica* means 'of Ceylon'. It is called 'Chitrak' in Sanskrit. If the paste of root with water is applied on the skin, blisters appear within few minutes and become red in colour after bursting<sup>4</sup> (resulting in discolouration of skin).<sup>6</sup> Any colour on another one = Chitra<sup>4</sup>, hence the name Chitrak. The foremost objective in reviewing this plant is to explore and make researchers aware about usefulness of *Plumbago zeylanica* Linn. for human health.

### Taxonomic Profile

Bentham and Hooker's classification<sup>8-10</sup>

Class – Dicotyledonae

Sub class – Gamopetalae

Series – Heteromerae

Order – Primulales

Family – Plumbaginaceae

As Plumbaginaceae show affinities with both centrospermae and primulales,<sup>11</sup> it's taxonomic position is ambiguous. The family was placed by Hallier in centrospermae.<sup>12,13</sup> Affinities of plumbaginaceae to centrospermae are due to resemblances in unilocular ovary with basal ovule borne on long funiculus and embryo surrounded by mealy endosperm. However plumbaginaceae differs from centrospermae in having anatropous ovule and straight embryo.<sup>12</sup> Because of common floral plan with antipetalous stamen, unilocular ovary, plumbaginaceae has been placed in primulales.<sup>12,14</sup> Many taxonomists viz. - Bentham and Hooker,<sup>8-10</sup> Bessey,<sup>10,13</sup> Hutchinson,<sup>9,10</sup> Thorne<sup>15</sup> considered plumbaginaceae as one of the family of primulales. Plumbaginaceae is distinguished from primulaceae by its solitary ovule and free styles.<sup>14</sup> Wettstein,<sup>10,12</sup> Lawrence,<sup>12</sup> Rendle,<sup>12,15</sup> Engler and Prantle,<sup>8,9,10,15</sup> Cronquist,<sup>8,9</sup> Takhtajan,<sup>9,10</sup> Dahlgren,<sup>8,9</sup> Stebbins<sup>15</sup> placed family in order plumbaginales. Both the orders (primulales, plumbaginales) have been derived from centrospermae or their ancestors.<sup>13,14</sup>



Figure 1: *Plumbago zeylanica* Linn.

### Synonyms

### In Sanskrit

Agni,<sup>16-18</sup> Agnimata,<sup>16</sup> Agnisikha,<sup>16</sup> Anala,<sup>16,18</sup>  
 Analanama,<sup>16</sup> Aruna,<sup>18</sup> Barhi,<sup>16</sup> Bhali,<sup>16</sup> Brihadbhanu,<sup>16</sup>  
 Chitra,<sup>16</sup> Chitrapali,<sup>18</sup> Chitraka,<sup>16,18</sup> Chitranga,<sup>16,18</sup>  
 Dahaka,<sup>16</sup> Dahana,<sup>16-18</sup> Daruna,<sup>16</sup> Dvipi,<sup>16,18</sup> Himarati,<sup>16</sup>



Hiranyareta,<sup>16</sup> Hutabhuk,<sup>16,17</sup> Huashaa,<sup>17</sup> Jataveda<sup>16</sup>,  
 Jyotishka,<sup>16,18</sup> Jyoti,<sup>18</sup> Jvala,<sup>18</sup> Krishanu,<sup>16</sup> Krishnavartma,<sup>16</sup>  
 Kuta,<sup>16</sup> Lohitanga,<sup>16</sup> Pachi,<sup>16</sup> Palaka,<sup>16</sup> Pali,<sup>16</sup> Pathi,<sup>16,18</sup>  
 Pathina,<sup>16</sup> Pavaka,<sup>16,18</sup> Saptarshi,<sup>16</sup> Shambara,<sup>16</sup> Shabala,<sup>18</sup>  
 Shardula,<sup>16,18</sup> Shikha-vana,<sup>16</sup> Shikhi,<sup>16</sup> Shuchi,<sup>16</sup> Shura,<sup>16,18</sup>  
 Shushma,<sup>16</sup> Shwetachitraka,<sup>16</sup> Ushana,<sup>16,18</sup>  
 Vaishavanara,<sup>16</sup> Vallari,<sup>16</sup> Vahni,<sup>16,17</sup> Vanhinama,<sup>16</sup>  
 Vibhakara,<sup>16</sup> Vibhavasva,<sup>16</sup> Vyala,<sup>16,18</sup> Varuna.<sup>18</sup>

**Table 1:** Synonyms of *Plumbago zeylanica* Linn. in different regional languages of India

S. No.	Name of Regional Language	Synonyms
1	Hindi	Chita, <sup>16,19,20</sup> Chitarak, <sup>16,19,20</sup> Chitawar, <sup>16</sup> Chiti, <sup>16</sup> Chitra <sup>16,19,20</sup>
2	Urdu	Sheetraj Hindi, <sup>21,22</sup> Cheetah, <sup>21,22</sup> Chitalakri <sup>16,22</sup>
3	Marathi	Chitraka, <sup>16,19,20</sup> Chitramula <sup>16,19,20</sup>
4	Tamil	Adigarradi, <sup>16</sup> Akkini, <sup>16</sup> Angodiveli, <sup>16</sup> Chitramoolam, <sup>20,22,23</sup> Kanilam, <sup>16,22</sup> Kanilindiran, <sup>16</sup> Karimai, <sup>16</sup> Kodiveli, <sup>16,22,23</sup> Koduvveli, <sup>16</sup> Sadaveda, <sup>16</sup> Sittragam, <sup>16,20,22</sup> Sittramulam, <sup>16</sup> Tigana, <sup>16</sup> Vanama, <sup>16</sup> Vellaikkodiveli, <sup>16</sup> Vengodi, <sup>16</sup> Veli <sup>16</sup>
5	Telugu	Agnimata, <sup>16</sup> Chitramulamu, <sup>16,20</sup> Chitramoolam, <sup>20</sup> Tellachitramulamu, <sup>16</sup> Tella chitra <sup>24</sup>
6	Bengali	Chita, <sup>16,22,23</sup> Chitrak, <sup>20,23</sup> Chitra, <sup>20,23</sup> Safaid Chitarak <sup>22</sup>
7	Gujarathi	Chitro, <sup>20,23</sup> Chitra, <sup>23</sup> Pitaro, <sup>23</sup> Chitrak, <sup>20</sup> Chitrakmula <sup>21</sup>
8	Kannada	Chitramula, <sup>19,22,23</sup> Vahni, <sup>19,22,23</sup> Pellichitramool, <sup>23</sup> Chitramulika, <sup>22</sup> Bilichitramoola <sup>22</sup>
9	Malayalam	Thumpo Koduvveli, <sup>22,23</sup> Vellakoduvveli, <sup>19,22,23</sup> Tumba koduvveli <sup>19</sup>
10	Oriya	Chitamulo, <sup>19,23</sup> Chitapru, <sup>19,23</sup> Krisanu, <sup>19,23</sup> Ogn <sup>19,23</sup>
11	Punjabi	Chitra, <sup>21,22</sup> Chitrak <sup>20,24</sup>
12	Assamese	Agiyachit, <sup>21,22</sup> Agnachit, <sup>21,22</sup> Boga agechita <sup>22</sup>
13	Kashmiri	Chitra, <sup>21,22</sup> Shatranja <sup>21,22</sup>
14	Manipuri	Telhidak Angouba <sup>22</sup>

