Chapter -II
REVIEW OF LITRATURE

The study of nematodes first began in the 17th century. T. Needham (1743) appears to have first discovered plant parasitic nematodes as eelworms in seed galls of wheat from England comes to the attention of the early investigator. It was not until 1855 that Barkely determined a root knot nematode _Meloidogyne sp._, to be the cause of galls on the root of green house cucumber plant in England. Kuhn (1857) found the stem and bulb nematode _Ditylenchus dipsaci_ the heads of teasel. Schacht (1859) reported the sugarbeet cyst nematode _Heterodera schachtii_, from Germany (Gerald Thorn and Richard B .Malik1968). The oldest description of dorylaim nematode dates back to the year 1845, when Dujardin described a species and named it _Dorylaimus stagnalis_. De Man (1876) proposed the family Doryloimidae for the genus Dorylaimus. Orley (1880), De Man (1880), Cobb (1913, 20) added several genera to this family (Abrar Ahmed2001)

Some of early findings have been listed below in chronological order

**DeMan (1884)** gave taxonomic monograph of soil fresh water nematode of the Netherlands.

**Atkinson and Neal (1889)** independently published on root knot nematode in United State.

**Barber (1901)** gave description of root knot nematode on tea in South India.

**Cobb (1913)** proposed _Xiphinema_ with _X.americanum_ as the type species under the family _Xiphinematidae_ (Dalmasso1969) subfamily _Xiphinematinae_ (Dalmasso1969).
Sub-family Xiphimenatinae (Xiphineminae) was proposed by Dalmasso (1969) for *Xiphinema* under Longidoridae.

**Micoletzky (1922)** proposed the genera *Longidorus* as a subgenus for Dorylaimus elongatus.

**Daday (1905)** described the genus Hoplolaimus based on a single specimen from South America.

**N.A.Cobb (1907)** joined the USDA, Consider to be the father of American Nematology.

**Ayyar (1926,1933,1934)** –rootknot of vegetables and other crop in India

**Steiner (1945)** proposed genera Helicotylenchus with *Helicotylenchus nannus* as the type species which possess a spiral body, annulated lip region, powerful well-developed stylet and overlapping oesophageal glands.


**Golden (1956)** separated the genus from *Rotylenchus* as an independent genus primarily on the position of dorsal oesophageal gland orifice which is one third or more of the length of stylet. Sher (1961) revised this genus recognizing *Helicotylenchus dityystera* (Cobb, 1893b) as type species.

**Prasad etal (1959)** reported cereal cyst nematode for the first time from India.

1966-Nair Das, Menon reported the burrowing nematode on banana for the first time from India.

**Sher (1961)** synonymised *Scutellonema coheni* and *Scutellonema boocki* with *Scutello nemabrachyyurum*. Although *Scutellonema bradys* (Steiner & Le Hew, 1933),
Scutellonema blaberrum (Steiner, 1937) were entirely identical and based on the rules of priority S. bradys was older, Scutellonema blaberrum (Steiner, 1937) Andrassy,1958 was regarded as the type species. Sher (1963) further enlarged the generic diagnosis and continued his study of the genus in greater details by describing twenty new species. Khan and Basir (1965) described Scutellonema imphallus.

According to Andrassy (1978) the total numbers of nematodes were 1940 in which 1788 was established as genera, 152 as sub-genera. And further classified 570 in Secernentea (including Tylenchida) with rhabditids comprising 241 and Tylenchida (including Aphelenchidas) 329 genera respectively (Reddy P.P.1983).

M.I Khan (1991) gave the description of Pratylenches associated with apple in solan India, in this work new species of Pratylenches malanisies (n sp) were found which resemble P.crenatus.

Chizon V .N (1991) described Xiphinema riparia and Longidorous lingnosis species from ficus carica. According to him Symptoms of damage Infected plants exhibit stunting, reduced vigour and tillering. The topmost leaves become chlorotic with scorched tips. Affected plants tend to mature and dry out faster than healthy plants. Incipient infections of the rhizomes are evidenced by small, shallow, sunken, water soaked lesions (The nematodes migrate intracellularly through tissues, producing large infection channels or galleries within the rhizome..A survey was undertaken by Ramkrishnan (1998) in major papya growing areas in Tamil nadu to assess the nematode problems according to him nematode is highly effective in reducing yield component of papaya

Richard F. Davis (2000) Extracted Hoplolaimus Columbus from Soil and Roots of cotton fields in mid or late season H. Columbus population was consistently found to bein the soil fraction. According to him Extraction of H. columbus from soil alone appears to be sufficient for comparing treatment effects on nematode populations in cottonfield plots’
J. A. LaMondia (2002) described Seasonal Populations of *Pratylenchus penetrans* Strawberry Roots in Windser according to him More *P. penetrans* were extracted from roots than from soil throughout the year, and numbers per g root were greater in feeder than structural roots. *Pratylenchus penetrans* numbers were lowest in perennial roots. Additionally, the numbers of P. penetrans extracted from feeder roots attached to structural roots were higher than from feeder roots attached to perennial roots.

