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The minuteness of the nematodes and their usually subterranean habitat have been the prime factors in the slow development of the science of nematology. Although the first plant parasite was reported as early as 1743, plant nematology progressed rapidly only during the later part of the 19th and early 20th century. Like any of the developing field of bioscience, the earlier studies on nematodes dealt with aspects of morphology and taxonomy. As awareness of nematodes grew because of their potential as pests and parasites of agricultural and horticultural crops, most of the research effort was directed towards the study of the biology, pathology, host-parasite relationship and control. The economic importance of nematodes to agricultural, medical and veterinary sciences is well known and losses due to these animals run into crores of rupees annually. In the recent years yet another aspect has gained universal acceptance, this is concerning their use as models in experimental biology.

Experimental biology covers aspects like, behaviour, nutrition, genetics, biochemistry, neurophysiology and ageing, and nematodes are ideal for such studies. For biochemical assays their prolific reproduction and ease in culturing, makes them available
in large numbers. Nematodes possess a simple nervous system with only a limited number of nerve cells hence could be used extensively in neurophysiological studies. Typical symptoms of ageing in nematodes are comparable to those in higher animals and can be studied within few days and replicated several times in a few weeks because of the short life span they may take months and sometimes years to study in other animals. The short life cycle of nematodes coupled with a limited number of cells in the body have made them excellent organisms for developmental studies and complete cell lineages marking the fate of each and every individual cell can be traced.

Among all nematodes *Caenorhabditis elegans* was found to be best model for experimental studies and hence was used by Brun (1966); Dusenbery *et al.* (1978) and Croll (1976) for studies on behaviour. For studies on genetics Klass & Hirsh (1976), Meredith & Edgar (1986), Goldstein & Curis (1987) and Scheirenberg (1987) also used *C. elegans*. This nematode was used as model in nutritional studies by Andrew & Nicholas (1976) and De Cuyper & Vanfleteren (1982) and in ageing studies by Tilby & Moses (1975), Croll *et al.* (1977a,b), Klass (1977), Hosono (1978); Mitchel *et al.* (1979) and Davis *et al.* (1982). With the introduction of *C. elegans* as a model in experimental biology, the use of other nematodes (viz., free living and plant parasites) in
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this field also started. The studies made on the behaviour of *Rhabditis oxycedrea*, *Panagrellus redivivus*, *Meloidogyne incognita*, *Acrobeloides* sp, *Hemicriconemoides mangiferae* and second stage juveniles of *Heterodera schachtii* were made by Gunther (1971), Jairajpuri & Azmi (1979), Azmi & Jairajpuri (1979), Azmi et al. (1979) and Wyss & Zunke (1986) respectively. Crowe & Madin (1975) studied anhydrobiosis in *Aphelenchus avenae* while Demeure et al. (1979) observed in vitro responses to desiccation in *A. avenae*, *Helicotylenchus dihystera*, *Scutellonema brachyurum* and *Acrobeloides* sp. The effects of irradiations and carcinogens on the behaviour of nematodes were further studied by Cox et al. (1976) and Meyer & Kampfe (1973). The behaviour of nematodes in detail was observed by Croll (1976). Since nematodes show typical symptoms of ageing hence ageing studies made in this regard included the works of Erlanger & Gershon (1970), Gershon (1970) and Kisiel et al. (1975) on *Tubatrix aceti* while Epstein et al. (1972) and Himmelhoch & Zuckerman (1978) studied this phenomenon in *C. briggsae*. Further, Ahmad & Jairajpuri (1981, '82) studied ageing in *Cruznema lambdiense* and sex attraction and ageing in *Chiloplacus symmetricus*. Reversat (1981) studied age related changes in the chemical oxygen demand of second stage juveniles of *M. javanica* and *Heterodera oryzae*.

In recent years studies on the role of nematodes as indicators of environmental pollution have gained some
momentum as initial results have been encouraging as shown by the studies of Zullini (1976), Ferris & Ferris (1979), Fricke et al. (1981) and Shaw et al. (1983). The nematode/copepod ratio is used in pollution monitoring as studied by Coull et al. (1981), Raffaeli & Mason (1981), Warwick (1981) and Shiells & Anderson (1985). The role of nematodes along with arthropods in decomposition of semi-arid ecosystem was studied by Elkins & Whiteford (1982) and further their abundance patterns in detection of environmental perturbation was observed by Platt et al. (1984).