**Table 2:** Synonyms of *Plumbago zeylanica* Linn. in different foreign countries / foreign languages

S. No.	Name of foreign countries / foreign languages	Synonyms
1	English	Ceylon leadwort, <sup>16,20,22,23</sup> Doctorbush, <sup>22</sup> White Flowered leadwort <sup>16,20,22,23</sup>
2	Arabia	Shitaraj, <sup>22</sup> Ensain, <sup>22</sup> Enkin <sup>22</sup>
3	Burma	Kanchopphiju, <sup>16,22</sup> Kinkhenphiu <sup>16,22</sup>
4	Chinese	Pai Hua T'eng, <sup>16,22</sup> Pe Hoa T'en <sup>16</sup>
5	French	Dentelaire, <sup>16,22</sup> Dentelaire de Ceylon <sup>25</sup>
6	German	Bleiwurz, <sup>17,22</sup> Zahnkraut, <sup>22</sup> Ceylo-nische Bleiwurz <sup>25</sup>
7	Indonesia (In different regions)	Ceraka, (Sumatra), <sup>17,22</sup> Gadong encok, <sup>17</sup> Poksor <sup>17,22</sup> (Jawa), Kareka (Madura) <sup>17,22</sup> Oporie (Timor), <sup>17,22</sup> Daun encok, Ki encok (Sunda), <sup>17</sup> Bama (Bali) <sup>17</sup>
8	Nepal	Chitu <sup>16,22</sup>
9	Philippines	Sagdikit (Tagalog) <sup>17,22</sup> , Bagbag, <sup>17</sup> Talankaw <sup>17,22</sup> (Iloc)
10	Swahili	Sanza <sup>22</sup>
11	Tswana	Mosikomabe <sup>22</sup>
12	Elgon	Chepkaset <sup>16</sup>
13	Kikuyu	Mohehe <sup>16</sup>
14	Lumbwa	Serenguet <sup>16</sup>
15	Mundari	Citur, <sup>16,19</sup> Birkitamuli <sup>19</sup>
16	Nandi	Chepkwaret <sup>16</sup>
17	Persian	Bighbarindeh, <sup>16</sup> Shitarak, <sup>16</sup> Shitirak <sup>16</sup>
18	Shangaan	Musisi <sup>16</sup>
19	Sinhalese	Ellanitul, <sup>16</sup> Sudunital <sup>16</sup>
20	Tigrinia	Aftah, <sup>16</sup> Aftehe <sup>16</sup>
21	Twi	Ahyewgya, <sup>16</sup> Orpaphwea <sup>16</sup>
22	Malaysia	Celaka, <sup>17</sup> Celaka bukit, <sup>17</sup> Celaka Putih, <sup>17</sup> Ceraka <sup>17</sup>
23	Tibet	Tsi tra ka (Wylie) <sup>17</sup>
24	Vietnam	Bach hoa xa <sup>24</sup>
25	Singapuri	Agni shikha <sup>24</sup>



**Plumbago zeylanica Linn. (Chitrak) : In Ayurveda**

Chitrak has good medicinal potential, hence enjoys important place in ayurveda.

**Ayurvedic Properties**

Rasa: *Katu*<sup>4,26,27</sup>

Guna: *Laghu, Ruksha, Tikshna*<sup>4,26,27</sup>

Veerya: *Ushna*<sup>4,26,27</sup>

Vipak: *Katu*<sup>4,26,27</sup>

Effect on *Dosha*: *Kaphavatashamaka*<sup>4,26,27</sup> (alleviates *kapha* and *vata*)

*Pittavardhaka*<sup>4,26,27</sup> (Increases *pitta*)

*Karma/Action*: *Deepana*<sup>20,21,23,26,27,28,29</sup> (Appetite stimulant)

*Pachana*<sup>20,21,23,26,27,28,29</sup> (Digestive)

*Pittasaraka*<sup>23,26,27,28</sup> (Increases *pitta*)

*Arshoghna*<sup>20,26,28,29</sup> (Alleviates piles)

*Grahi*<sup>20,21,23,26,27</sup> (Absorbs excessive fluid in intestine/binds stool)

*Krimighna*<sup>20,23,26,27,28</sup> (Worm destroying)

*Kushtahara*<sup>20</sup> (Alleviates skin diseases)

*Raktapittaprakopaka*<sup>23,26,27</sup> (Aggravates *raktapitta/haemorrhage*)

*Kaphaghna*<sup>23,26,27,28</sup> (Removing Phlegm)

*Kanthya*<sup>23,26,27</sup> (Beneficial for throat and voice)

*Garbhasravakara*<sup>23,26,27</sup> (Abortifacient)

*Garbhashaya Sankochak*<sup>23,26,27</sup> (Contracts uterus)

*Swedajanana*<sup>23,26,27</sup> (Sudorific)

*Jwaraghna*<sup>23,26,27</sup> (Febrifuge)

*Shoolahara*<sup>20,21</sup> (Alleviates pains)

*Shothahara*<sup>20,21,23,27</sup> (Anti-inflammatory)

*Lekhana*<sup>20,23,28,29</sup> (Anti-obesity)

*Vajikarana*<sup>23,27,28,29</sup> (aphrodisiac)

*Visphotajanana*<sup>23,28,29</sup> (Vesicant)

*Uttejaka*<sup>23,27,29</sup> (Nerve stimulant)

*Madak*<sup>23,27,29</sup> (Intoxicaton)

*Katupaushtika*<sup>23,26,27,28,29</sup> (Bitter tonic)

*Rasayana*<sup>20,23,27,28,29</sup> (Rejuvenator)

*Triptighna*<sup>20,28,29,30</sup> (Anti saturative)

*Stanya sodhak*<sup>30</sup> (lactodepurant)

*Sukra sodhaka*<sup>30</sup> (Sperm purifier)

**Ayurvedic preparations and formulations of *Plumbago zeylanica* Linn.****Table 3:** Ayurvedic preparations and formulations of *Plumbago zeylanica* Linn.

