INTRODUCTION

Himachal Pradesh is a state in Northern part of India with Shimla as the state capital. It is spread over 21,495 sq miles (55,670 km²), and is bordered by the states of Jammu and Kashmir on the north, Punjab on the west and south-west, Haryana and Uttar Pradesh on the south, Uttarakhand on the south-east. Himachal Pradesh is located between 30°10´ to 33°12´ north latitude and 75°47´ to 79°04´ east longitude. The state comprises of twelve districts – Shimla, Solan, Chamba, Hamirpur, Bilaspur, Kangra, Kullu, Mandi, Sirmaur, Una, Kinnaur and Lahaul and Spiti. There are major divisions: the middle or central Himalayas comprising of Kinnaur, Kullu, Lahaul and Spiti and Pangi areas, the lesser Himalayas of Dhauladhar ranges and Shimla hills, Shivaliks of Sirmour, Bilaspur, Solan and Hamirpur districts and river terraces of different valleys like Kullu valley, and Una districts. It is a mountainous state with altitudes ranging from 350 to 69750 meters above the sea level. This wide variation in altitude with mountains, hills and valleys provides different climatic conditions leading to the cultivation of varieties of crops. Based on altitude, rainfall, temperature, humidity and topography, Himachal Pradesh has been divided into four agro-climatic Zones: subtropical sub-mountain and low hills, sub-temperate sub-humid hills, wet temperate high hills and dry temperate high hills and cold desert. The temperature and relative humidity range from 0-35°C and 50-80% respectively. Rainfall varies in between 350-1500 mm in different areas. Soil type is mostly loamy sand, sandy loam, clay loam and silt loam.

Himachal Pradesh is a land of jade forests and fresh air. As much as 68% of the land area is covered with jungles. While the foothills and valleys are a refreshing green, the areas above the snow line are almost bare and desert type. The southernmost tracts are dominated by sal (Shorea robusta), sisham, chir pine, dry deciduous and moist broad-leaved forests. The temperate region above this grows oaks, deodar, blue pine, fir and spruce. In the uppermost climes, trees are sturdy with a vast network of roots (to help them tide over the weeks of burial under heavy snow). Alders, birches, rhododendrons and moist alpine scrubs are found in the name of vegetation. The tough rhododendron is an amazing plant of terrific importance in the ecological chain. About 70-80% population of the state are dependent on farming. The major agricultural crops are sub-tropical and temperate fruits among which apple is one of the most economically important fruit crop. Maize, rice, wheat, ginger, cucurbits, peas, potato, tomato, barley are grown in different seasons.

Among the soil-borne pests, soil free-living and plant-parasitic nematodes are generally overlooked due to their hidden nature and microscopic size. They multiply in millions and spread from place to place by different agricultural practices, causing great damage to the agricultural crops. They inhibit root growth, growth of plants affecting crop production and are thus responsible for massive yield losses. Due to this lack of awareness in
common people and farmers; the importance of nematodes in agriculture was overlooked in this state till 1951. Thirumalachar (1951) first recorded the occurrence of root-knot nematode on potato tubers for the first time from Shimla.

After 1951, extensive studies on taxonomy of tylenchid nematodes were done and several new species from Himachal Pradesh were described by different nematologists (Jairajpuri and Siddiqi, 1963a; Khan, 1964; Jairajpuri & Baqri, 1973; Saha et al., 1973; Khan & Singh, 1974; Jairajpuri and Siddiqi, 1979; Sultan & Jairajpuri, 1978, 1979; Sultan, 1980; Khan & Khan, 1982; Khurma & Gupta, 1988 a, b; Sharma et al., 1986). On the other hand, the study on nematodes belonging to the order Dorylaimida from Himachal Pradesh is comparatively less, although several new species have been described from the state (Jairajpuri & Siddiqi, 1963b; Ali et al., 1974; Ahmad & Jairajpuri, 1979, 1980 and 1982; Baqri & Jairajpuri, 1974, 1975; Jairajpuri & Coomans, 1977).

