Soil Nematodes of the Indian Himalayan Region

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Bibliography on the Soil Nematodes of the Indian Himalayan Region

Introduction

The nematodes are ubiquitous, found everywhere on this earth, even in uninhabitable habitats from hot spring, ice to deep ocean trenches. Some of them are the parasites of agricultural and horticultural crops, invertebrates and vertebrates. A majority of them are free living in the soil or marine, or freshwater and some are predaceous. Nematodes occur in a wide range of habitats which is incomparable with any other metazoan group. About 0.1-1.0 million marine nematodes may be found per Sq.m. Roughly it has been estimated that out of 500,000 nematode species over the world; approximately 80,000 nematode species may be existing in India. Nematodes have a huge expected number of species, Only some species in thousands are known untill date from all over the world. In India, considerable work has been done on animal nematodes but the work on plant and soil nematodes started late. The first plant parasitic (root-knot) nematode was reported by Barber (1901) from tea gardens of southern India.

Soil nematodes act as a good biological agent in the management of plant parasitic nematodes. There has been a prominent increase in the use of nematodes in environmental studies as it provides easy detection of change in decomposition pathways and soil functioning at an early stage resulting in soil health status, ultimately act as a bio indicator for climate change. Certain nematodes take part in maintaining natural balance in the soil while a few are good experimental animals in the basic research on nutrition, physiology, genetics, etc. A few families like Rhabditidae, Cephalobidae etc may be considered as indicator species. Nematodes can be used for determining pollution and other types of aquatic disturbances as nematodes can ingest heavy metals and other pollutants settled in the sediments.

The great diversity of life forms, evolved as a result of variation in climatic conditions and topography which is distributed in a variety of habitat types ranging from tropical rainforest to temperate forest and alpine grasslands in Himalaya. In India, history of nematode research is too young and thus it is not possible to compare the present state of the art with the past. The first vertebrate nematode was recorded in 1855 while the first plant nematode in 1901. We compiled a bibliographic database of studies on soil nematodes conducted in Indian Himalayan Region.

Methods

Data was searched using the search terms "Himalaya", "soil nematodes" and name of the six Himalayan States such as "Jammu and Kashmir", "Himachal Pradesh", "Uttarakhand", "Sikkim", "West Bengal" and "Arunachal Pradesh" on internet, library of Zoological Survey of India, Dehradun and its e-publications. All the information were entered in the Microsoft Excel Spreadsheet and arranged alphabetically to remove any duplication. All the analyses were carried out in Microsoft Excel to determine the trend of research over the decades, the emphasised areas and the knowledge gap.

Results and Discussion

The bibliography on micro fauna of Indian Himalayan Region includes 209 unique entries covering years starting from 1956 to 2016. We categorized the articles in three distinct ways: A) The first category was based on parts of 5 Himalayan States (Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh) where the studies were carried out. B) The second category was based on their publication dates, in which the studies were grouped into 10-year intervals from 1956 to 2016; this enabled us to see the research trends and patterns. C) The third category was based on the subject focus of the research; the publications were categorized based on the levels of broad subject (ecology and behaviour, taxonomy, evolution, conservation and climate change impact) at which the research was carried out.

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Entries based on 5 Himalayan states of Indian Himalayan Region

Most number of studies are from Jammu and Kashmir (Fig. 7.1) followed by Himachal Pradesh. Least number of studies was reported from Arunachal Pradesh and Sikkim.