S. No.	Name of Ayurvedic Preparations and Formulations.	Ref
1	<i>Yogaraja guggulu vati</i>	31,25
2	<i>Saptavimshatika guggulu vati</i>	31
3	<i>Punarnava guggulu vati</i>	31
4	<i>Panchatikta guggulu ghritha</i>	31
5	<i>Vyoshadi guggulu vati</i>	31
6	<i>Chitrakadi vati</i>	21,23,26,32,33
7	<i>Chitraka ghritha</i>	32,33
8	<i>Chitrakaharitaki</i>	21,23,26,32,33
9	<i>Dashamoolarishta</i>	23,32
10	<i>Drakshasava</i>	23,32
11	<i>Lauhasava</i>	23,32
12	<i>Ashwagandharishta</i>	23,32
13	<i>Yakritaplihari lauha</i>	23,32
14	<i>Chitrakadi taila</i>	23,32
15	<i>Chitrakadi Churna</i>	21, 26
16	<i>Agnitundi vati</i>	26
17	<i>Mustadi</i>	26
18	<i>Amalakyadi</i>	26
19	<i>Mushkakadi</i>	26
20	<i>Varemedi</i>	26
21	<i>Aaragvadhadi</i>	26
22	<i>Panchakola</i>	26
23	<i>Shadushana</i>	26
24	<i>Chitrakadi leha</i>	33
25	<i>Shaddharana yoga</i>	25,33
26	<i>Trimada</i>	25
27	<i>Chitra kathi</i>	25
28	<i>Chitraka rasayana</i>	33
29	<i>Chitraka swarasam</i>	34
30	<i>Chitraka kalkam</i>	34
31	<i>Chitraka quantham</i>	34
32	<i>Chitraka himam</i>	34
33	<i>Chitraka phantam</i>	34
34	<i>Amritashatapatlaghritham</i>	35
35	<i>Abhayarishtah</i>	35
36	<i>Agnikumarorasah</i>	35
37	<i>Aarogyapanchakam</i>	35
38	<i>Khandasam churna</i>	35
39	<i>Abhayadi quanthah</i>	35
40	<i>Agnimukham churnam</i>	35
41	<i>Ajamodadi vataka</i>	35
42	<i>Abhayamodaka</i>	35
43	<i>Pippalyadya churna</i>	36
44	<i>Kshirashatapakam ghritha</i>	37
45	<i>Satyadi churna and gutika</i>	37
46	<i>Triphalasava</i>	37
47	<i>Hapushadyam ghritha</i>	37
48	<i>Shwetakaraviradya taila</i>	37
49	<i>Eladi ghritha</i>	38
50	<i>Chitrakadi avaleha</i>	38
51	<i>Chavikadi ghritha</i>	38
52	<i>Tejovatyadi ghritha</i>	38

Chitrak is employed for obtaining various ayurvedic preparations and formulations in Ayurveda (Table 3).

**Medicinal value of *Plumbago zeylanica* Linn.**

*Plumbago zeylanica* Linn. is used in traditional systems of medicine to cure various diseases. All parts of the plant



are used but root is considered to have highest activity<sup>7</sup> and form prominent and effective herbal drug.<sup>26</sup>

**Root** - Root and root bark are bitter, hot and dry.<sup>16</sup> Root and root bark are stomachic, carminative, astringent to bowels, anthelmintic, and used to cure intestinal troubles, dysentery, leucoderma, inflammation, piles, bronchitis, itching, disease of liver, consumption, ascites,<sup>16,23,26</sup> tridosha.<sup>16,26</sup>

**Root bark** - A tincture of root bark is antiperiodic and sudorific. Milky juice is applied to ulcers and scabies.<sup>16,39</sup>

**Root** - Roots are abortifacient,<sup>16,32,39</sup> vesicant,<sup>39</sup> antidiarrhoeal,<sup>39</sup> appetizing,<sup>16,39</sup> digestive,<sup>16,24,32,39</sup> sudorific,<sup>32,39</sup> laxative,<sup>16,24</sup> expectorant,<sup>16,32</sup> alexipharmic,<sup>16</sup> thermogenic,<sup>32</sup> antiatherogenic, cardiotoxic,<sup>19</sup> neuroprotective,<sup>40</sup> nervous stimulant,<sup>40,32</sup> diuretic,<sup>19</sup> caustic,<sup>19</sup> antiseptic,<sup>24</sup> febrifuge,<sup>24</sup> antiperiodic, narcotic,<sup>32</sup> rubefacient,<sup>26</sup> aphrodisiac,<sup>28</sup> alterative or restorative (*rasayana*).<sup>26</sup>

It is useful in the treatment of anasarca, piles,<sup>16,39</sup> leprosy,<sup>16</sup> anemia,<sup>32</sup> ring – worm,<sup>16,32</sup> scabies,<sup>16,32,39</sup> jaundice, migraine, urinary calculi, internal abscesses, insanity, seminal weakness, vaginal discharge<sup>24</sup> (cures menstrual disorders and post partum discharge),<sup>4</sup> dyspepsia,<sup>39,32</sup> epilepsy, hysteria, nervous and rheumatic affections, obesity, indolent ulcer,<sup>39</sup> colic, cough, asthma, helminthiasis, elephantiasis, hepatosplenomagaly, odontalgia,<sup>32</sup> impotency,<sup>4</sup> laryngitis.<sup>23</sup>

**Leaves** - Leaves are used to treat infections and digestive problems such as dysentery.<sup>41</sup> Paste of leaves is applied to painful rheumatic areas or to chronic and itchy skin problems.<sup>42</sup> They are caustic, vesicant, aphrodisiac.<sup>16,23,26</sup>

**Flowers** - Digestant<sup>30</sup>

**Fruit** - Digestant<sup>30</sup>

**Seed** - Decoction of seed is used to reduce muscular pain.<sup>30,41</sup>

#### Some of the uses of Chitrak as described in Ayurveda:

1. Vagbhata and Sushrut have recommended Chitrak as *Rasayana*<sup>28</sup> (rejuvenator)
2. Chitrak along with other ingredients is used to prepare *pippalyadya churna* (ayurvedic formulation) which promotes *agni* (power of digestion) and elimination of *vayu* (flatus) from *koshta* (gastro-intestinal tract).<sup>36</sup>
3. *Chitrakadya gutika* (ayurvedic formulation) stimulates power of digestion and metabolism.<sup>36</sup>
4. *Kshirasatpalaka grita* (ayurvedic formulation) in which chitrak is one of the ingredient and is used to cure *kapha*, *gulma* (phantom tumour), sprue syndrome, anemia, splenic disorders, fever.<sup>37</sup>
5. Fine paste of chitrak should be consumed with cow's urine to get rid of leprosy.<sup>43</sup>