The developmental biology of nematodes is an aspect which has drawn considerable attention, be it for understanding the life cycle of economically important species so as to device control programmes or to elaborate the fundamental aspects of development of an organism. It may be pertinent to note that the early work on developmental biology of nematodes started in the later part of the 19th century. Some important works of that time are by Bütschli (1875), Galeb (1878), Goette (1882), Hallez (1885) and Boveri (1893). Later on other workers followed suit and nematode genera chosen for study included Rhabdias by Neuhaus (1903) Camallanus by Martini (1903) and Turbatrix by Pai (1928). The developmental biology of Seinura tenuicaudata, Rhabditis pellio, Chiloplacus
symmetricus and Tylentchorhynchus agri were studied by Hechler (1963); Somers et al. (1977); Ahmad & Jairajpuri (1979) and Coates-Beckford (1982) respectively. Gotoh (1964), Yuen (1965), Hirschmann and Triantaphyllou (1967); Khera (1973), Knobloch (1978), Wood (1973), Abdel-Rahman & Maggenti (1987) gave a detailed account on the embryonic development of Pratylenchus coffeae, Helicotylenchus vulgaris, H. dihystera, Acrobelinema cornis, Criconema octangulare, Aporcelaimellus sp. and Meloidogyne californiensis. Further, Cheng & Samoiloff (1971); Azmi & Jairajpuri (1977); Duggal (1978 a,b) and Ahmad & Jairajpuri (1981 a,b) studied sex attraction in Panagrellus sillusiae (= redivivus) Hoplolaimus indicus, Panagrellus redivivus, Chiloplacus symmetricus and Cruznema lambdiense. The reproductive behaviour of Acrobeloides sp. was studied by Jairajpuri & Azmi (1977) while Somers et al. (1977) described the reproductive behaviour and biology of Rhabditis pellio. Furthermore, Fassuliotis (1962); Cayrol (1964); Hechler & Taylor, (1966); Clarke (1967); Das & Rao (1970); Koshy & Swarup (1971); Sivakumar & Seshadri (1971); Prota et al. (1977); Demire et al. (1980); Bird & Stynes (1981) and Chitambar & Raski (1985) carried out studies on the life cycles of Hemicriconemoides chitwoodi, Ditylenchus myceliophagus, Seinura steineri, Nacobbus serendipiticus, Hoplolaimus indicus, Heterodera cajani, Rotylenchulus reniformis, Xiphinema index, Scutellonema cavenessi, Anquina agrostis and Prathylenchus vulunus respectively. Malakhov
(1981) observed the embryogenesis in free living marine nematodes of Orders Chromadorida, Desmodorida and Monhysterida.

The work in this thesis includes a comparative developmental biology of six species of nematodes namely, \textit{Teratorhabditis andrassyi} Tahseen & Jairajpuri, 1988; \textit{Cephalobus parvus} Thorne, 1937; \textit{Diploscapter orientalis} Kannan, 1968; \textit{Plectus acuminatus} Bastian, 1865; \textit{Monochoides fortidens} (Schuurman's Stekhoven, 1951) Taylor & Hechler, 1968 and \textit{Tobrilus paludicola} Micoletzky, 1925. In view of the differences in their mode of reproduction as well as in the patterns of development, these nematodes belonging to different groups were chosen. Out of these six species of nematodes the rhabditid, \textit{Ter.} (=\textit{Teratorhabditis} andrassyi), the diplogasterid \textit{M. fortidens} and enoplid \textit{Tob.} (=\textit{Tobrilus}) \textit{paludicola} are amphimictic species while the other three species e. g., \textit{D. orientalis} (rhabditid), \textit{C. parvus} (cephalobid) and \textit{P. acuminatus} (aerolaimid) are parthenogenetic.

This study includes a comparative account of the reproductive organs, the mode of reproduction and the structure of the eggs. For a comparative study of embryonic development the cleavage patterns and duration of each developmental stage was studied in all the species. The idea was to determine differences or similarities, if
any, in the embryonic development of the species which belong to four distinct Orders and to interpret, if possible, the phylogenetic relationships (convergence or divergence) amongst them.

For post-embryological studies stained juveniles were observed and measured. Emphasis was laid on the development of the genital primordium. Detailed observations were made on the multiplication and differentiation of the cells/nuclei forming the gonad. The pattern of primordial development in the formation of gonad along with the origin and development of other secondary sexual characters was also studied in depth.