Nematodes associated with different fruit plants in Himachal Pradesh have been studied by Mukhopadhyaya (1970), Bhardwaj & Sharma (1971), Chandel (1986) and by Sharma & Kaur (1986, 1987). Association of nematodes with mushroom was observed by Bhardwaj et al., (1973) and Chandel (1982). A detailed information on plant nematology of Himachal Pradesh has been provided (Sharma & Gupta, 1998). Extensive work on the host record, occurrence, distribution and association of nematodes with different economically important agricultural and horticultural crops was done (Thirumalachar, 1951; Mukhopadhyaya, 1970; Dalal & Bhatti, 1983; Sharma et al., 1984; Kaur, 1987; Sharma et al., 1988; Khurma, 1989; Kaur et al., 1989; Kaur et al., 1990; Kaur & Sharma, 1990; Chandel, 1993)

The present study includes two systematic lists of soil free-living and plant-parasitic nematodes belonging to the orders Dorylaimida Pearse, 1942 and Tylenchida Thorne, 1949 from Himachal Pradesh. 34 species under 18 genera and 9 families of Dorylaimida and 83 species under 35 genera and 13 families of Tylenchida have been compiled and reported in this report. Among these, Dorylaimus neominimus Gantait et al. 2010, Aporcelaimellus heynsi Baqri and Jairajpuri, 1968, Labronema. glandosum Rahman et al., 1986, Thonus garhwaliensis Ahmad et al., 1986, and the genera Actinolaimoides Meyl, 1957, Laimydorus Siddiqi, 1969 and Indokochinema Darekar and Khan, 1979 are new records from Himachal Pradesh. Dorylaimus thornei Andrassy, 1969 is the first report from India. Five species of Tylenchida i.e. Polenchus shamimi Baqri, 1991, Rotylenchoides neoformis (Siddiqi and Husain, 1964) Sher, 1966, Rotylenchulus reniformis Linford and Oleiveira, 1940, Tylenchorhynchus cylindricus Cobb, 1913 and the genus Filenchus (Meyl, 1961) Andrassy, 1954 are new records from Himachal Pradesh. The respective species of the genera Actinolaimoides, Laimydorus, Indokochinema and Filenchus could not be confirmed. The classification proposed by Jairajpuri and Ahmad (1992) and by Siddiqi (2000) have been followed to arrange the available genera and species of Dorylaimida and Tylenchida respectively from Himachal Pradesh and to indicate their present taxonomic status.

MATERIALS AND METHODS

Processing of soil samples and extraction of nematodes:

The collected soil samples were processed by Cobb's sieving and decantation technique (Cobb, 1918) followed by modified Baermann funnel technique (Christie and Perry, 1951) for extraction of nematodes. Sample of about 500gms was taken in a bucket of 10 liter capacity. The bucket was filled with clean water up to half of its capacity. The soil and water were thoroughly mixed by hand to make a homogeneous suspension. Stones and plant debris were removed. The muddy suspension was stirred very well by hand and left undisturbed for 20-30 seconds allowing the heavier particles to settle down at the bottom of the bucket while the nematodes and fine soil particles remained suspended in water. This suspension was passed through a coarse sieve and was collected in another bucket. The entire process was repeated thrice to
get a muddy suspension quite free from stones, large soil particles and other undesirable organic matter. This suspension was subjected to similar filtration, but through a fine sieve of 325 meshes. Most of the fine soil particles passed through this sieve but the nematodes and larger soil particles were retained on the surface of the sieve. This was again washed thoroughly with running water within the sieve to get rid of the soil particles as far as possible without losing the nematodes. Then the entire content of the sieve was collected in a beaker of 250 ml, by washing the sieve repeatedly with water, so that all nematodes could be collected.

Then a double layer of tissue paper was placed on an aluminium net of 2 mm pore size and was made moist by applying water gently without leaving any air gap or bubble between the layers of the tissue paper. Now, the aliquot, previously collected in the beaker, was poured gently on this moist double tissue paper supported by 2 mm pore size aluminium net and was further suspended in clean water in a petri dish. The aliquot on the tissue paper was covered by another petri dish to prevent evaporation and desiccation. The whole arrangement was left undisturbed for at least 24 hours.

The nematodes migrated downward through the tissue paper in the clear water of petri dish. This clear water containing nematodes was taken in a big test tube with the help of a dropper by washing the petri dish several times with clean water, so that no nematodes were left out in the petri dish. The water in test tubes, along with nematodes, was kept undisturbed for 2-3 hours, so that the nematodes in the water could settle down at the bottom of the test tube. Then most of the water in the test tube was withdrawn very carefully without disturbing the nematodes. Finally the entire nematode population along with 3-4 ml of water was taken after decantation of water.