6. A mud pot smeared inside with ghee is given a coating (inside) with the paste of *pippali* (*Piper longum* Linn, long pepper), *pippalimula* (root of long pepper), *pathya* (*Terminalia chebula* Retz), *jantughna* (*Embellia ribes* Burm.f.), and chitraka. After the paste dries up, the pot is filled with takra (buttermilk) and kept undisturbed for a month. This is carminative and cures dyspnoea and cough.<sup>38</sup>
7. Chitrak is one of the ingredient of *Eladi grita*. This recipe consumed daily in the morning followed by drinking of milk is rejuvenator, improves intelligence, eyesight, life span, hunger, cures diseases such as diabetes, abdominal tumour, consumption, anaemia and rectal fistula.<sup>38</sup>
8. *Tejovatyadi grita* (ayurvedic formulation prepared from chitrak and other ingredients) cures haemorrhoids, disorders of duodenum, hiccup and pain in region of the heart and flanks.<sup>38</sup>
9. Buttermilk or curd which is kept overnight in a pot smeared inside with paste of bark of chitrak root is consumed for the cure of piles.<sup>38</sup>
10. The roots of plants are used with honey in obesity.<sup>26</sup>
11. The root decoction is orally useful in anaemia.<sup>26</sup>
12. Chitrak is added to milk while boiling it. Later curd and buttermilk is prepared from that milk. Such buttermilk is excellent remedy for non-bleeding piles.<sup>4</sup>
13. Root paste is applied in arthritis.<sup>4</sup>
14. The root paste is used as antidote for snake bite.<sup>44,45</sup> It is used in both vegetable as well as animal poisoning.<sup>43</sup>
15. The root is used as masticating for tooth ache<sup>46</sup> (odontalgia)<sup>32</sup>
16. The fine paste made out of root of chitrak, a stem bark of *Erythroxylon monogymum* Roxb and *Moringa oleifera* Lam. in equal proportion ground with cow's urine is applied externally to relieve oedema of legs.<sup>34</sup>
17. The fresh juice of chitrak root (*chitrak swarasam*) is taken with cow's urine twice a day for 2 – 3 weeks relieves internal piles.<sup>34</sup>
18. Paste of fresh root of chitrak (*chitrak kalkam*) is applied externally to filarial leg.<sup>34</sup>
19. The paste made out of chitrak root churnam (1-2 g) is taken with buttermilk (30-60 ml), 2-3 times a day to give quick relief in diarrhoea.<sup>34</sup>
20. The decoction prepared out of chitrak root bark churnam is taken orally twice in a day for about 1-2 weeks gives relief from dysentery, abdominal disorders, peptic ulcers, piles and improves appetite<sup>34</sup>



21. External application of the paste of root of chitrak, *Nerium oleander* L. and stem bark of *Semicarpus anacardium* L.f., *Holoptelia integrifolia* (Roxb) Planch and excretory matter of pigeon in equal proportions induces early maturation, rupture and healing of abscess.<sup>34</sup>
22. External application of paste made out of fresh root of chitrak soaked in cow's urine for a period of 24 hours gives relief in scabies.<sup>34</sup>
23. Chitrak root is employed for production of *chitrakadi avaleha* (confection) which cures piles, leprosy, splenic diseases, abdominal tumours and enlargement of the abdomen and increases the digestive power.<sup>38</sup>
24. Cow's urine mixed with powder of chitraka and *vyosa* [*Zingiber officinale* Rosc. (dry ginger) + *Piper longum* Linn (long pepper) + *Piper nigrum* Linn (black pepper)] and added with honey is poured into a pot smeared with ghee in its interior and kept undisturbed for a fortnight. Consumption of this cures leucoderma.<sup>38</sup>
25. *Vidang* (*Embelia ribes* Burm. f.) Chitrak, *saktu* (corn flour) mixed with ghee, *saindhava* and *vacha* (*Acorus calamus* Linn) should be burnt to ashes on the pan and consumed with milk to cure abdominal tumour and splenic enlargement.<sup>38</sup>
26. The decoction of *palas* (*Butea monosperma* Lam), *chitraka*, *chavya* (*Piper retrofractum* Vahl), *matulunga* (*Citrus medica* Linn), *haritaki* (*Terminalia chebula* Retz), *Pippali* (*Piper longum* Linn), *pippalimula* (root of *Pippali*), *patha* (*Cissampelos pareira* Linn.), *nagara* (*Zingiber officinale* Rosc.), *dhanyaka* (*Coriandrum sativum* Linn) is given to the patient suffering from *kaphaja* type of *grahani* (sprue syndrome).<sup>36</sup>
27. Alkali preparation made from *haridra* (*Curcuma longa* Linn), *daruharidra* (*Berberis aristata* DC), *vacha* (*Acorus calamus* Linn), *kustha* (*Saussurea lappa* C.B.Clarke), *chitrak*, *katuruhini* (*Picrorhiza kurroa* Royle ex Benth), *musta* (*Cyperus rotundus* Linn) is used to promote *agni* (power of digestion).<sup>36</sup>
28. A paste of *vidanga* (*Embelia ribes* Burm.f.), *Chitraka*, *danti* (*Baliospermum montanum* Muell-Arg), *chavya* (*Piper retrofractum vahl*) and *vyosa* are consumed with milk to cure abdominal enlargement.<sup>38</sup>

### Side Effects and Toxic Effects

Excessive use of chitrak cause toxicity. Higher dose of Chitrak creates irritant and intoxicant effect. It causes burning of tongue, throat, stomach and all over the body. It also causes nausea, vomiting, diarrhoea, dysuria, burning micturition. Pulse becomes feeble and skin becomes wrinkled and cold. If given in pregnancy, it causes irritation of pelvic organs which leads to abortion.<sup>4</sup>

Treatment for excessive doses - Discontinue its use and give *sheeta* and *snigdha dravyas* such as milk, ghee, butter and also *Suvarnabhasma*.<sup>28</sup>

### *Plumbago zeylanica* Linn in classical Ayurvedic script

त्रिविधः सतु विज्ञेयः कृष्णः श्वेतोऽथ रक्तकः।<sup>47</sup>

According to this verse in *Yogaratanasamuccayam*, there are three types of chitrak-black, white and red.<sup>47</sup>

यशास्वं चित्रकः पुष्पैर्ज्ञेयः पीतसितासितैः॥  
यथोत्तरं स गुणवान् विधिना च रसायनम्॥६२॥<sup>48</sup>

From this verse in *Vagbhata's Astangahrdayam* we get three types of chitrak viz. yellow flowered, white flowered, black flowered—more effective in successive order. When they are used in proper procedure, they act as rejuvenator.<sup>48</sup>

छायाशुष्कं ततो मूल मासं चूर्णीकृतं लिहन्।  
सर्पिषा मधुसर्पिभ्यां पिबन् वा पयसा यतिः॥६३॥  
अम्भसा वा हितात्राशी शतं जीवति नीरुजः।  
मेधावी बलवान् कान्तो वपुष्मान् दीप्तपावकः॥६४॥<sup>48</sup>

This verse in *Vagbhata's Astangahrdayam* depicts the importance of chitrak as rejuvenator. The fine powder of shade dried roots of chitrak is licked with ghee or mixture of ghee and honey or consumed along with milk or water and partaking only healthy / suitable food make the person to live for hundred years without any diseases, endowed with intelligence, strength, radiance, pleasant look and good digestive power.<sup>48</sup>

चित्रको दहनो व्यालः पाठीनो दारुणोऽग्निः।<sup>49</sup>  
ज्योतिष्को बल्लरी वह्निः पाली पाठी कटुः शिखी॥८०॥  
कृष्णोऽरुणोऽनलो द्वीपी चित्रभानुश्च पावकः।

*Dahan*, *vyala*, *pathina*, *darun*, *agnika*, *vyotishka*, *vallari*, *vahni*, *pali*, *pathi*, *katu*, *shikhi*, *krishnaruna*, *anala*, *dvipi*, *chitrabhanu* and *pavaka*-all these are synonyms of chitrak.<sup>49</sup>