Pandey RC (2002) describe effect of soil moisture and hydrogen ion concentration of nematode population dynamics in Allahbad. According to him maximum population of female were found at 20% where as larvae and other nematode survive at 14% pH 7.5 was appropriate for highest population of nematode.

Mudgil (2002) suggested that yellow disease was primarily caused by the lack of fertilizer and nematodes were considerd to be secondry pathogen.

Hashmi (2008) isolated *Tylencydochychus teeneei sp* from around the root tip of fig (ficus carica) in Jordan. According to him it has affinities with *T.huesing paellzold* (1958), except shorter female body.

Keepenski (2003) surveyed anise growing areas in Burdoor Turkey fifteen new species were belonging to order Tylencyodida which were recorded first time in turkey.

Baris etal (2008) revealed the presence of Aphelencoides in ficus carica in turkey

I.M. de O. Abrantes (2008) conducted a survey in Portugal to detect root-knot and plant-parasitic nematodes associated with edible fig trees (*Ficus carica*). Fifty-three soil and root samples were collected in seven Portuguese districts. Fruits from edible fig and wild caprifig trees (*F. carica sylvestris*) were also collected. Of the genera and species found, *Helicotylenchus spp.*, *Paratylenchus sp.*, *Pratylenchus sp.*, and *Xiphinema spp.* was the most widely distributed. Root-knot nematodes are probably the
nematodes that are most damaging to fig trees. Ogma palmatum, Mesocriciconema xenoplax and Schistonchus caprifici are recorded for the first time from Portugal.

Vegheis (2009) Survey on the nematode population in five districts of southern Kerala namely - Thiruvananthapuram, Kollam, Alapuzha, Pathanamthitta and Kottayam.in this work 15 species of soil nematodes identified were - *Aphelenchoides aligarhiensis*, *Aphelenchus species*, *Caloosia logicaudata*, *Criconemoides species*, *Ditylenchus species*, *Epicharinema keralense*, *Helicotylenchus species*, *Hoplolaimus seinhorsti*, *Longidorus saginus*, *Meloidogyne incognita*, *Pratylenchus coffeae*, *Radopholus similis*, *Rotylenchulus reniformis*, *Tylenchorhynchus*, *Xiphinema species*, of which *M. incognita*, *R. similis* and *Pratylenchus coffeae* are the endoparasites and others are ectoparasites. Absolute and relative frequency of occurrence of these nematodes in sandy loam, laterite and alluvial soil were meloidogyn were more abundant and criconemoid were least abundant.


Laukarkpum (2011) provide an extensive report on plant parasitic nematode associated with mulberry of plant valley district of Manipur, she summarized in report that *Tylenches* species was first time recorded in imphal Manipur India.

Nuzhat Ara (2011) surveyed and gave abundance and diagnostic feature of *Aporcelaimellus* according to her 100 nematode specimens under the genus *Aporcelaimellus* was identified from different cultivated crops. *Aporcelaimellus* prevalence was the highest in banana (80%) and the lowest was in mulberry (20%)
during sampling periods. The diagnostic morphology of this nematode was slender vulva lips, thick vagina, and with long anal body with sharply pointed tail. The highest number of nematode was found in banana (80%) and lowest was in mulberry (20%) plants. The soil environment affects the survival and movement of nematodes in the soil. Nematodes occur in greatest abundance in the top 15 to 30 cm depth of the soil.

**Kumar Garav (2012)** gave ecology and taxonomic study of nematode on Westland according to him *Helicotylenchus spp.* was major in Kadappa, Kurnool, Nalgonda and Prakasam districts associated with sunflower, banana, chilli, sugarcane, cotton and tomato. *M. graminicola* was found only in Nellore district.

**Reena Sahu (2012)** surveyed and gave pathophysiology of root knot nematode in vegetable crops in relation to community analysis with physico chemical parameter. According to her investigation she revealed showing highest average population density (2169 nematodes/10 gm root and 29993 nematodes / 200 cc soil) in the village Funda (Paatan). Among the several genera of vegetable crop plants surveyed *Lycopersicon esculentum*, *Dolichus lablab* and *Momordica charantia* showed the presence of root galls with the highest average population density being in *Dolichus lablab* in the month of January. The hot spots of nematode infestations marked in the present case prove beyond doubt that the vegetable crops in district Durg of Chhattisgarh are severely infested with phytonematodes. Most of the species recorded in the present study particularly, root knot nematodes, are highly pathogenic and population is beyond the damage threshold level.