**Fixation and Preservation of Nematodes:**

The nematodes, kept in 3-4 ml of water in the test tube, were killed and fixed instantly in their characteristic body posture by Seinhorst’s method (Seinhorst, 1966) in hot FA (formalin-acetic acid 4:1) solution, the composition of which was as follows:

- Formalin (40% formaldehyde) : 08 ml
- Glacial acetic acid : 02 ml
- Distilled water : 90 ml

These fixed nematodes were preserved in the same solution in properly labeled specimen tubes.

**RESULT**

**List 1: Systemic Index of Dorylaimid Nematodes Available from Himachal Pradesh**

Phylum NEMATODA Rudolphi, 1808 (Lankester, 1877)
Order DORYLAIMIDA Pearse, 1942
Suborder DORYLAIMINA Pearse, 1936
Superfamily DORYLAIMOIDEA De Man, 1976
1. Family DORYLAIMIDAE De Man, 1976
2. Subfamily DORYLAIMINAE De Man, 1976
3. Genus **Dorylaimus** Dujardin, 1845
4. **Dorylaimus innovatus** Jana and Baqri, 1982
5. **D. neominimus** Gantait et al., 2010
6. **D. thornei** Andrassy, 1969
Subfamily LAIMYDORINAE Andrássy, 1969
4. Genus **Laimydorus** Siddiqi, 1969
5. **Laimydorus sp.**
6. Family APORCELAIMIDAE Heyns, 1965
7. Subfamily APORCELAIMINAE Heyns, 1965
8. Genus **Aporcelaimellus** Heyns, 1965
9. **Aporcelaimellus sp.**
11. **A. heynsi** Baqri and Jairajpuri, 1968
12. Subfamily QUDSIANEMATINAE Jairajpuri, 1965
13. Genus **Indokochinema** Darekar and Khan, 1979
8. Genus *Indokochinema* sp.

5. Genus *Labronema* Thorne, 1939


10. *T. garhwalensis* Ahmad *et al*., 1986

4. Family NORDIIDAE Jairajpuri and Siddiqi, 1964

   Subfamily PUNGENTINAE Siddiqi, 1969

7. Genus *Pungentus* Thorne & Swanger, 1936

11. *Pungentus clavatus* Ahmad & Jairajpuri, 1979

8. Genus *Enchodelus* Thorne, 1939

   Subgenus *Enchodelus* Thorne, 1939


   Subgenus *Nepalus* Ahmad & Jairajpuri, 1980


   Subgenus *Paraenchoedelus* Ahmad & Jairajpuri, 1980


17. *E. (P.) thornei* Baqri & Jairajpuri, 1974

   Subgenus *Rotundus* Ahmad & Jairajpuri, 1980


   Subfamily ACTINOLAIMOIDINAE Meyl, 1957

9. Genus *Actinolaimoides* Meyl, 1957

19. Genus *Actinolaimoides* sp.

Superfamily LONGIDOROIDEA Thorne, 1935

5. Family LONGIDORIDAE Thorne, 1935

   Subfamily LONGIDORINAE Thorne, 1935

10. Genus *Paralongidorus* Siddiqi, Hooper & Khan, 1963

20. Species *Paralongidorus citri* (Siddiqi, 1959)

   Siddiqi, Hooper & Khan, 1963

   Syn. *Xiphinema citri* Siddiqi, 1959

11. Genus *Longidorus* Micoletzky, 1922


   Syn. *Neolongidorus himalayansis* Khan, 1986

22. *Longidorus elongates* (De Man, 1876)

   Thorne & Swanger, 1936

   *Dorylaimus elongatus* De Man, 1876

6. Family XIPHINEMATIDAE Dalmasso, 1969

   Subfamily XIPHINEMATINAE Dalmasso, 1969

12. Genus *Xiphinema* Cobb, 1913

23. *Xiphinema* sp.