चित्रकोऽग्निश्च शार्दूलश्चित्रपाली कटुः शिखी।<sup>50</sup>  
कृशानुर्दहनो व्यालो ज्योतिष्कः पालकस्तथा॥४३॥  
अनलो दारुणो वाहिः पावकः शबलस्तथा।  
पाठी द्वीपी च चित्राङ्गो ज्ञेयः शूरश्च विंशतिः॥४४॥

*Chitrak*, *agni*, *shardula*, *chitrapali*, *katu*, *shikhi*, *kushanu*, *dahana*, *vyala*, *vyotishka*, *palaka*, *anala*, *daruna*, *vahni*, *pavaka*, *shabala*, *pathi*, *dvipi*, *chitranga* and *shura* - all these are twenty synonyms of chitrak.<sup>50</sup>

चित्रकमूलं दीपनीयपाचनीयगुदशोथार्शःशूलहराणां।<sup>51</sup>

Roots of chitrak are best appetite stimulant (*Deepana*), digestive (*Pachana*) and best remedy in anus inflammation, piles and abdominal pain.<sup>51</sup>

चित्रकोऽग्निसमः पाके कटुः शोफकफापहः।  
वातोदराशोऽग्रहणी-क्रिमिकण्डूतिनाशनः॥४५॥<sup>39,50</sup>



Chitrak is digestive. It is *katu* (pungent) in *vipaka* (after digestion). It is prescribed for *sopha* (oedema), deranged *kapha* and *vata*, *udararoga* (diseases of abdomen), *arsha* (piles), *grahani* (sprue), *krimi* (worm infestation) and *kandu* (pruritus).<sup>39,50</sup>

सिकतामेहिनं चित्रककषायं पाययेत्।<sup>43</sup>

The decoction of root of Chitrak is given in *sikatameha*<sup>43</sup> (urinary ailment)

चित्रकोऽनलनामा च पाठी व्यालस्तथोषणः।<sup>52,53</sup>  
चित्रकः कटुकः पाके वह्निकृत्पाचनो लघुः ॥७०॥  
रुक्षोष्णो ग्रहणीकुष्ठशोथार्शः कृमिकासनुत्।  
वातश्लेष्महरो ग्राही वातघ्नः श्लेष्मपित्तहृत् ॥७१॥

*Anala* (fire) with all its other names-*pathi*, *vyala* and *ushna* are the names of chitrak. Chitrak is *katu* (pungent) both in taste and *paka* (after digestion). It kindles digestive fire, digestive, *laghu* (easy for digestion), *ruksha* (dry), *ushna* (hot in potency).

It cures *grahani* (sprue syndrome), *kushta* (obstinate skin diseases), *shotha* (inflammation), *arsha* (piles), *krimi* (worm infestation) and *kasa* (cough). It mitigates *vata*, *shleshma* (kapha), water absorbent (*grahi*) and cures diseases arising from deranged *vata*, *kapha*, *pitta*.<sup>24,52,53</sup>

The synonyms of fire like *pathi*, *vyal*, *agni*, *vahni* etc. are attributed to chitrak to indicate very burning action of root causing blisters on skin.<sup>54</sup>

मण्डूरलोहाग्निविडङ्गपथ्याव्योषांशकः सर्वसमानताप्यः।<sup>55</sup>  
मूत्रासुतोऽयं मधुनाऽवलेहः पाण्ड्वामयं हन्त्यचिरेण घोरम् ॥२३॥

*Manduraloha* (Iron slag), *agni* (chitrak), *vidanga* (*Embellia ribes* Burm.f.), *pathya* (*Terminalia chebula* Retz), *vyosa* [*Zingiber officinale* Rosc. (dry ginger) + *Piper longum* Linn (long pepper) + *Piper nigrum* Linn (black pepper)]-all in equal parts added with equal part(of all) of *tapy* (Iron pyrites) and soaked in cow's urine for some days and then consumed to cure severe *panduroga* (anemia).<sup>55</sup>

मूलं बलचित्रकयोः पिबेद्वा पाण्ड्वामयातोऽक्षसं हिताशी।<sup>55</sup>  
सुखाम्बुना वा लवणेन तुल्यं शिशोः फलं क्षीरभुजोपयोज्यम् ॥२६॥

Patient of *panduroga* (anemia) may consume root of *bala* (*Sida cordifolia* Linn) and chitrak one *aska* (10 gram) in quantity along with comfortable warm water or consume fruit of *sigru* (*Moringa oleifera* Lam) with equal quantity of *lavana* (*saindhava*) with food along with milk.<sup>55</sup>

पिप्पली पिप्पलीमूलं चव्यचित्रकनागरैः।<sup>53</sup>  
पञ्चभिः कोलमात्रं यत्पञ्चकोलं तदुच्यते ॥ ७२ ॥  
पञ्चकोलं रसे पाके कटुकंरुचिकृन्मतम्।  
तीक्ष्णोष्णं पाचनं श्रेष्ठं दीपनं कफवातनुत् ॥  
गुल्मप्लीहोदरानाहशूलघ्नं पित्तकोपनम् ॥७३॥

*Pippali* (*Piper longum* Linn., long pepper), *pippalimula* (root of long pepper), *chavya* (*Piper retrofractum* Vahl), *chitrak*, *nagara* (*Zingiber officinale* Rosc., dry ginger) –

these five are combined in the quantity of one kola (five gram) each, is known as '*Panchakol*'.

It is pungent (*katu*) in taste and after digestion.

It improves taste, it is penetrating, hot in potency, best digestive and promoter of digestive fire, mitigates *kapha* and *vata*, cures abdominal tumour, diseases of spleen, enlargement of abdomen, flatulence, colic and aggravates *pitta*.<sup>53</sup>

पञ्चकोलं समरिचं षडूषणमुदाहृतम्।<sup>53</sup>  
पञ्चकोलगुणं तत्तु रुक्षमुष्णं विषापहम् ॥७४॥

'*Panchakol*' together with *maricha* (*Piper nigrum* Linn., black pepper) is known as '*shadushan*'. The properties are same as '*Panchakol*', especially being dry and hot in potency and it removes effect of poison.<sup>53</sup>

### Types of Chitrak in Ayurveda

There is no consistency in Ayurveda about types of chitrak. Depending upon colour of flowers, four types of chitrak are mentioned-White (*Sveta*), Yellow (*Pita*), Red (*Rakta*), Black (*Krishna*).<sup>4,26</sup> Vagbhata quoted three types of chitrak - *Sveta*, *Pita* and *Asita* (black).<sup>33,48</sup> But according to commentator Dr. Indradeo Tripathi, yellow and red types are same.<sup>50</sup> According to Yogaratasamuccayam three types of Chitrak-Black, White and Red.<sup>47</sup> In Rajnighantu *rakta* chitrak is also called '*Kalah*' chitrak.<sup>33,50</sup> Blue chitrak and black chitrak are synonymous.<sup>52,56</sup> White and red chitrak are used widely. Red chitrak is more potent but scarce.<sup>4</sup> Usually three types are recognized-*Plumbago zeylanica* Linn (White), *Plumbago rosea* L (Red), *Plumbago capensis* Thunk (Blue).<sup>33</sup> These three types are also recorded from India.<sup>19</sup>

### *Plumbago zeylanica* Linn.: In UNANI

*Plumbago zeylanica* Linn. is used in many unani preparations (Table 4).

