

A THIRTEENTH CENTURY INDIAN REFERENCE TO PLANT NEMATODES

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Plant nematology is a comparatively new science, and western references to this group of plant parasitic worms date back to the sixteenth century. In this context the authors have quoted certain stanzas from a Sanskrit anthology of the thirteenth century which refers to symptoms of certain plant diseases caused by worms, which seem to be no other than our modern plant nematodes. The anthology in question is *Śārṅgadhara-Paddhati*, compiled by Śārṅgadhara, a courtier in the court of King Hammira who ruled in Śākambharī deśa (modern Bundelkhand) between 1283-1301, and the relevant stanzas are quoted from a small chapter in the work, styled *Upavanavinoda*, which is translated in to English by Majumdar.

“Sowed cockle, reap’d no corn”, wrote Shakespeare in 1594 in Scene 3 of Act IV in *Love’s Labour’s Lost*. One hundred forty-nine years later, in 1743, a Catholic Clergyman, Turbevill Needham, solved the mystery of ‘Cockle’ when he macerated a shrunken, blackened wheat grain and examined it under his primitive microscope. What he saw was a soft white fibrous substance, apparently consisting of long fibres bounded together and completely devoid of any sign of life or motion. On putting a drop of water over the macerate the Clergyman was astounded to discover that the apparently lifeless bundle of fibres dissolved into tiny wriggling objects, that moved irregularly with a twisting motion, which he thought to be a species of aquatic animals “and may be denominated Worms, Eels or Serpents, which they very much resemble.”¹

The above appears to be the first record in European literature, of what are now well known as plant nematodes, unwittingly made by the Bard of Avon towards the end of the sixteenth century.

In this context two stanzas from the *Upavanavinoda*, a chapter from an encyclopaedic Anthology “*Śārṅgadhara-Paddhati*”, are of great interest to historians of Science, since they indicate that plant parasitic nematodes were known to Indians at least as early as the thirteenth century. The original stanzas 183, 184 in sec-

tion XIII of the *Upavanavinoda* dealing with *tarucikitsā*—the treatment of plants—are reproduced below :

दोषैर्यस्य विना प्रवालकुसुमम्लानिर्विरुद्धं वपुः
मूले तस्य तरोर्भवन्ति कृमयो यत्नाच्चतानुद्धरेत् ।
गोमुत्राज्यविडङ्गसर्षपतिलैर्लिप्तः प्रणाष्टैस्ततः
सिक्तः क्षीरजलैरुदेति सहसा धूपैश्च धूपायितः ॥ १८३
करञ्जारगवधारिष्टसप्तपर्णत्वचाकृतः ।
उपचारः क्रिमिहरो मूत्रमुस्तविडङ्गवान् ॥ १८४

These stanzas have been translated by Majumdar² as follows :

183. One should do well to realize that worms (*krmayo*) are at roots of plants affected with tubercles, or at plants for the paleness of buds and flowers of which no other particular cause can be assigned ; and one should do well to root out these worms with care. If now fresh urine of cows, clarified butter, *Vidaṅga*,^a mustard and sesamum are mixed together and applied to the trunk, and then fumigated and watered with milk and water, they (these plants) grow.
184. All kinds of worms are destroyed if one appliee to the roots of trees the bark of *karañja*,^b *ārgvadha*,^c *ariṣṭa*,^d *saptaparna*^e —pasted in the urine of cows together with *viḍaṅga* and *musta*.^f

The term '*krmayo*' has been applied in Sanskrit literature to a large variety of organisms collectively known as worms.

Reference to worms at the root 'of plants affected with tubercles', at once brings to mind one of the now best known group of nematode parasites of plants known as root-knot nematodes, which produce conspicuous gall-like swellings on the roots in which they live. Other symptoms, e.g. paleness of buds and flowers in the absence of any particular cause are also these days known to be due to infestations of plant nematodes which infect practically all parts of the plants including trunk, branches, leaves, flowers, fruits and seeds causing wither of leaves and flowers and gall formations in roots. In fact the 'cockle' is no other than nematode infected corn.

Apparently the presence of 'worms' at the roots of plants affected by tubercles or in plants whose buds and flowers were pale for no particular cause, was deduced from symptoms of affliction as worms are too minute to be noticed with naked eye. It is also apparent that the value of fumigation in containing depredation of plant nematodes, a method in much usage currently, was also known to ancient Indians.

(a) *Embelia ribes*. (b) *Galedupa arborea*. (c) *Cassia fistula*. (d) *Melia azadirachta*.
(e) *Alstonia scholaris*. (f) *Cyperus rotundus*.

The *Śārṅgadhara-Paddhati*, according to Majumdar² is an Anthology compiled by Śārṅgadhara at the behest of the King Hammira of Śākambharī-deśa (modern Bundelkhand) who ruled in the thirteenth century A.D. (1283-1301). The poet was a courtier in the court of the king and it appears he compiled the treatise at royal command for the benefit of his subjects.

This is an encyclopaedic work dealing with a variety of subjects including asceticism, erotics, rhetoric, medicine, politics, economics, botany, chemistry, cosmetics, criticism in general, philosophy and science of war. *Upavanavinoda*, which forms one of the chapters in this Anthology deals with the science of arbori-horticulture, which has been translated in English by the late Professor G. P. Majumdar who was a Professor of Botany in the Presidency College, Calcutta.

According to Majumdar the subject of arbori-horticulture was studied in India for centuries prior to the publication of the *Śārṅgadhara-Paddhati*, under what was known as *Vrkṣāyurveda* but which is now practically lost. The stanzas relating to what appear to be plant nematodes, reproduced above, might have been taken from some earlier work no longer extant.

Since Bhaduri, Tiwari and Biswas³, in dealing with the history of zoology in India, have not referred to any work on plant nematodes, we consider it worthwhile to highlight the passages in the *Upavanavinoda*, which undoubtedly indicate that worms parasitising plants, and causing formation of tubercles at roots and paleness of buds and flowers, were recorded in ancient Indian texts preceding Shakespeare by full three centuries. This should be the earliest recorded reference to plant nematodes as far as we know.

REFERENCES

- ¹ Thorne, G. *Principles of Nematology*. McGraw-Hill Book Co. Inc. New York. p. 3, 1961.
- ² *Upavanavinoda*. Edited by G. P. Majumdar. The Indian Research Institute, Calcutta, 1935.
- ³ Bhaduri, J. L., Tiwari, K. K., and Biswas, B. Zoology, in *A Concise History of Science in India*, ed. D. M. Bose, S. N. Sen and B. V. Subbarayappa pp.403-444. Indian National Science Academy, New Delhi. 1972.