24. *Xiphinema americanum* Cobb, 1913

25. *X. basiri* Siddiqi, 1959


   Syn. *X. hayati* Javed, 1983


Superfamily BELONDIROIDEA Thorne, 1939

7. Family BELONDIRIDAE Thorne, 1939

   Subfamily BELONDIRINAE Thorne, 1939


   Subgenus *Axonchium* Cobb, 1920


   Subfamily DORYLAIMELLINAE Jairajpuri, 1964

14. Genus *Dorylaimellus* Cobb, 1913

   Subgenus *Dorylaimellus* Cobb, 1913


   Superfamily TYLENCHOLAIMOIDEA Filipjev, 1934

8. Family TYLENCHOLAIMIDAE Filipjev, 1934

   Subfamily TYLEPTINAE Jairajpuri, 1964

15. Genus *Gymnotyleptus* Ahmad & Jairajpuri, 1982

29. *Gymnotyleptus* *gymnochilus* (Loof, 1964)

   Ahmad & Jairajpuri, 1982

   Syn. *Tyleptus* *gymnochilus* Loof, 1964
30. Gymnotyleptus indicus Ahmad & Jairajpuri, 1982
Superfamily NYGOLAIMOIDEA Thorne, 1935
Subfamily NYGOLAIMINAE Thorne, 1935
31. Aquatids christicki Ahmad & Jairajpuri, 1982
32. A. deconincki Jairajpuri & Coomans, 1977
17. Genus Clavicaudoides Heyns, 1968
33. Clavicaudoides tenuicaudatum Ahmad & Jairajpuri, 1982
18. Genus Paravulvus Heyns, 1968
34. Species Paravulvus papillatus Ahmad & Jairajpuri, 1982

List 2: Systemic Index of Tylenchid Nematodes Available From Himachal Pradesh

Class SECERNENTEA von Linstow, 1905
Subclass TYLENCHIA Inglis, 1983
Order TYLENCHIDA Thorne, 1949
A] Suborder TYLENCHINA Chitwood in Chitwood Chitwood, 1950
Infraorder TYLENCHATA Siddiqi, 2000
Superfamily TYLENCHOIDEA Örley, 1880
1. Family TYLENCHIDAE Örley, 1880
Subfamily TYLENCHINAE Örley, 1880
1. Genus Tylenchus Bastain, 1865
1. Species Tylenchus arcuatus Siddiqi, 1963
2. T. elegans De Man, 1876
3. T. magnus Khurma & Gupta, 1988
2. Genus Aglenchus Andrássy, 1954
(Meyl, 1961)
4. Species Aglenchus agricola (De Man, 1884)
Meyl, 1961
5. A. muktii Phukan & Sanwal, 1980
6. Species Coslenchus capsici Khurma & Gupta, 1988
7. C. costatus (De Man, 1921) Siddiqi, 1978
8. C. indicus (Khan, Chawla & Prasad, 1969)
Siddiqi, 1978
Syn. Tylencythus (Aglenchus) indicus Khan, Chawla & Prasad, 1969
(Meyl, 1961)
9. Species Filenchus sp.
5. Genus Polenchus Andrassy, 1980
10. Species Polenchus shamimi Baqri, 1991
Subfamily BOLEODORINAE Khan, 1964
6. Genus Boeleodorus Thorne, 1941
11. Species Boeleodorus mirus Khan, 1964
Subfamily DUOSULCIINAE Siddiqi, 1979
Subgenus Malenchus Andrassy, 1968
12. Species Malenchus (Malenchus) sp.
8. Genus Ottolenchus Husain & Khan, 1967
(Golden, 1971)
Syn. Ottolenchus purvus (Siddiqi) Siddiqi, 1979
Subfamily PLEUROTYLENCHINAE Andrassy, 1976
(Geraert, 1968)
14. Species Cephalenchus leptus Siddiqi, 1963
Infraorder ANGUINATA Siddiqi, 2000
Superfamily ANGUINOIDEA Nicoll, 1935
(1926)
2. Family ANGUINIDAE Nicoll, 1935 (1926)
Subfamily ANGUININAE Nicoll, 1935 (1926)
15. Species Ditylenchus myceliophagus Goodey, 1958
10. Genus Ditylenchus Filipjev, 1936
11. Genus Nothotylenchus Thorne, 1941
16. Species Nothotylenchus sp.
12. Genus *Safranema* Siddiqi, 1980
17. Species *Safranema* sp.