**Table 4:** Unani preparations of *Plumbago zeylanica* Linn. and their uses

Sr. No.	Unani Preparation	Uses
1	Habbe Asfar	Used in gout(joint pain), hemiplegia, sciatica
2	Anqruya Kabeer	Nervine tonic and used in arthritis, hemiplegia
3	Majoon baladur	Nervine tonic and used in arthritis, hemiplegia
4	Majoon regmahi	Nervine tonic and used in sexual debility
5	Majoon falasfa	Brain tonic, Nervine tonic, eye tonic, used in poor digestion, low back ache
6	Majoon jograj guggul	Nervine tonic, used in hemiplegia, poor digestion, obesity, hyperlipidemia

### *Plumbago zeylanica* Linn.(Medicinal Uses): ABROAD

*Plumbago zeylanica* Linn., a traditional medicinal plant in India, is also a important ethnomedicinal plant in foreign countries (Table-5).

### *Plumbago zeylanica* Linn.: Ethnoveterinary Uses

1. The root bark is used to stop bleeding in ruminants.<sup>63</sup>



2. Leaves are used for relief in flatulence in animals.<sup>64</sup>
3. Root paste is applied externally on local inflammation in animals.<sup>65</sup>
4. Root is used to expel worms from horses in Java.<sup>63</sup>

### Phytochemical Constituents

Literature review revealed presence of following phytochemical constituents in *Plumbago zeylanica* Linn. – naphthoquinones (plumbagin, biplumbagin, chloroplumbagin, chitranone, elliptone),<sup>17,22</sup>

binaphthoquinones,<sup>6</sup> coumarins (seselin, 5-methoxyseselin, suberosin, xanthyletin),<sup>17,22</sup> di-phenyl sulfone, carboxylic acids and esters, meroterpenes, triterpenoids, amino acids, anthraquinones, steroids, steroid glucosides, sugars, and other compounds.<sup>6</sup> Amongst all these compounds plumbagin is major ingredient with 1% in the whole plant but with higher percentage in root.<sup>22</sup>

**Table 5:** Traditional medicinal uses of *Plumbago zeylanica* Linn. in abroad

Sr. No.	Name of Country / Continent / Community / City	Uses	Ref.
1	Africa	1. A cold infusion of root is used for influenza and black water fever	19
		2. Pulped roots or aerial parts are inserted into vagina to induce abortion	22
		3. Roots used for jaundice, skin diseases	58
		4. Roots and leaves used for fertility related disorders	58
		5. Roots or leaves crushed with lemon juice are used as counter irritant and vesicant(West Africa)	7,59
		6. Roots mixed with okra( <i>Hibiscus esculentus</i> )is used to treat leprosy(West Africa)	60,61
		7. A paste of powered root or root sap is used for tattooing(Eastern Africa)	7
		8. Plant is used for treatment of gastro-intestinal complaints (North-west Ethiopia)	62
		9. It is folk medicine against parasitic diseases, scabies, ulcers(South-west Nigeria)	62
		10. Root infusion is used for shortness of breath(Zimbabwe)	22
		11. Root cooked with meat in soup is considered as aphrodisiac(Zimbabwe)	7,22
		12. Roots used as remedy for diarrhoea and dyspepsia(Mauritius and Rodrigues)	7,22,59
		13. Roots applied as enema for treatment of haemorrhoids(Ghana)	22
		14. Roots boiled in milk are used as remedy for inflammation of mouth, throat and chest(Zambia)	22
		15. Powered bark, root, leaf used to treat gonorrhoea, syphilis, tuberculosis (Ethiopia)	7,22
		16. Roots pounded with vegetable oil are used in rheumatic swellings(Nigeria)	7,59
		17. Roots applied as vesicant(Madagascar)	7
		18. Decoction of leaves is drunk as purgative(Madagascar)	7
		19. Root decoction is taken to treat bacterial infection of urethra and bladder(Madagascar)	7
		20. Pounded root is applied to treat itch(DR Congo and Gabon)	7
		21. Roots with other plant parts are used on tumour(Tanzania)	60
2	Malaysia	1. Extract of root is used to treat hypertension	22
		2. Decoction of plant is provided on third day postpartum	22
		3. Eating of leaves cause abortion	19
3	China	Plant increases digestive heat with fire like power	22
4	Indonesia	Leaves applied over pubic region in dysuria	22
5	New Caledonia	Plant is used as vulnerary	16
6	Gold Coast	Roots are used as an enema to cure piles	16
7	Nepal	1. Plant is used as antiviral medicine	62
		2. It is used to treat dyspepsia, diarrhoea, haemorrhoids	22
		3. Decoction of root is used to treat baldness	60
8	Taiwan	Folk medicine for anti-helicobacter activity	62
9	Japan and Philippines	Roots are used for causing abortion	60

### Pharmacological Review

*Plumbago zeylanica* Linn. show wide spectrum of Pharmacological activities (Table 6).

Vishnukanta and Rana evaluated the anticonvulsant activity of *Plumbago zeylanica* Linn. leaves. It was found that hydroalcoholic (70:30) extract of leaves has no anticonvulsant activity<sup>71</sup>.

### CONCLUSION

*Plumbago zeylanica* Linn is widely accepted medicinal plant in ayurveda, unani and many countries. Overall literature survey indicates its use against wide range of diseases and as rejuvenator (*Rasayana*). Presence of wide

number of biologically active phytochemicals and its pharmacological activities indicates its future perspective in pharmaceutical industry to bring out new innovations in the field of medicine.

It will prove an important contributor to improve human health and well being.

The results reviewed in the study are aimed at encouraging and attracting attention of researchers to produce new drugs from *Plumbago zeylanica* Linn. and rapid regeneration of *Plumbago zeylanica* Linn. to ensure sustainability and easy availability of plant for treatment of various diseases.



