



Pharmaceutical Standardisation

A comparative pharmacognostical profile of *Desmodium gangeticum* DC. and *Desmodium laxiflorum* DC.

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Abstract

Shaliparni is one of the *Laghupanchamoola* ingredients. *Desmodium gangeticum* DC. is an accepted source of *Shaliparni* as per Ayurvedic Pharmacopoea of India (API). *Desmodium laxiflorum* DC. is the drug commonly used instead of *D. gangeticum* in the Saurashtra region. The study is an attempt to compare the above said two species on the basis of their pharmacognostical profiles. The macroscopy and microscopy of roots of both plants were studied as per standard procedures. Root powders of both *Desmodium* species used in the experimental study to ascertain its *Rasa* by dilution method. Both the species show the same *Rasa* and *Anurasa* i.e., *Madhura* and *Kashaya* and almost same morphological and microscopical characters like prismatic crystals, starch grains etc. Hence it is concluded that *D. laxiflorum* may be considered as a substitute for *D. gangeticum* on the basis of present pharmacognostical study.

Key words: *Desmodium gangeticum* DC., *Desmodium laxiflorum* DC., pharmacognosy

Introduction

Shaliparni is one of the most potent drugs of *Dashamoola*. However, due to less availability, *Desmodium gangeticum* DC. is often substituted with other *Desmodium* species like *Desmodium laxiflorum* DC., etc., to meet the remarks. Both these *Desmodium* species have closely related morphological and microscopical characters. They are erect stout herbs under shrubs, growing 40-120 cm high, stems angled, more or less hairy.^[1] Both species traditionally used for *Atisara* (diarrhea) and *Grahani* (dysentery).^[2] The present investigation includes morphological and anatomical evaluation of the both species. *D. gangeticum* and *D. laxiflorum* are the herbs belonging to the same family Fabaceae, widely found in Saurashtra region of Gujarat. Commonly, these plants are known as *Ekpanipandadiyo* and *Runchhadopandadiyo* respectively.^[3]

Materials and Methods

Collection and authentication of plant materials

The plant *D. gangeticum* and *D. laxiflorum* were collected during July-August and October-November from Jamnagar

and Junagadh region respectively and authenticated through Pharmacognosy Laboratory, Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar. Voucher specimen was also preserved for further references. The roots were separated, washed under running tap water; air dried under shade, coarsely powdered and kept in airtight container for further use.

Rasa Nirधारana (dilution method)

Root powders of both *Desmodium* species used in the experimental study to ascertain its *Rasa* by dilution method.^[4] Study was conducted in 40 volunteers who can identify and express the taste. Volunteers were the scholars of the post-graduate course in I.P.G.T. and R.A and were in the age range of 23-35 years.

Volunteers were requested to taste the plant powder after gargling with normal drinking water. They were requested to write down the taste they felt immediately after putting the powder on tongue and after half-a-minute on slip of paper. The results were interpreted based on the *Rasa* perceived. The taste immediately felt in the first half minute is considered as the *Pradhana Rasa* and that perceived after is *Anurasa*.

Macroscopic and microscopic analysis

The macroscopy and microscopy of both the roots were studied as per standard procedures. For the microscopical studies, cross sections were prepared and stained with phloroglucinol and hydrochloric acid as per the procedures. The powder study has done following the same method.^[5]

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Histochemical tests

The histochemical tests of powdered drugs were performed as per standard procedures^[6] [Table 1].

Observations and Results

Macroscopic characters

The plant *D. gangeticum* is a stout herb, up to 1 m height generally, has poorly developed tap root system and 5-15 or more, long deep growing prominent spreading lateral roots, arising from its basal part. The lateral roots are very strong and cord like, long, nearly uniformly cylindrical and smooth. They have thick central strand of wood surrounded by a comparatively thin but tough bark. The root grows 2-3 foot deep. The outer surface is yellowish brown in color. Wood part is light yellow in color, hard, woody. Fracture is hard and short. The drug has slight characteristic odor and taste.

The plant *D. laxiflorum* is an erect herb, up to 20-25 cm height, generally and well developed, nearly uniformly cylindrical, long, deep growing tap root system with lateral roots. They have thick central strand of wood surrounded by a comparatively thin but tough bark. The root grows 2-3 foot deep. The outer surface is yellowish white in color. Wood part is light yellowish white in color, hard, woody. Fracture is hard and short. The drug has slight characteristic odor and taste.