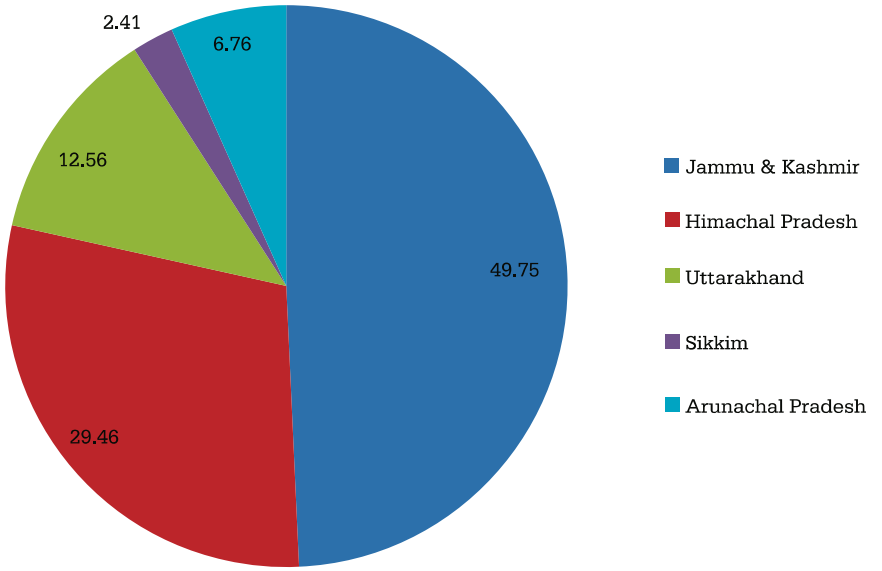

Figure 7.1 State wise distribution of publications

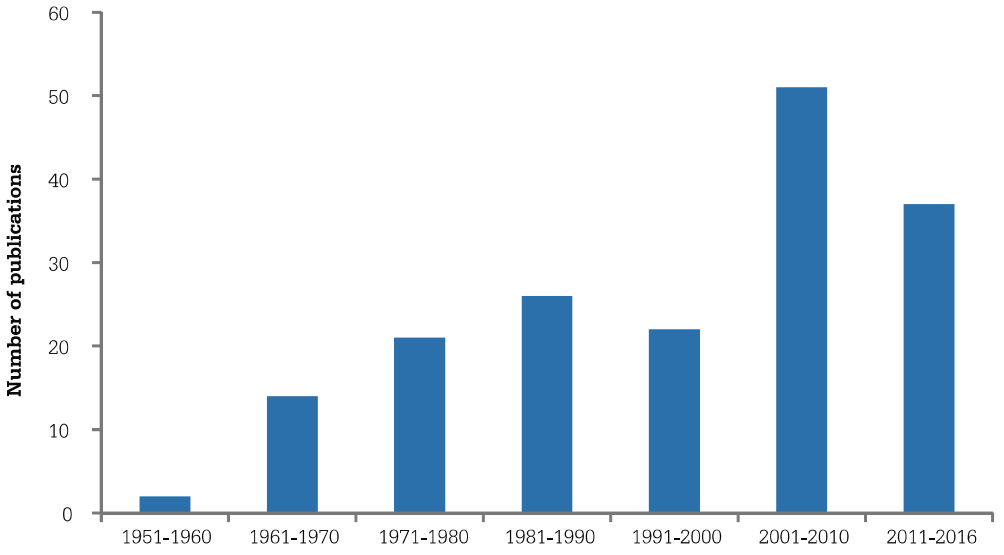

Figure 7.2 Temporal pattern of publications on nematodes of Indian Himalayan Region

The results show that there is an increase in nematode research during last decades. However, it is observed that there was a drop during the period from 1991-2000 (Figure 7.2).

Studies grouped based on subject focus

Based on the subject focus of the research the publications were categorized based on the levels of broad subject (ecology and behaviour, taxonomy, pathogencity, climate change impact and control) in Indian Himalayan region (Figure 7.3).

Research Gaps and Future Priorities

It is observed that most of the studies are result of random surveys in most of the states of IHR. Moreover, these studies are attempts to identify the important nematode pests of agricultural crops which show that considerable work has been done on nematodes residing in agricultural fields and studies on nematodes from forest ecosystems are very meagre. There is an increase in number of studies on nematodes during last decades which may be attributed to the fact that there is advancement in technology during this period. It is also observed that most of the work has been conducted on plant-parasitic nematodes while there are very few studies on bacteriovors, fungivores and omnivores nematodes. There are a large number of studies on ecology and behaviour theme followed by taxonomy, pathogenicity and their control. Studies on themes like genetics, climate change are needed.

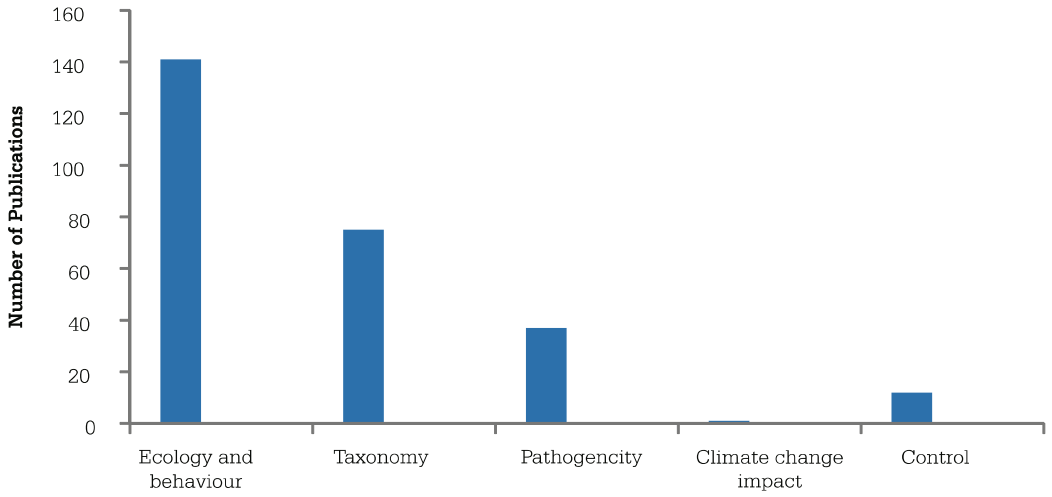

Figure 7.3 Number of publications on nematodes of the Indian Himalayan Region in different subject categories

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