**Table 6:** Pharmacological activities of *Plumbago zeylanica* Linn.

S. No.	Name of pharmacological activity	Ref
1	Analgesic Activity	22,30,66
2	Memory inducing Activity	22,67
3	Anticancer Activity	6,22,40,68
4	Anti-inflammatory Activity	6,22,30,40
5	Hepatoprotective Activity	22
6	Antidiabetic Activity	22,40
7	Antifertility Activity	6,22, 40
8	Immunosuppressive Activity	22
9	Antioxidant Activity	22,40
10	Antiallergic Activity	6,22,30,40
11	Abortifacient Activity	22,30,40
12	Wound Healing Activity	6
13	Antiatherosclerotic Activity	6
14	Leishmancidal Activity	30
15	Trypanocidal Activity	30
16	Antimalarial Activity	30,40
17	Antiviral Activity	30,40
18	Antiulcer Activity	69
19	Hypolipidemic Activity	6,40
20	Antigonorrhoeal Activity	6
21	Antibacterial Activity	6,30,40,70
22	Antifungal Activity	6,40
23	Larvicidal Activity	22
24	Anthelmintic Activity	40

**Acknowledgement:** The authors are grateful to Dr. Santalal Dwivedi, Head, Dept. of Dravyagunvignyan, Chaitanya Ayurved Mahavidyalaya, Sakegaon and Hkm Qazi Azimuddin, Head, Dept. of Ilmul Advia, Alhaj Ab. Razzaque Kalsekar Unani Medical College and Shri Sureshdada Jain Hospital and Research Centre, Jalgaon for useful discussions and help in preparing the manuscript.

## REFERENCES

- Agrawal SS, Paridhavi M, Herbal drug Technology, Universities press (India) Private limited, Hyderabad, 2007, 1-9.
- Plumbaginaceae, <http://en.wikipedia.org/wiki/plumbaginaceae>
- Anjum Perveen, Qaiser M, Pollen Flora of Pakistan XXXIX Plumbaginaceae, Pak. J. Botany 36(2), 2004, 221–227.
- Gogte VM, Ayurvedic Pharmacology and therapeutic uses of Medicinal plants (Dravyagunvignyan), translation by the academic team of Bharatiya Vidya Bhavan's SPARC, Chaukhamba Publication, New Delhi, 2009, 370-372.
- Plumbago*, <http://en.wikipedia.org/wiki/Plumbago>
- Kishore N, Mishra BB, Tiwari VK, Tripathi V, An account of Phytochemicals from *Plumbago zeylanica* (Family: Plumbaginaceae): A natural gift to human being<sup>†</sup>, Chron Young Sci, 3, 2012, 178–198.
- Prota 11 (1): Medicinal plants/Plantes medicinales 1 Record display, *Plumbago zeylanica* L, [http://database.prota.org/PROTAhtml/Plumbago%20zeylanica\\_En.htm](http://database.prota.org/PROTAhtml/Plumbago%20zeylanica_En.htm)
- Sambamurthy AVSS, Taxonomy of Angiosperms, I.K. International Pvt. Ltd. New Delhi, 732, 2005, 24-66.
- Pandey BP, Taxonomy Of Angiosperms, S Chand and company Ltd, New Delhi, 2007, 9-45.
- Verma BK, Introduction to Taxonomy of Angiosperms, PHI Learning Pvt. Ltd., New Delhi, 2011, 20-73.
- Kubitzki K, Plumbaginaceae, In: Kubitzki K, Rohwer JG, Bittrich V (Editors) The families and genera of vascular plants, Vol II, Springer-Verlag Berlin Heidelberg, New York, 1993, 523-526.
- Datta SC, Systematic Botany, 4<sup>th</sup> edition, New age International (P) Limited, New Delhi, 1996, 389-391.
- Lawrence GHM, Taxonomy of Vascular Plants, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1967, 114-140, 660-662.
- Sharma OP, Plant Taxonomy, Second edition, Tata McGraw Hill Education Private Limited, New Delhi, 2011, 372-374.
- Subrahmanyam NS, Modern Plant Taxonomy, Vikas Publishing House, Pvt. Ltd. New Delhi, 2003, 51-124.
- Kirtikar KR, Basu BD, ICS, Indian Medicinal Plants, Second Edition, Vol 6, Oriental Enterprises, Dehradun, 2001, 2029–2035.
- Datta Sanjana, Mishra RN, *Plumbago zeylanica* Linn (Chitrak) – Review as Rasayan (Rejuvenator/Antiaging) International Journal of Research in Pharmaceutical and Biomedical Sciences, 3(1), Jan-Mar 2012, 250–267.
- Joshi SG, Medicinal Plants, Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi, 2003, 313.
- The Wealth of India: A dictionary of Indian raw materials and industrial products Vol VIII, Publications and information directorate, CSIR, New Delhi, 1989, 162–164.
- Satyavati GV, Gupta AK, Tandon Neeraj (Editors) Medicinal Plants of India, Indian council of Medical Research, New Delhi, Vol 2, 1987, 471–479.
- The Ayurvedic Pharmacopoeia of India Part I, The controller of Publications Delhi, Vol I, 2001, 29.
- Singh Mukesh, Nagori Kushagra, Iyer Shiv, Khare Gaurav, Sharwan Gotmi, Tripathi DK, Ethnomedicinal, Traditional and Pharmacological aspects of *Plumbago zeylanica* Linn, Pharmacologyonline, 3, 2011, 684-700.
- Sharma PC, Yelne MB, Dennis TJ, Database on medicinal plants used in Ayurveda Volume I, Documentation and publication division, Central council for research in Ayurveda and siddha, New Delhi, 2000, 102–113.
- Dev Sukh, A Selection of prime Ayurvedic plant drugs, Ancient modern concordance, Anamaya publishers, New Delhi, 2006, 348-351.
- Nadkarni AK (Revised and enlarged), Dr. K M Nadkarni's Indian Materia Medica, Popular Prakashan Private Ltd. Bombay 2009, 988–993.
- Pandey Gyanendra, Dravyaguna vijñāna, Part I, Krishnadas Academy, Varanasi, 2002, 512-520.
- Sharma PV, Dravyaguna vijñāna vol II, Caukhambha Bharti Academy, Varanasi, 2001, 359-362. (Hindi book).
- Deshpande AP, Ranade Subhash, Dravyaguna, vijnyana (part I and II) Proficient Publishing House, Pune, 2010, 468–472.
- Deshpande AP, Jawalagekar RR, Ranade Subhash, Dravyagun vidnyan (Bhag-1 and 2), Anmol prakashan, Pune, 1997, 533–537 (Marathi Book)
- Vishnukanta, Rana AC, *Plumbago zeylanica*: A phytopharmacological review, Vol 2 Issue 2, 2011, 247–255.
- The Ayurvedic Pharmacopoeia of India part II, Vol II, The controller of Publications, Delhi, 2008, 121–143.
- Bhutya Ramesh Kumar, Ayurvedic medicinal plants of India Vol 2, Scientific Publishers(India), Jodhpur 2011, 87–89.
- Sastry JLN, Dravyaguna vijñāna, Vol II Chaukhambha, Orientalia, Varanasi, 2014, 314–317.
- Chetty KM, Sivaji K, Sudarsanam G, Sekar PH, Pharmaceutical studies and therapeutic uses of *Plumbago zeylanica* L. Roots (Chitraka, Chitramulam) Ethnobotanical leaflets, 10, 2006, 294-304.
- Shah Nagin Das Chhagan Lal (Editor) Bharat Bhaisajya Ratnakara, Vol I, B. Jain Publishers(P) Ltd., Delhi, 1995 (Hindi Book).
- Sharma RK, Dash Bhagwan, Agnivśā's Carak Samhitā Vol IV, Chowkhamba Sanskrit series office, Varanasi, 2009.