Microscopic characters

Transverse section

1. *D. gangeticum*

Outer most thin layered cork, consist of light yellowish brown colored, 4-8 rows of tangentially elongated rectangular, nearly twice as long as broad cork cells [Figure 1a].

Cortex is broad and composed of several rows of thin walled, tangentially elongated ovate shaped parenchyma cells embedded with starch grain and contains scattered group of lignified sclerenchymatous fibers of various sizes and shapes, each group consisting of 4-20 small thick walled cells.

Phloem composed of polygonal to rectangular thin walled tangentially elongated somewhat compressed parenchyma cells encircling the central wood portion [Figure 1b].

The wood comprises of vessels, parenchyma, and fibers and occupies largest portion of the root. The medullary ray 2-5 seriated, parenchymatous, radiates from cortex, passes through phloem and ends toward in xylem. The xylem has diffused porous arrangement of xylem vessels, in the group of 2-3 isolated units, thick walled xylem parenchymatous and fibers. Prismatic crystals of calcium oxalate and starch grain observed embedded in cortical parenchyma and ray cells [Figure 1a].

2. *D. laxiflorum*

Outer most thin layered cork, consist of light brownish yellow colored; in which outer 1-2 rows made up of tangentially elongated compressed parenchyma, while inner most 3-4 layers consists of rectangular parenchymatous cork cells [Figure 2a].

Cortex is broad and composed of several rows of thin walled, tangentially elongated ovate shaped parenchyma cells embedded with starch grain, also contains scattered group of lignified

sclerenchyma fibers. Each group consists of 4-15 small thick walled cells.

Phloem composed of polygonal to rectangular thin walled tangentially elongated somewhat compressed parenchyma cells encircling the central wood portion [Figure 2b].

The wood comprises of vessels, parenchyma and fibers and occupies largest portion of the root. The medullary rays bi- to multi-seriated parenchymatous cells, radiates across cortex, passes through phloem and ends toward in xylem. The xylem has diffused porous arrangement of xylem vessels, group of 2-3 isolated units, thick walled xylem parenchymatous and fibers. Prismatic crystals of calcium oxalate and starch grain observed embedded in cortical parenchyma and ray cells [Figure 2a].

Powder characteristics

The presence of prismatic crystals of calcium oxalate, starch grain, lignified parenchyma, transversely elongated cork cells, septed fibers, pitted vessels, and simple fibers observed during the powder microscopy of *D. gangeticum* DC [Figures 3 and 4].

Table 1: Histochemical tests of crude powders

Plant materials	Reagents	Observations
Section/powder of drug	Phloroglucinol+HCl	Gives pink color to lignified elements like xylem vessels and fibers
Section/powder of drug	Iodine solution	Gives blue color to starch grains

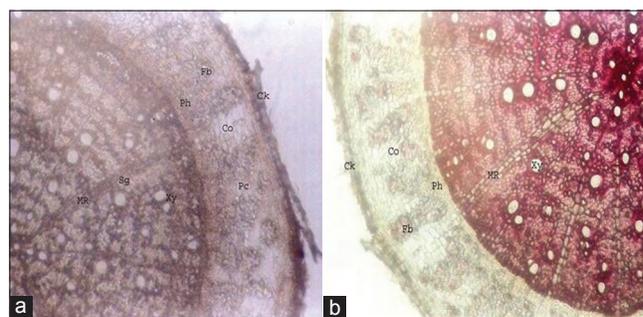


Figure 1: T.S of *Desmodium gangeticum* DC. root. (a) Unstained, (b) Stained. Ck: Cork, Ph: Phloem, Mr: Medullary rays, PC: Prismatic crystal, Xy: Xylem, Co: Cortex, Sg: Starch grain, Fb: fibers

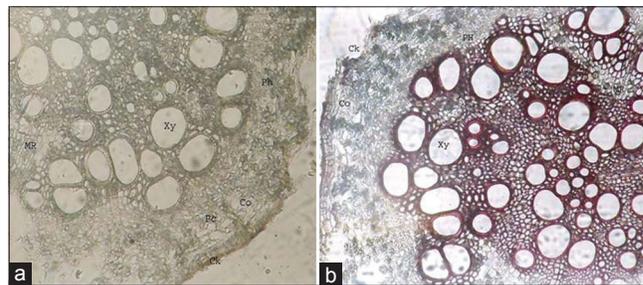


Figure 2: T.S of *Desmodium laxiflorum* DC. root. (a) Unstained, (b) Stained. Ck: Cork, Ph: Phloem, Mr: Medullary rays, PC: Prismatic crystal, Xy: Xylem, Co: Cortex, Sg: Starch grain, Fb: fibers

In the powder microscopy of *D. laxiflorum*; prismatic crystal of calcium oxalate, starch grains, brownish content, bordered pitted vessel, simple fiber, lignified pitted parenchyma cells, brownish colored cork cell in surface view was observed [Table 2].