**Zahra et al (2013)** studied the monthly population fluctuation in plant parasitic nematodes associated with banana plantation in and its correlation with the temperature, moisture, pH and organic carbon content of the soil. They observed four genera of plant parasitic nematodes viz. *Rotylenchus reniformis*, *Helicotylenchus crenacauda* and *Hoplolaimus indicus* to be associated with Banana, with all the four species reaching peak in August, and declining till January.
A second but smaller peak was observed in March, followed by decline till June, showing a bimodal population fluctuation in all the cases. Temperature, moisture and organic carbon content showed positive correlation with the population whereas a negative correlation existed in response to pH.

**Carolina Cantalapiedra *et al* (2013)** gave comparative morphological characterizations of new species within . The nematode *Rotylenchus paravitis* n. sp. infesting roots of commercial sunflowers in southern Spain was described. The new species was characterised by a truncate lip region with 7–9 annuli and continuous with the body contour, lateral fields areolated at pharyngeal region only, body without longitudinal striations, stylet length of 44–50 μm, vulva position at 43–54%, tail rounded to hemispherical with 12–18 annuli. A comparative phenetic study based on a multivariate principal component analysis was developed to determine potential species discrimination. The degree of variation for most characters among specimens of *Rotylenchus paravitis* n. sp. and *R. vitis* was comparable to that observed among specimens belonging to each of the two studied populations of *R. robustus* from Spain and USA.

**Ester *et al* (2013)** gave a detail study of morphology and molecular characterization of *Pratylenches* species.

**Sergei A. Subbotin (2013)** Molecular characterisation and diagnostics of some *Longidorus* species from Russia. Eleven valid and six unidentified species of the genus *Longidorus* collected in different regions of Russia, two states of USA, Germany, New Zealand and Ukraine were identified.

**Mwangi, J. M. *et al* (2013)** conducted a survey to determine the incidences of plant parasitic nematodes (PPN) and factors enhancing population build-up in cabbage (*Brassica oleracea* L. var capitata)-based cropping system in selected agro-ecological zones of Kenya. The study revealed that cabbage was a preferable host to
lesion nematodes *(Pratylenchus)* with 87% and 58% frequency of occurrence in soil and roots, respectively. The mean population of this nematode in soil and root samples was significantly different from other nematode general. Meloidogyne spp. was present at low frequency of 42% and 23% in soil and roots and density 6.36/100 cm3 of soil and 1.1/10 g roots. Helicotylenchus spp. were recovered in significant numbers with 82% frequency of occurrence in rhizosphere and 27% in roots and a density of 26.28/100 cm3 in soils and less than 1 nematode per 10 g of roots. Tylenchorhynchus spp. occurred in 67% of the soil samples while Paratrichodorus, Trichodorus and Paratylenchus spp. were present in 78%, 57% and 58% frequency of occurrence in the cabbage rhizosphere but at a low population density. Other PPN detected in low frequencies of occurrence and density include; *Tylenchus, Scutellonema, Xiphinema spp* among others.

A.M., Youssef *et al* (2014) carried out survey of Plant Parasitic Nematodes Associated with Different Plants in North Sinai Korayem, (Egypt). It gave distribution and dissemination of plant parasitic nematodes associated with vegetables and field crops, fruit trees besides some ornamental and weed plants. Data showed the presence of fourteen plant parasitic nematode genera and species. *Tylenchorhynchus sp.* was the most predominant in Rafah County with the percentage occurrence of 66.6%. For all surveyed villages, stunt nematode was the first in its general average percentage frequency of occurrence of 29.1% followed by that of root knot nematode (27.3%), stubby nematode (13.9%) and lesion nematode (12.5%).

Vinita Sharma (2015) described total 26 species of terrestrial nematode (15 from order Doryloimida and 11 from order Mononchida) has been recorded from Rajaji National Park (RNP), Uttarakhand, India.

Extensive contribution to tylenchids were made by several workers like Golden (1971), Andrassy (1976), Baqri (1978), Bajaj and Bhatti (1978), Dhanachand & Jairajpuri (1980), Mag genti (1983), Inglis (1983) and Nickle (1984). They and others have produced large number of books and monographs with descriptions of several new
taxa. Certes (1889) reported species of Criconemella as Dorylaimus giardi and Eubostrichus guerni. Southern (1914) established the genus Ogma based on a female Ogma under the sub-family Criconematinae.


But work on Ficus carica plants in Aurangabad district not done, which is of prime importance for agriculture so the present study was carried out to fill the lacuna. A study on the taxonomy, correlation of nematode with ecological factor, community analysis of plant parasitic nematode s associated with *Ficus carica* was carried out to provide information about the absolute frequency, relative frequency, relative density, prominence value.