THE IDENTITY OF PUNARNABA

BY H. L. CHAKRAVARTY, M.Sc.

Department of Botany, Presidency College, Calcutta

(Communicated by G. P. Majumdar)

Received for publication on May 21, 1941

There is a state of confusion as to the real identity of the Ayurvedic drug 'Punarnaba' particularly Swet Punarnaba, so widely reputed as a specific for dropsy, beriberi, ascites and the allied diseases, hence also goes by the name of 'Sothaghnī' in Sanskrit. In the local markets in Bengal one† Trianthema Portulacastrum Linn., a plant of the Family Ficoidaceae is extensively sold by the herbalists. This plant is prescribed by the Kavirajes as Swet Punarnaba. But in almost all works on Indian Pharmacopoea and Medicinal Plant including, Col. Chopra's Indigenous Drugs of India, Kirtikar and Bose's publication of Indian Medicinal Plants, Dymock's Pharmacographia indica, Watt's Dictionary of the Economic Products of India, Anislie, Bently and Trimen and others, Boerhaavia (Fam. Nyctaginaceae) has been identified with Punarnaba. Boerhaavia repens Linn. (B. diffusa Linn.) has been described by many as the Punarnaba of Ayurveda, placing in support the explanation that there are two varieties of this species, one bearing white flower (Swet Punarnaba) and the other with red flower (Rakta Punarnaba). But this being an indigenous medicinal plant originally described in Sanskrit, one must give prominence on the Ayurvedic description of the drug in order to search for the real plant. In the original description of the plant as given in Banavasadhī Darpanit it is mentioned along with other characters that 'Swet Punarnaba' bears white flowers, but unfortunately however, none of the species of Boerhaavia occurring in India have been mentioned in any book on Indian Systematic Botany to possess white flowers, they are either pinkish or reddish in colour, hence the confusion. Trianthema Portulacastrum Linn. may therefore be the real 'Swet Punarnaba' as its characters agree with the Sanskrit description and moreover it is used as such throughout India by the Ayurvedic practitioners and is known from time immemorial as the 'Swet Punarnaba' in every Hindu house of India. It has, therefore, become imperative to make a side by side chemical study of the two plants in order to find out the active alkaloidal principle 'Punarnavine'. It may be mentioned here with regret that sometimes it has so happened that Trianthema has been chemically analysed under the wrong name of Boerhaavia with a misconceived idea derived from the

* Read before the Botanical Society of Bengal on 28th April 1939.
† Trianthema Portulacastrum Linn. = Trianthema monogyna Linn.
literature that *Boerhaavia diffusa* is the real Swet Punarnaba of commerce and hence often the scientific identification of the drug is considered unnecessary. It is interesting to note that a herbalist in Calcutta will always supply *Trianthema* instead of *Boerhaavia* when asked for Punarnaba. Samples of Punarnaba have been collected from several well-known drug manufacturing firms of Calcutta, and on botanical identification they have been found to be *Trianthema Portulacastrum*. The author has also collected genuine specimens of both the red and white varieties of *Trianthema Portulacastrum* and of *Boerhaavia repens* and their chemical and pharmacological investigations have been kindly taken up at the Calcutta School of Tropical Medicine. The research results of the analyses has been published in the *Indian Journal of Medical Research* by Col. R. N. Chopra, N. R. Chatterjee, and S. Ghosh, 2nd October, 1940.

For convenience of the readers in general, an English translation of the original Sanskrit description of the plant together with generic and specific descriptions of *Boerhaavia* and *Trianthema* is given below to facilitate the real diagnosis of these plants.

**TRANSLATION OF SANSKRIT DESCRIPTION**

White Punarnaba, diffuse annual with branches and stems. It germinates at the first shower of rain, grows and is adorned with flowers and fruits during the rainy season. Therefore it is difficult to procure it in other seasons. If not attacked by other pests it may grow up to 3 or 4 yards. The leaves of the white Punarnaba is almost round, soft and fleshy. The tender branches are covered with short hairs. Its flowers are white. The seeds are like those of Amarantus. The “Rakta Punarnaba” does not dry or die up after the fruits are ripe. Even though the stem may dry up the root remains under the soil and gives rise to new plants at the advent of rains. Therefore the real name of Punarnaba is justified by Rakta Punarnaba. Its leaves, stem and flowers are red. Its leaves are not so thick as those of Swet Punarnaba, not round rather oblong.