Rasa determination

Rasa determination was done by method developed by Dhyani in 40 volunteers.^[4] *Madhur Rasa* and *Kashaya Anurasa* was perceived in maximum number of volunteers [Table 3].

Discussion

Organoleptic study

Both the species had *Madhura Kashaya Rasa*, color brownish in *D. gangeticum* and light brownish cream in *D. Laxiflorum* and both perceived characteristic odor [Table 4]. Based on the morphology and microscopical study done by pharmacognostical methods; the study reveals that both the species shows almost similar characters. However, it can be differentiated by some characters. Macroscopically, the color, size, and shape of the

roots are the only the differentiating characters of the both species. *D. gangeticum* has poorly developed tap root system with deep growing prominent spreading lateral roots, arising from its basal part. While, *D. laxiflorum* has well developed, long, deep growing tap root system with strong and cord like lateral roots. Microscopically; *D. gangeticum* shows thin 4-8 layered yellowish brown colored parenchymatous cork, broad cortex with approximately 4-20 celled group of sclerenchymatous fibers and 2-5 seriated medullary rays. While *D. laxiflorum* shows thin, light brownish yellow colored, 1-2 outer and 3-4 inner-layered parenchymatous cork, broad cortex with 3-15 celled groups of sclerenchyma fibers and bi- to multi-seriated medullary rays, as differentiating characters. Prismatic crystals and starch grains observed commonly in both the species.

Table 2: Powder microscopy methods

Plant materials	Reagents	Results
Section/powder of both speices	Phloroglucinol+HCl	Positive
Section/powder of both speices	Iodine solution	Positive