37. Sharma RK, Dash Bhagwan, Agniviśa's Carak samhita Vol III cikitsā sthān, Chowkhamba Sanskrit series office, Varanasi, 2009, 273, 278, 289, 341, 347.
38. Murthy KR Srikantha (Translator) Vāgbhaṭa's Aṣṭāṅga Hrdayam vol II, Nidāna, Cikitsita and Kalpasiddhi sthāna, Chowkhamba Krishnadas Academy, Varanasi, 2010.
39. Chatterjee Asima, Pakrashi Satyesh Chandra (Editors) The treatise of Indian medical plants Vol 4, National institute of science communication and Information Resources, New Delhi, 2003, 55–56.
40. Ganesan Kumar, Gani Sharmila Bani, Ethnomedical and Pharmacological potentials of *Plumbago zeylanica* L – A review, American journal of phytomedicine and clinical therapeutics, 1(3), 2013, 313-337.
41. Moshrafuddin Ahmed, Medicinal plants, MJP Publishers, Chennai, 2010, 361-362.
42. Prajapati Narayan Das, Purohit SS, Sharma Arun K, Kumar Tarun, A Handbook of Medicinal plants, Agrobios (India), Jodhpur, 2003, 410.
43. Murthy KR Srikantha (Translator) Surśuta Samhitā, Vol II. Cikitsā Sthāna and Kalpa Sthāna, Chaukhamba Orientalia, Varanasi, 2010, 112, 126, 127, 460.
44. Retnam KR, Martin P, Ethnomedicinal plants Agrabios (India), Jodhpur, 2006, 140, 141.
45. Pade SD, Vanaudashi – Gunadarsh, Publisher-Rajendra Vitthal Raghuvanshi, Pune 164 – 165 (Marathi Book).
46. Bhattacharjee SK, Handbook of Medicinal plants, Pointer Publishers, Jaipur, 2004, 274.
47. Arya Vaidya Sala, (Editor), Indian Medicinal plants - a compendium of 500 species, Orient Longman Ltd., Vol 4, 321-326.
48. Murthy K. R. Srikantha (Translator) Vāgbhaṭa's Aṣṭāṅghrdayam, Chowkhamba Krishnadas Academy, Varanasi, Vol III, 2012, 391.
49. Oza Zarkhande, Mishr Umapati (Editor and Hindi commentator), Dhanvantarinighantu, Chowkhamba Surbharati Prakashan, Varanasi, 1996, 114.
50. Tripathi Indradeo (Hindi commentator) Rajanighantu of Pandit Narahari edited with Dravyagunaprakasika, Krishnadas Academy, Varanasi, 1982, 143-144.
51. Shashri Kashinath, Chaturvedi Gorakhanath (Hindi commentator), The Charak Samhita of Agnivesha Part I, Chawkhamba Bharati Academy, Varanasi, 1998, 467-471.
52. Chuneekar Krushnachandra (Hindi commentator), Pandey Gangasahaya (Editor) Bhavprakashnighantu Caukhambha Bharti Academy, Varanasi, 2010, Haritakyadivarg, 21–24.
53. Murthy KR Srikantha (Translator), Bhāvaprakāśa of Bhāvamiśra, Krishnadas Academy, Varanasi, 1998, Vol I, 169-170.
54. Bhaskar P (Editor) Encyclopedia of Ayurvedic Medicinal Plants, Mangalam Publication, Delhi, 2011, Vol2, 400-404.
55. Murthy K. R. Srikantha (Translator), Surśuta Samhita Vol III, Chowkhamba Orientalia, Varanasi, 2010, 289
56. Desai VG, Aushadhi Sangrah, Raghuvanshi Prakashan, Pune. (Marathi Book)
57. Allama Hkeem Najamul Ghani, Rampuri, Khazaenu Advia, Adara Kitabushif, New Delhi, 635-636. (Urdu Book)
58. Jain SK, Notable foreign medicinal uses of some plants of Indian tradition, Indian Journal of Traditional knowledge, October2003, Vol2(4), 321-322.
59. Pant Manju, Lal Ankita, Rana Swati, Rani Anju, *Plumbago zeylanica* L.: A Mini Review, International Journal of Pharmaceutical Applications, 3(3), 2012, 399-405.
60. Kumar Ashwani, Ethnobotanical studies on medicinal plant: Chitram, Science2.0 (<http://www.science20.com>), Dec 23, 2009.
61. Zingare AK, Encyclopedia of medicinal flora, Vol II, Satyam Publishers and distributors, Jaipur, 2012, 78-79.
62. *Plumbago zeylanica* (Plumbaginaceae) <http://www.mmh-mms.com/downloads/mp15plumbagozeylanica.pdf>
63. Divine Remedies, complete herbal guide for everyone, Herbs A TO Z <http://www.divine-remedies.com/plumbago-zeylanica.htm>
64. Nag Ambika, Galav Praveen, Katewa SS, Indigenous animal healthcare practices from Udaipur district, Rajasthan, Indian Journal of Traditional knowledge, Vol 6(4), October 2007, 583-588.
65. Deshmukh RR, Rathod VN, Pardeshi VN, Ethanoveterinary medicine from Jalana district of Maharashtra State, Indian Journal of Traditional knowledge, Vol 10(2), April 2011, 344-348.
66. Mittal Vineet, Sharma SK, Kaushik Deepak, Khatri Meenu, Tomar Kusum, A comparative study of analgesic activity of *Plumbago zeylanica* Linn callus and root extracts in experimental mice, Research Journal of Pharmaceutical, Biological, and Chemical sciences, 1(4), October-December, 2010, 830-836.
67. Mittal Vineet, Sharma SK, Pawan Jalwal, Hooda Anil, Mor J, *Plumbago zeylanica* roots: A potential source for improvement of learning and memory, International Journal of Pharma and Biosciences, V1(2), 2010, 1-6.
68. Hiradeve Sachin, Danao Kishore, Kharabe Vijay, Mendhe Bibhilesh, Evaluation of anticancer activity of *Plumbago zeylanica* Linn. leaf extract, International Journal of Biomedical Research, 1(2), 2010, 1-9.
69. Falang, Kakjing Dadul, Uguru Mary Ogonnaya, Wannang Noel Nenman, Azi Iliya Hosea, Chaiamaka Nwoye, Antiulcer activity of *Plumbago zeylanica* Linn root extract, J. Nat. prod. plant resources, 2(5), 2012, 563-567.
70. Dhale DA, Markandeya SK, Antimicrobial and phytochemical screening of *Plumbago zeylanica* Linn (Plumbaginaceae) leaf, Journal of experimental sciences, Vol2, Issue3, 2011, 4-6.
71. Vishnukanta, Rana AC, Evaluation of anticonvulsant activity of *Plumbago zeylanica* Linn leaf extract, Vol 3, Issue1, Jan-March 2010, 76-78.

**Source of Support:** Nil, **Conflict of Interest:** None.

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