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Early embryonic developmental patterns in soil nematodes

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ABSTRACT

The eggs of soil nematodes are usually laid in single cell stage but in some cases retained upto three cleavages and still in some, the entire embryonic development takes place within the famale's body. Polarity in eggs, is determined by the position of polar body. The first cleavage furrow is transverse but the cleavages afterwards are variable in different nematode groups. The division can be equal or unequal or it can be transverse, longitudinal or oblique in plane. The time taken between two consecutive cleavages vary from species to species and it is greater in tylenchids among Secernenteans and in Adenophoreans.

The eggs of soil nematodes are variable in shapes viz rounded elongated oval and ellipsoidal. The eggs are usually laid in single cell condition. However in some nematodes the development takes place within the female's body. In a tylenchid, *Scutellonema cavenessi* eggs are laid after undergoing three cleavages within the females body[4], while in *Rotylenchulus parvus*[8], occasional matricidal hatching occurs. In most of the rhabditid nematodes development within the female body is a common feature[9,13]. In most of the nematodes, particularly young females, the egg laying is followed by amphimixis *i.e.* the fusion of male and female pronuclei. The female pronueleus lies in the centre while the male pronucleus approaches it and their fusion occurs (Fig. 1 A,B). In some nematodes the movement of the pronuclei as well as their fusion brings about changes in the cytoplasm, a condition that has been referred to as psuedocleavage[11] (Fig. 1A). Usually one male pronueleus succeeds in entering the mature ovum after which entry of other pronuclei is checked by formation of fertilization membrane. It has been observed in some abnormal conditions that several pronuclei gain entry in the mature ovum of *Tobrilus paludicola* but finally disintegrate or get absorbed in the cytoplasm and the egg also fails to develop further.

The onset of cleavage is marked by cytoplasmic retraction. The cytoplasm takes a uniform shape and as a result a polar body is seen. The polarity of the egg is determined by the position of the polar body. In the beginning of cleavage it generally lies at the animal pole/anterior end and other end

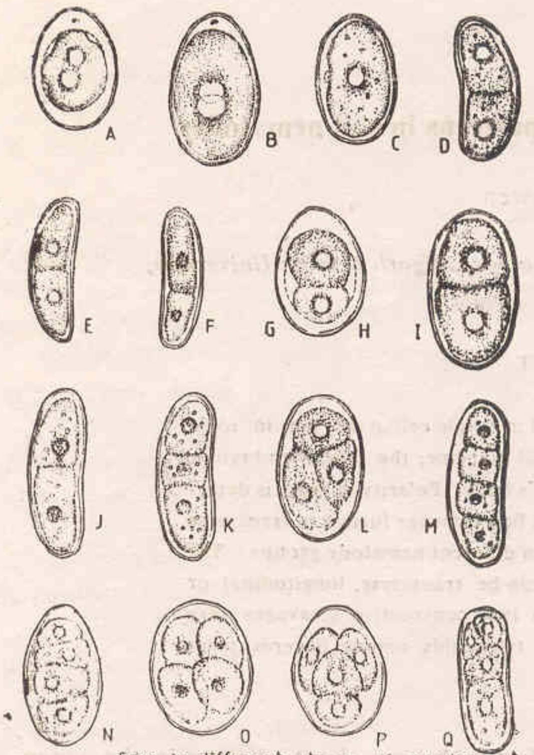

Fig. 1.

is recognized as vegetal pole or the posterior end of the egg (Fig. 1C). After several cleavages the position of polar body has no significance. The egg prepares for division by showing streaming movement in the cytoplasm and the enlargement of the central nucleus. The first cleavage furrow is typically transverse in soil nematodes giving rise to S_1 (anterior) and P_1 (posterior) blastomeres. The division can be equal or unequal in different nematode groups. The unequal division can further result in formation of anterior larger and posterior smaller blastomeres or the anterior smaller and posterior larger blastomeres. Equal blastomeres are observed in *Rotylenchulus parvus*[3] *Nacobbus serendipiticus* (Clarke, 1967), *Chromadorita tenuis*[8] *Xiphinema* sp.[5] and *Mononchus aquaticus*[6] (Fig. 1D, E). The nematodes having anterior larger blastomere are *Seinura oxura*[7], *Rhabditis teres*[17] and *Desmodora serpentulus*[10] (Fig. 1F, G). The nematodes having posterior larger blastomere are *Ditylenchus destructor*[1] *Cylindrocorpus longistoma*[2] and *Helicotylenchus*[19] (Fig. 1 I, J). The second cleavage in soil nematodes can be transverse or oblique in plane division in tylenchid nematodes is exclusively in transverse plane (Fig. 1K), while oblique division is characteristic of some rhabditids, viz. *Taratorhabditis andrassyi*[14] diplogasterids viz. *Mononchoides fortidens*[15], dorylaims viz. *Dorylaimus stagnalis*[12] and mononchs viz. *Mononchus aquaticus*[6] (Fig. 1L). The third cleavage is again transverse or oblique in plane. However, the cleavage plane in tylenchids is always perpendicular to longitudinal axis (Fig. 1M) except *Ditylenchus destructor*[1] where instead of forming four blastomeres in a row the division results in T-shaped arrangement of blastomeres (Fig. 1Q). A similar type of arrangement is found in a desmorid, *Desmodora serpentulus*[10] (Fig. 1P). The blastomeres appear in tandem as a result repeated transverse divisions (Fig. 1N) in a rhabditid, *Diploscapter orientalis*[16]. The oblique cleavage results in a rhomboid arrangement of blastomeres in various nematodes *e. g. Plectus zelli* (Tahseen *et al.*, 1992), *Cylindrcorpus longistoma*[2], *Desmodora serpentulus*[10] *and Aporcelaimellus* sp.[18] (Fig. 10). The rate of cleavages vary in different nematode groups. It takes less time in free living nematodes particularly the rhabditids and cephalobids. The lineages take more time in tylenchids (18–30 h from single cell to blastula stage) and dorylaims (4–6 days from single cell to blastulation).

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