**B.** Suborder *Hoplolaimina* Chizhov & Berezina, 1988

Superfamily *HOPLOLAIMOIDEA* Filipjev, 1934 (Paramonov, 1967)

3. Family *HOPLOLAIMIDAE* Filipjev, 1934
Subfamily *HOPLOLAIMINAE* Filipjev, 1934

Subgenus *Basirolaimus* Shamsi, 1979

18. Species *Hoplolaimus* (*Basirolaimus*) *chambus* Jairajpuri & Baqri, 1973
Syn. *Hoplolaimus chambus* Jairajpuri & Baqri, 1973


20. *Basirolaimus indicus* (Sher, 1963)


21. Species *Scutellonema brachyurus* (Steiner, 1938) Andrássy, 1958
Syn. *Rotylenchus brachyurus* Steiner, 1938
Subfamily *ROTYLENCHOIDINAE* Whitehead, 1958


22. *Rotylenchoides neoformis* (Siddiqi and Husain, 1964) Sher, 1966

16. Genus *Helicotylenchus* Steiner, 1945


24. *H. girus* Saha *et al*., 1973


(Syn. of *H. retusus* for Lal & Khan, 1997)


29. *H. vulgaris* Yuen, 1964

17. Genus *Orientylus* Jairajpuri & Siddiqi, 1977

30. Species *Orientylus geraerti* Jairajpuri & Siddiqi, 1979


18. Genus *Rotylenchus* Filipjev, 1936
Subgenus *Rotylenchus* Filipjev, 1936

31. Species *Rotylenchus* (*Rotylenchus*) *dalhousiensis* Sultan & Jairajpuri, 1979

(Syn. of *R. robustus* for Brzeski, 1998)


34. *Rotylenchus* (*Rotylenchus*) sp.

4. Family *ROTYLENCHULIDAE* Husain and Khan, 1957 (Husain, 1976)
Subfamily *ROTYLENCHULINAE* Husain and Khan, 1967

19. Genus *Rotylenchulus* Linford and Oleiveira, 1940

35. Species *Rotylenchulus reniformis* Linford and Oleiveira, 1940

5. Family *PRATYLENCHIDAE* Thorne, 1949 (Siddiqi, 1963)
SubFamily *PRATYLENCHINAE* Thorne, 1949

20. Genus *Pratylenchus* Filipjev, 1936

36. Species *Pratylenchus coffeae* (Zimmermann, 1898) Filipjev & Schurr. Stekh., 1941
Syn. *Tylenchus coffeae* Zimmermann, 1898

37. *P. neglectus* (Rensch, 1924) Filipjev & Sch. Stekh., 1941
Syn. *Aphelenchus neglectus* Rensch, 1924

38. *P. neocapitatus* Khan & Singh, 1975

39. *P. penetrans* (Cobb, 1917) Filipjev & Sch. Stekh., 1941
Syn. *Tylenchus penetrans* Cobb, 1917
40. *P. zeae* Graham, 1951  
Syn. *P. impar* Khan & Singh, 1975

41. *Pratylenchus* sp.  
Subfamily HIRSCHMANNIELLANAE  
Fotedar & Handoo, 1978


42. Species *Hirschmanniella mucronata* (Das, 1960) Khan, Siddiqi, Khan, Husain & Saxena, 1964  
Syn. *Radopholus mucronata* Das, 1960

43. *H. oryzae* (Van Breda de Hann, 1902) Luc & Goodey, 1964  
Syn. *Tylenchus oryzae* Van Breda de Hann, 1902

6. Family MELOIDOGYNIDAE Skarbilovich, 1959 (Wouts, 1973)  
Subfamily MELOIDOGYNIDAE  
Skarbilovich, 1959

22. Genus *Meloidogyne* Goeldi, 1892

44. Species *Meloidogyne arenaria* (Neal, 1889) Chitwood, 1949  
Syn. *Anguina arenaria* Neal, 1889

45. *M. graminicola* Goloden & Birchfield, 1965

46. *M. hapla* Chitwood, 1949

47. *M. incognita* (Kofoid & White, 1919) Chitwood, 1949  
Syn. *Oxyuris incognita* Kofoid & White, 1919  
Syn. *Heteroder a incognita* (Kofoid & White) Sandground, 1923

Syn. *Heteroder a javanica* Treub, 1885

7. Family HETERODERIDAE Filipjev & Schurr. Stekh., 1941 (Skarbilovich, 1947)  
Subfamily HETERODERINAE Filipjev & Schurr. Stekh., 1941