**GENERIC CHARACTERS OF BOERHAAVIA LINN.**

*(Fam. Nyctaginaceæ)*

Erect or diffuse often divaricately branched herbs. Leaves opposite, often in unequal pairs; flowers small reddish or pinkish, paniculate, umbellate or subcapitate articulated in the pedicel; bracteoles small, often deciduous, rarely whorled or involucrate. Perianth tube long or short, ovoid below narrowed above the ovary; limb funnel-shaped with 5-lobed margin, the lobes plicate; stamens 1 or 2–5, connate below, exerted; filaments capillary, unequal; ovary oblique, stipitate; ovule erect; stigma peltate. Fruit enclosed in the ovoid turbinate or clavate, obtuse of truncate perianth tube, round, 5-ribbed or 5-angled, viscidly glandular; seeds with adherent testa; embryo hooked; cotyledons thin, broad; the outer larger, enclosing a soft scanty albumen.
THE IDENTITY OF PUNARNABA

BOERHAAVIA REPENS LINN. (SPECIFIC DESCRIPTION)

A diffuse herb; root large, fusiform; stem prostrate or ascending, reaching 2–3 ft. in length, divaricately branched, slender, cylindric, thickened at the nodes, minutely pubescent or nearly glabrous, often purplish. Leaves at each node in unequal pairs, the larger 1–1 1/3", the smaller 1/4–1/2" long, both nearly as broad as long, broadly ovate or suborbiculate, rounded at the apex, green and glabrous above, usually white minute scales beneath, the margins entire, often coloured pink, somewhat undulate, base rounded or subcordate, petiole nearly as long as the blade, slender. Flowers very small, shortly stalked or nearly sessile, 4–10 together in small umbells, arranged in long stalked corymbose, axillary or terminal panicles, bracteoles small, lanceolate, acute. Perianth 1/2" long, ovarial part of the tube 1/20" long, contracted above the ovary, glandular viscid; limb funnel-shaped, dark pink, with 5 narrow vertical bands outside. Stamens 2–3 slightly exerted. Fruit 1/3" long, clavate rounded, broadly and bluntly 5-ribbed, very glandular (Fig. 1).

GENERIC CHARACTER OF TRIANTHEMA (FAM. FICOIDÆ)

Diffuse prostrate, branched herbs, glabrous, pubescent or papillosus, leaves petiolate opposite, unequal, linear, ovate or obovate, quite entire; stipules, but the petiole dilated with membranous stipuli form margins. Flowers axillary, sessile or peduncled, solitary, cymose or panicled. Calyx tube short or long; lobes 5 coloured within mucronate at the back. Petioles O. Stamens 5–10 or many, inserted near the top of the calyx-tube. Ovary free, sessile 1–2-celled, often truncate at the apex; ovules 1–a, basal; style 1 or 2. Capsule membranous below with a hard thick cap which is detached by a circumscissile dehiscence and carries away one or more seeds, 1–2-celled. Seeds 1–a, subreniform; embryo annular.

TRIANTHEMA PORTULACASTRUM LINN. (SPECIFIC DESCRIPTION)

A prostrate somewhat succulent herb; stem more or less angular, glabrous or pubescent, much branched. Leaves sub-fleshy, Obliquely opposite unequal, the upper one of the pair larger 3–1 1/2" by 3–1 1/4" the lower 3–1 1/2 by 1 1/2–2 1/2" broadly obovate, rounded and often apiculate at the apex, cuneate at the base, glabrous; petioles 1–1/2" long much dilated and membranous at the base, especially those of the smaller leaves in which the membranous enlargement forms triangular pouch. Flowers solitary, sessile, almost concealed by the pouch of the petiole. Calyx lobes ovate, acute white, stamens 10–20. Ovary obliquely truncate; style 1. Capsule small, almost concealed in the petiolar pouch, lid truncate, slightly concealed, with 2-spooling teeth, carrying away at least 1 seed, the lower part 2–5 seeded. Seeds reniform, muriculate, dark black (Fig. 2).
There is another, rather rare, red variety of *Trianthema Portulacastrum* which is sold in the market as Rakta Punarnaba. It differs from the species in having a reddish texture of the whole plant throughout with red margins of the leaves. It is difficult to say at this stage whether Rakta Punarnaba is *Boerhaavia repens* or the *Trianthema Portulacastrum* var. rubra. The result of the investigation of these plants will be published later on. Rakta Punarnaba is however very rarely used in medicine.

**COMPARATIVE DESCRIPTION**

**Boerhaavia repens** Linn.  
* (B. diffusa L.)*

1. A diffuse non-succulent herb, branches extending laterally to a considerable length from a common-stock, sometimes runs up to several yards, often found growing upon old and broken walls with long branches hanging downwards.

2. Colour—reddish green

3. Root—large, fusiform

4. Stem—prostrate or ascending or descending 2–3 ft., long divaricately branched, slender, cylindric, thickened at the nodes, often purplish.

5. Leaves in each node in unequal pairs the larger 1–1 1/2", the smaller 1/4–1/2" long both nearly as broad as long, broadly ovate or suborbicular, rounded at the apex, green and glabrous above, usually white minute scales beneath the margin, entire, often coloured pink, somewhat undulate base rounded or subcordate.

6. Petioles nearly as long as the blade, slender.

7. Flowers very small, shortly-stalked or nearly sessile, 4–10 together in small umbels arranged in slender long-stalked

**Trianthema Portulacastrum** Linn.  
* (T. monogyna L.)*

1. A rather small prostrate or semi-erect somewhat succulent herb, generally not growing beyond 2 ft.

2. Colour—light green

3. Root—small, not fusiform

4. Stem—more or less angular glabrous or pubescent, much branched 1/4–1 ft. long.

5. Leaves sub-fleshy oblique opposite, unequal, the upper one of the pair the larger 3/4–1 1/2" by 1/2–1 1/2", the lower 1/4–1" by 1/4–1/2", broadly obovate, rounded and often apiculate at the apex, cuneate at the base, glabrous.

