SUMMARY

In the present work an attempt was made to elaborate and explore in detail, the reproductive behaviour of some soil-inhabiting nematodes. Experiments on sex attraction, copulatory behaviour, copulatory senses, ageing and reproduction, and orientation were conducted on the following three species of nematodes: i) Chiloplacus symmetricus, ii) Curznema lambdiensis and, iii) Rhabditis sp.

Observations on sex attraction in Chiloplacus symmetricus showed that only the males were attracted to female secretions, females and fourth-stage male juveniles did not respond. Males showed no significant attraction towards male or fourth-stage female juvenile secretions. The females did not respond to either male or fourth-stage female juvenile or their own secretions. Similarly, fourth-stage male juveniles were unresponsive to any secretions. Orientation of males to sex attractants involved both klinokinesis and klinotaxis, the final approach being a direct movement. Copulation took place when the male coiled its tail around the female and the spicules located the vulval opening. The spermatozoa after deposition in the uterus moved upwards and accumulated in the spermatheca. Copulation lasted from half a minute to nearly 45 minutes.
A study of the factors influencing sex attraction in *Chiloplacus symmetricus* revealed that movement of males to attractant sources was highly variable depending on the experimental techniques employed. In Petri dish experiments, fewer females produced a significant male response than in the mickey mouse traps and also the incubation period needed by the females to produce a response from the males was lesser in the former experiment. Attraction was evident earlier in the Petri dish experiments than in mickey mouse traps. Within each type of experiment also, sex attraction varied with the number of females at the attractant source, period of incubation, time of observation, thickness of agar and the concentration of agar. Generally, five females incubated for 18 hr resulted in a good response of males in the Petri dish experiment but at least 50 females incubated for 18 hr were required for the mickey mouse trap. Attraction was evident towards five females in the former experiment in 2 hr and towards 50 females in the latter experiment also in 2 hr. 1, 2 and 4 mm thick layers of agar did not produce any change in attraction but in 8 mm thick agar attraction decreased significantly. Agar concentration of 4 and 8% inhibited sex attraction in both sets of experiments while there was no significant difference in 1 and 2% agar. Light produced no significant difference in attraction in either experiment.
The sex attraction of ageing males and females of *C. symmetricus* showed that this phenomenon was dependant on the age and reproductive state of the worms. All age-groups of virgin males were responsive to all age-groups of virgin females except 22 day old males to 18 and 22 day old females. The response of young males to older females decreased gradually and similarly the response of ageing males to younger females also decreased gradually. Attraction between virgin males and non-virgin females showed that males of all age-groups were attracted to 10 day old non-virgin females and all except 22 day old males were also attracted to 14 day old females but males did not respond to older females. Males of all non-virgin age-groups showed a positive response to virgin females of all age groups except 22 day old males to 22 day old females. In non-virgin males to non-virgin females, 10 day old females were attractive to males of all age groups and only 10 and 14 day old males were attracted to 14 day old females. Females of other age-groups were not attractive.

In *Curznema lambdiensis* males did not attract males and similarly females did not attract females. Young virgin males responded to young virgin females but not to old virgin females. Young virgin females, however, responded to both young and old virgin males. Virgin males were not attracted to non-virgin females.
but non-virgin males were attracted to virgin females. Non-virgin females showed a positive response to virgin males and virgin females also responded to non-virgin males. Attraction of males to females and females to males increased when the number of attractant worms increased to 50 from ten but a further increase did not produce a corresponding increase in attraction. When both males and females were put at the attractant source, the attraction of females increased from female: male ratio 1:50 to 20:50 but declined thereafter to increasing ratios. Males, however, did not show any similar increase to male: female ratio and attraction gradually decreased from 1:50 to 50:50 male:female ratio.

From the studies on the copulatory behaviour of Curznema lambdiensis it was concluded that copulation involved three distinct steps: i) attachment to female and location of the vulva, ii) penetration by the spicules and, iii) insemination. The bursa aided in gripping the female while the spicules located the vulval opening but did not take part in channelising the sperm from male to female reproductive tracts. The build up of internal pressure to release sperm was accomplished by shortening and swinging of the body in wide arcs. Females continued feeding during copulation. The mean number of copulation per day varied from 3 to 7.2 and the sperm transferred per day from 61 to 176. On an average 20-33 sperm were transferred per copulation per day. In its life span,
a male copulated 15 to 32 times and transferred a total of 517-754 sperm. When males were isolated for more than two days, both the number of copulations and the number of sperm transferred decreased. The mean number of sperm transferred on the first copulation was maximum in two day old males while three and four day old males showed a significant decline. As the isolation period of the males increased, the time required for the first copulation also increased.

In ageing virgin females of *Curznema lambdiensis* the number of oocytes released by the ovary was less than in copulating females. Unfertilized oocytes failed to develop an egg shell and usually ruptured in the uterus. The egg mass sometimes passed out of the body during vulval twitchings or was reabsorbed by the uterine walls. In old virgin females, the ovary gradually became vacuolated and then shrivelled up. In copulating females as many as 171 eggs were produced on the first day. Fertilization took place in the spermatheca but the oocytes first contacted the sperm in the oviduct. Eggs were laid in batches but in older females they were retained in the body and ultimately led to 'endotokia matricida'. Spermatozoa in virgin males began maturing by the end of the final moult and within a day filled the entire seminal vesicle. On the third day they began to degenerate. Such degenerate spermatozoa had either a condensed cytoplasm or their outer layer became mammilated. The
testis degenerated in the same way as the ovary. Normally copulating males did not accumulate sperm in their seminal vesicle. Degenerative changes started on the third day. The mean life span of virgin worms was 10 days while of non-virgins it was only 6.5 days. When ageing males were mated with young females or vice-versa, egg production gradually decreased. Similar results were obtained for egg production after the first copulation.

An analysis of the copulatory senses of *C. lambdiensis* revealed that males, either virgin or non-virgin, could distinguish between an inanimate and an animate object but could not differentiate between dead and live females either on sterile agar or on agar with an attractant gradient. Freshly moulted males copulated regularly over the entire three day period but maximum sperm were transferred during the first copulation. Two day old males copulated rapidly and a greater number of sperm were transferred per copulation on the first day than on the second and third day. On the second and third day the intervals between copulations increased. In alternately isolated and copulating males, copulations occurred at a faster rate than normally and the number of sperm transferred was also greater.

Movement of males of *Rhabditis* sp was random on plain sterile agar as was indicated by the high correlation coefficients but in the presence of female secretions, males showed a bias pattern of
movement (no correlation) and tended to accumulate at the source of attractant. Males orienting to a point source showed more turnings and asymmetric movements than when orienting to a source 2 mm in diam. In the former case, tracks were often extremely circuitous. The movement of males from the centre of an attractant area was highly variable and in most cases, the males orientated initially towards a point between two attractant sources and only when near the source did they move directly. However, those males that moved into the area between two attracting sources at the periphery of the circle, showed very tortuous tracks and were captured by an attractant source only when they came very close to it. Males responding to attractants showed preferential movement and most aggregated at the five female source on both the attempts. The maximum number of males showing the same response on both the trials was at the five female source. However, not more than 50% of the males showed the same response on both the trials. Analysis of the locomotory characteristics in attractant and non-attractant zones of agar revealed that sex attractants inactivated males i.e., decreased their wave frequency. The wave length increased but the amplitude remained constant.