23. Genus *Heterodera* Schmidt, 1871

49. Species *Heterodera avenae* Wollenweber, 1924

50. *H. trifolii* Goffart, 1932  
24. Genus *Globodera* Skarbilovich, 1959

51. Species *Globodera pallida* (Stone, 1973) Behrens, 1975  
Syn. *Heterodera pallida* Stone, 1975

Syn. *Heterodera pseudorostochiensis* Kirjanova, 1963

Superfamily DOLICHODOROIDEA Chitwood in Chitwood & Chitwood, 1950 (Siddiqi, 1968)

8. Family TELOTYLENCHIDAE Siddiqi, 1960  
Subfamily TELOTYLENCHINAE Siddiqi, 1960

25. Genus *Quinisulcius* Siddiqi, 1971


54. *Q. indicus* Luqman & Khan, 1986

26. Genus *Tylenchorhynchus* Cobb, 1913

55. Species *Tylenchorhynchus clarus* Allen, 1955

56. *T. cylindricus* Cobb, 1913

57. *T. mashhoodi* Siddiqi & Basir, 1959  

58. *Tylenchorhynchus* sp.

27. Genus *Bitylenchus* Filipjev, 1934  
Syn. *Tylenchus* (Bitylenchus Filipjev, 1934)

59. Species *Bitylenchus brevilineatus* (Williams, 1960) Jairajpuri, 1982  
Syn. *Tylenchorhynchus brevilineatus* Williams, 1960

60. *Bitylenchus* n. sp.

Subfamily MERLINIINAE Siddiqi, 1971


62. *M. nizami* Luqman & Khan, 1986
63. *Merlinius* sp.

Subfamily PSILENCHINAE Paramonov, 1967
29. Genus *Psilenchus* De Man, 1921
64. Species *Psilenchus aestuarius* Andrássy, 1962
65. *P. hilarus* De Man, 1921
66. *P. hilarus* Siddiqi, 1963


C) Suborder CRICONEMATINA Siddiqi, 1980
Superfamily CRICONEMATOIDEA Taylor, 1936 (1914) Geraert, 1966
10. Family CRICONEMATIDAE Taylor, 1936 (1914) Thorne, 1949
Subfamily CRICONEMATINAE Taylor, 1936 (1914)
30. Genus *Ogma* Southern, 1914
Subgenus *Ogma* Southern, 1914
31. Genus *Macroposthonia* De Man, 1880
68. Species *Macroposthonia bilaspurensis* Gupta & Gupta, 1981
Syn. *Criconemella curvata* Raski, 1952
70. *M. xenoplax* (Raski, 1952) De Grisse & Loof, 1965
Syn. *Criconemoides xenoplax* Raski., 1952
Subfamily HEMICRICONEMOIDINAe Andrássy, 1979
32. Genus *Hemicriconemoides* Chitwood & Birchfield, 1957
71. Species *Hemicriconemoides gaddi* (Loos, 1949) Chitwood & Birchfield, 1957
Syn. *Criconemoides gaddi* Loos., 1949
72. *H. mangiferae* Siddiqi, 1961
Syn. *H. aberrans* Phukan & Sanwal., 1983
Superfamily HEMICYCLIOPHOROIDEA Skarbilovich, 1959 (Siddiqi, 1980)
11. Family HEMICYCLIOPHOROIDAE Skarbilovich, 1959 (Geraert, 1966)
Subfamily HEMICYCLIOPHOROINAE Skarbilovich, 1959
33. Genus *Hemicycliophora* De Man, 1921
73. Species *Hemicycliophora subaoalica* Jairajpuri & Baqri, 1973
74. *Hemicycliophora* sp.

Superfamily TYLENCHULOIDEA Skarbilovich, 1947 (Raski & Siddiqi, 1975)
12. Family TYLENCHULOIDAE Skarbilovich, 1947 (Kirjanova, 1955)
Subfamily TYLENCHULOINAE Skarbilovich, 1947
34. Genus *Tylenchulus* Cobb, 1913
75. Species *Tylenchulus semipenetrans* Cobb, 1913
Subfamily PARATYLENCHINAE Thorne, 1949
35. Genus *Paratylenchus* Micoletzky, 1922
Subgenus *Gracilacus* Raski, 1962 (Siddiqi, 1986)
76. Species *Paratylenchus* (*Gracilacus*) *aonli* Misra & Edward, 1971
Subgenus *Paratylenchus* Micoletzky, 1922
77. *Paratylenchus* (*Paratylenchus*) *colbrani* *colbrani* Raski, 1975
78. *P. (P.) elachistus* Steiner, 1949
79. *P. (P.) lepidus* Raski, 1975
80. *P. (P.) minor* Sharma & Khan, 1986
81. *P. (P.) nanus* Cobb, 1923
82. *P. (P.) runii* Sharma & Khan, 1986
83. *P. (P.) vandenbrandei* De Grisse, 1962