6. Petiole, 1/4–1/2" long, much dilated and membranous at the base, especially those of the smaller leaves in which the membranous enlargement forms a triangular pouch.

7. Flowers solitary axillary, sessile, almost concealed by the pouch of the petiole, colour white.
Boerhaavia repens Linn.  
(B. diffusa L.)  

Triantehma Portulacastrum Linn.  
(T. monogyna L.)

(8) Bracteoles small lanceolate, acute.

(9) Perianth (calyx and corolla indistinguishable) ½" long with 5 lobed margin, lobes plicate, ovarial part of the perianth tube 1/20" long, contracted above the ovary, glandular viscid; limb, funnel-shaped, dark pink, with fine narrow vertical bands outside.

(10) Stamens 2 or 3, slightly exerted.

(11) Fruit indehiscent ¼" long, clavate, 5-ribbed, viscidly glandular, one-seeded nut, seeds angled.

(8) Bracteoles absent.

(9) Calyx tube (petals absent) with 5 lobes, lobes ovate acute, white.

(10) Stamens 10-20.

(11) Fruit smooth circumscissile, dehiscent small almost concealed in the pouch of the petiole, lid truncate non-glandular slightly concave, with spreading teeth, carrying away at least one seed, the lower part 3-5-seeded, seeds reniform, muriculate dull black.

Note.—The red variety is rather a stouter plant with reddish texture of the stem and with red leaves and flowers.

Habitat.—The distribution of both Boerhaavia and Triantehma is identical over India, Burma and Ceylon.

SUMMARY AND CONCLUSION

Three different types of plants, viz., Boerhaavia repens, Triantehma Portulacastrum (T. monogyna) red and white varieties, are believed to be the Punarnaba of Ayurvedic practitioners. But as a matter of fact the Swet Punarnaba, which is more widely used all over India and which is considered more efficacious, identifies itself with Triantehma Portulacastrum, white variety. The white Punarnaba justifies its identity more clearly (Chopra, Ind. Drug. Ind., p. 300) by the presence of white flowers, apart from other parts which are also whitish. In these species only Triantehma Portula- castrum (white variety) bears the white flowers. This species is evidently, therefore, the Swet Punarnaba of Ayurveda. The description of Swet Punarnaba as diffused annuals which are grown in rainy seasons and bear white and round leaves and seeds like those of amaranthus coincides with the description of Triantehma (white variety) and recedes away from the characters of Boerhaavia repens. Boerhaavia repens, on the other hand, is
a perennial plant and it rejuvenates by its underground tap-root. It is rather a stiff red-stemmed spreading plant which finds a very suitable abode on broken walls hanging sometimes several yards downwards, or when grown over plane surface spreads all around. The characters of Boerhaavia repens closely tally with the Ayurvedic description of Rakta Punarnava (Kaviraj B. Kavyatirtha, p. 431–36), as it possesses red flowers, red stem and perennial root stock.

On chemical analysis of the three types of specimens supplied by the writer, Chopra, Chatterjee and Ghosh (1940) have found that the alkaloidal principle 'Punarnavine' is present in all of them in variable proportions. The percentage of this alkaloid is more in proportion in the red variety of Trianthema than either in Boerhaavia or in the white variety of Trianthema; the percentage of the salt potassium nitrate is also found to be more in proportion in Trianthema, red variety, than in Boerhaavia or Trianthema white variety. As potassium nitrate is supposed to be partly responsible for the discharge of aquatic fluid from the body of a patient suffering from beri-beri, ascites, dropsy and the like diseases, it will be worth investigation if the red variety of Trianthema is more efficacious in the diseases mentioned above.

In conclusion I beg to express my thanks to Bt.-Col. R. N. Chopra, Director, School of Tropical Medicine, for the kind interest he has taken in this work.

REFERENCES

2. Chopra, R. N. (1933) .. Indigenous Drugs of India, 1933, 9, 26 and 300–05.
6. Hooker, J. D. (1875) .. Flora of British India, 2, 600, 4, 708, 709.
10. Prain, David (1903) .. Bengal Plants, 1, 532–33; 2, 862–63.
Fig. I. *TriantHEME Portulacastrum* Linn.

1. A flowering plant. 2. A flowering node with a flower. 3. A flower open out to show different parts. 4. Two petals with appendages on the dorsal surface. 5. A ripe fruit showing membranous lower portion and hard solid upper portion with truncated apex. 6. Seeds. 7. A transversely ruptured fruit showing two seeds attached to the upper part and a few in the lower.

Fig. II. *Boerhaavia repens* Linn.


H. L. CHAKRAVARTY—THE IDENTITY OF PUNARNABA