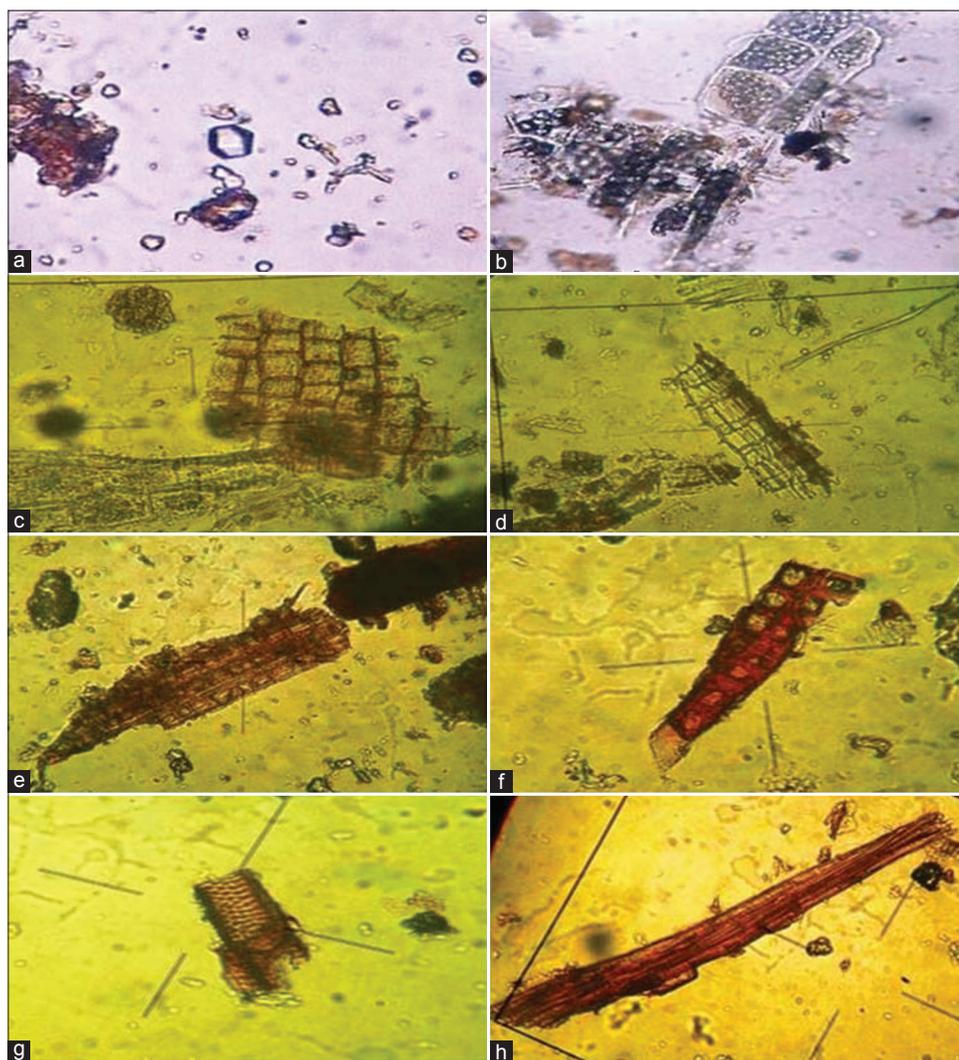


Figure 3: Powder microscopy of *Desmodium gangeticum* DC. root. (a) Prismatic crystals of calcium oxalate. (b) Starch grains embedded in paranchyma cells. (c) Lignified paranchyma cells. (d) Tangentially elongated cork cells. (e) Septed fiber. (f) Lignified thick walled parenchyma cells. (g) Pitted vessel. (h) Simple fibers