**DISCUSSION**

The study on nematodes started in Himachal Pradesh with the report of Thirumalahar (1951) about the infestation of root-knot nematode on potato tubers for the first time from Shimla and subsequently, the first nematology unit was established at Central Potato Research Institute, Shimla. A total of 138 nematode species under 63 genera belonging to Dorylaimida, Tylenchida and other nematode orders have been reported from Himachal Pradesh of which 45 species were described as new (Sharma & Gupta, 1998). Sharma & Kaur (1987) observed the parasitism of root-knot nematode *Meloidogyne* sp. on apple which is one of the most economically important cash crops of Himachal Pradesh. The species of root-knot nematodes like *Meloidogyne incognita*, *M. hapla* and *M. javanica* are the most prominent pest of potato and this nematode has been found to be prevalent in about 60% of the potato growing areas of Himachal Pradesh (Krishna Prasad, 1986) and prevalence and intensity of root-knot nematode infection on potato has also been observed (Krishna Prasad & Rajendran, 1986). *Quininsulcius capitatus* has also been suspected as potential pest of potato (Krishna Prasad, 1986; Khan et al., 1990). The infestation of *Meloidogyne* sp. on tomato in Solan area has also been observed (Bharadwaj et al., 1974). *Meloidogyne incognita* and *M. hapla* are the only recognized pests of vegetable crops in the state. *Tylenchorhynchus* spp., *Macroposthonia xenopelx*, *Meloidogyne incognita*, *Pratylenchus pratensis*, *Helicotylenchus* spp., *Paratylenchus* sp. and *Xiphinema* sp. have been observed to occur on agricultural, horticultural and forest trees (Sharma et al., 1982, Anonymous, 1993; Chandel, 1993). *Meloidogyne incognita*, *M. hapla*, *Pratylenchus penetrans*, *P. coffeae*, *Paratylenchus prunii*, *Tylenchulus semipenetrans*, *Macroposthonia xenopelx* and *Ditylenchus myceliophagus* are the most important nematode species which cause enormous yield losses in various economically important agricultural and horticultural crops and the wide spread occurrence of *Heterodera zeae*, *Quininsulcius capitatus*, *Tylenchorhynchus*, *Helicotylenchus* and *Xiphinema* in a number of agricultural and horticultural crops also cause direct or indirect crop losses (Sharma & Gupta, 1998). In the present study, 34 species under 18 genera and 9 families of Dorylaimida and 83 species under 35 genera and 13 families of Tylenchida have been compiled and reported. Among these, *Dorylaimus neominimus* Gantait et al. 2010, *Laimydorus* sp., *Aporcelaimellus heynsi* Baqri and Jairajpuri, 1968, *Indokochinema* sp., *Labronema. glandosum* Rahman et al., 1986, *Thonus garhwaliensis* Ahmad et al., 1986, *Actinolaimoides* sp. are new rerecords from Himachal Pradesh and *Dorylaimus theilini* Andrassy, 1969 is the first report from India. Five species of Tylenchida i.e. *Polenchus shamimi* Baqri, 1991, *Filenchus* sp., *Rotylenchoïdes neoformis* (Siddiqi and Husain, 1964) Sher, 1966, *Rotylenchulus reniformis* Linford and Oleiveira, 1940 and *Tylenchorhynchus cylindricus* Cobb, 1913 are new records from Himachal Pradesh.

**SUMMARY**

The present study includes two systematic lists of soil free living and plant parasitic nematodes belonging to the orders Dorylaimida Pearse, 1942 and Tylenchida Thorne, 1949 from Himachal Pradesh. 34 species under 18 genera and 9 families of Dorylaimida and 83 species under 35 genera and 13 families of Tylenchida have been compiled and reported. Among these, *Dorylaimus neominimus* Gantait et al. 2010, *Laimydorus* sp.,
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**REFERENCES**