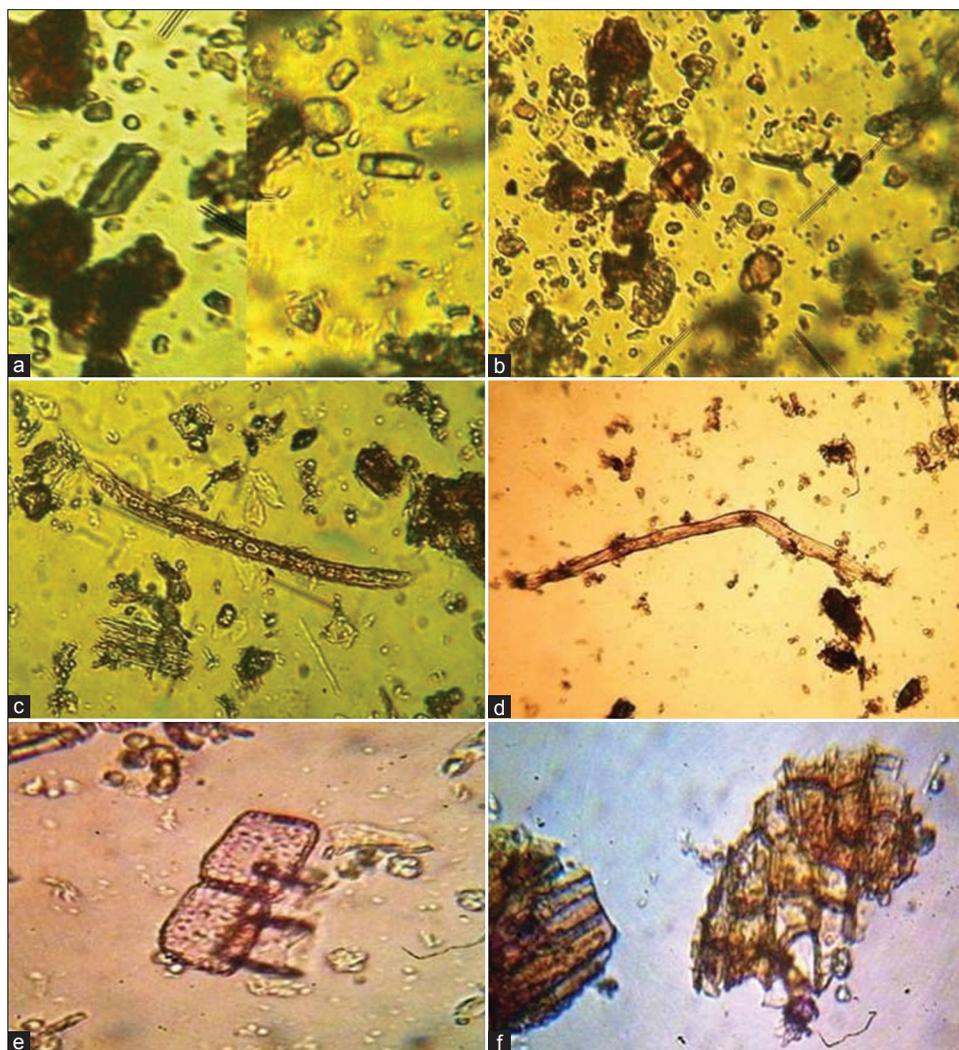


Figure 4: The diagnostic characters of powder of *Desmodium laxiflorum* DC. root. (a) Prismatic crystal of calcium oxalate and starch grains. (b) Brown content with starch grains. (c) Bordered pitted vessel. (d) Simple fiber. (e) Lignified pitted parenchyma cells. (f) Brownish colored cork cell in surface view

Table 3: *Rasa Nirdharana* by dilution method

Sample	Madhura	Amla	Lavana	Katu	Tikta	Kashaya	Avyakta
<i>Pradhana Rasa</i>							
<i>D. gangeticum</i>	72.5	-	-	-	-	12.5	15
<i>D. laxiflorum</i>	62.5	-	-	-	-	35	2.5
<i>Anurasa</i>							
<i>D. gangeticum</i>	17.5	-	--	-	35	22.5	25
<i>D. laxiflorum</i>	27.5	-	--	-	2.5	42.5	27.5

D. gangeticum: *Desmodium gangeticum*, *D. laxiflorum*: *Desmodium laxiflorum*

Table 4: Organoleptic characters of both the species

Sample	Taste	Color	Odor
<i>D. gangeticum</i>	Madhura, Kashaya	Brownish	Characteristic
<i>D. laxiflorum</i>	Madhura, Kashaya	Light brownish cream	Characteristic

D. gangeticum: *Desmodium gangeticum*, *D. laxiflorum*: *Desmodium laxiflorum*

The *Rasa Nirdharana* study was conducted, the study reveals that - both the *Desmodium* species are having

Madhura Rasa (*D. gangeticum*-22.5%, *D. laxiflorum*-42.5%) as *Pradhana Rasa* and *Kashaya Rasa* (*D. gangeticum*-72.5%, *D. laxiflorum*-62.5%) as *Anurasa* respectively [Table 3].

Conclusion

From the study conducted for both plants, it can be concluded that, both the species show the same *Rasa* and *Anurasa*. Both the plants have almost similar morphological and microscopical characters as observed in pharmacognostic study. Therefore,

based on present pharmacognostic study, it can be concluded that *D. laxiflorum* DC may be used in the scarcity of *D. gangeticum* DC.

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हिन्दी सारांश

Desmodium gangeticum DC. एवं *Desmodium laxiflorum* DC. का नामरूप विज्ञानीय तुलनात्मक अध्ययन

भावेश वाघेला, भूपेश आर.पटेल, प्रीति एन. पंड्या

प्राचीन काल से द्रव्यों के परिचय का ज्ञान पूर्ण वैज्ञानिक आधारयुक्त था। निघण्टु के अन्तर्गत द्रव्यों का परिचय गुण-कर्म एवं महत्व दर्शाया गया है। इस समय के दौरान द्रव्यों का संपूर्ण परिचय सिर्फ इसकी बाह्य रचना के आधार पर ही नहीं अपितु इसके गुण-कर्म के आधार पर भी किया जाता था। वर्तमान युग वैश्वीकरण का है। इस युग में द्रव्यों का संग्रह सामान्य व्यक्ति के द्वारा किया जाता है। इस कारण द्रव्य संग्रह में शास्त्रोक्त पद्धति का अभाव रहता है। वर्तमान समय में आवश्यकतानुसारद्रव्य की उपलब्धि कम होने के कारण दिन-प्रतिदिन अन्य द्रव्य की मिलावट बढ़ी है। प्राचीन काल से ही दशमूल का उपयोग बड़ी मात्रा में होता आया है। दशमूल के दस द्रव्यों के अन्तर्गत शालीपर्णी का समावेश होता है। शालीपर्णी के नाम से *Desmodium gangeticum* DC. लिया जाता है। परंतु सौराष्ट्र क्षेत्र के वैद्यों द्वारा *D. gangeticum* DC. के अभाव में *D. laxiflorum* DC. नामक वनस्पति का उपयोग किया जाता है। प्रस्तुत अध्ययन का उद्देश्य *D. gangeticum* DC. का सर्वोत्तम प्रतिनिधि द्रव्य खोजने का है।