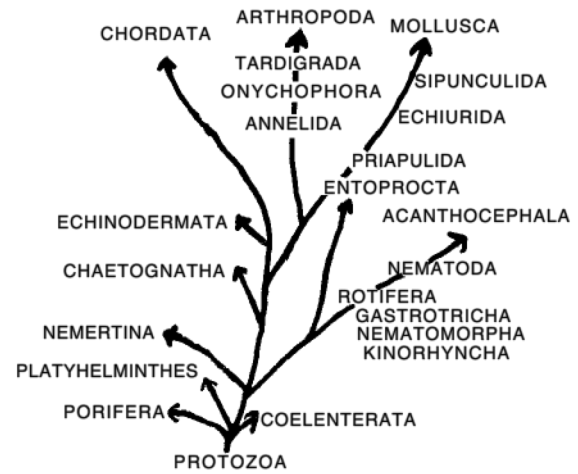
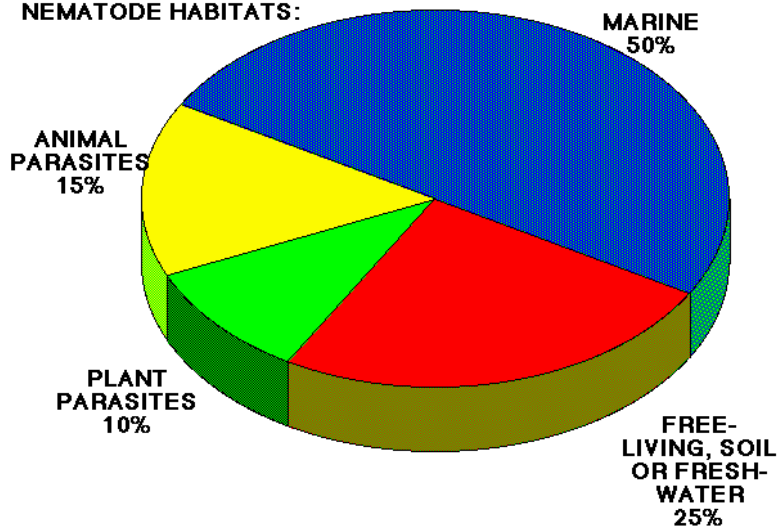


NEM 204

REVIEW OF INTRODUCTORY NEMATOLOGY



NEMATODE HABITATS:



ESTIMATED LOSSES DUE TO NEMATODES IN CALIFORNIA:

CROP	ESTI- MATED % LOSS	ACRES	FARM \$ VALUE	\$ LOSS
FIELD CROPS	6	1,091,166	2,791,345,185	307,047,970
FRUITS & NUTS	12	1,883,204	4,026,765,267	483,211,832
VEGE- TABLES	11	6,402,613	2,947,240,705	176,834,442
ORNAMEN- TALS	10		1,185,878,000	118,587,800

TOTAL 1,085,682,045

TOTAL CALIFORNIA CASH FARM VALUE = \$16,838,870,235

(NOTE: % LOSS ESTIMATES ARE FROM THE SOCIETY OF NEMATOLOGISTS FOR U.S. AS A WHOLE)

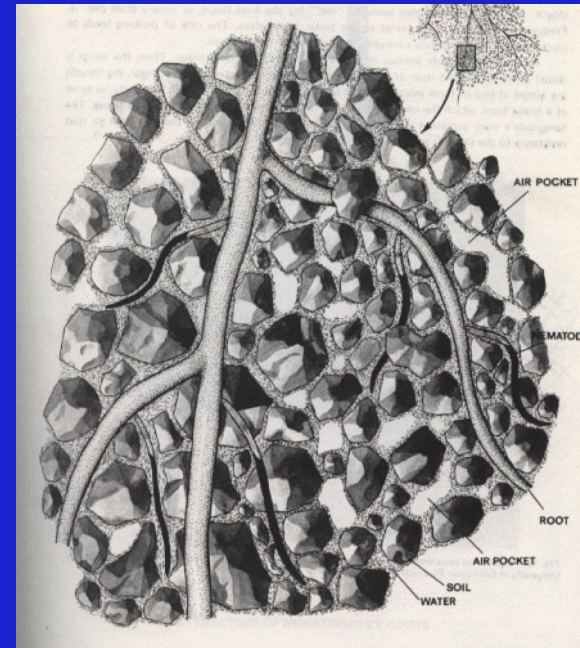
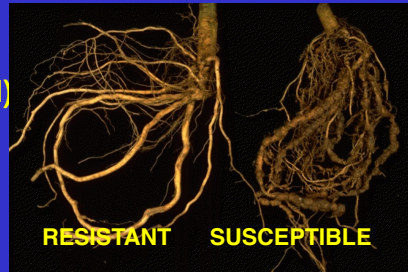
**ANNUAL CROPS:
MILLIONS OF DOLLARS LOST
IN CA IN 1991 FOLLOWING
SUSPENSION OF USE OF
TELONE II IN 1990 (SRI)**

ROOT-KNOT NEMATODE (RKN)

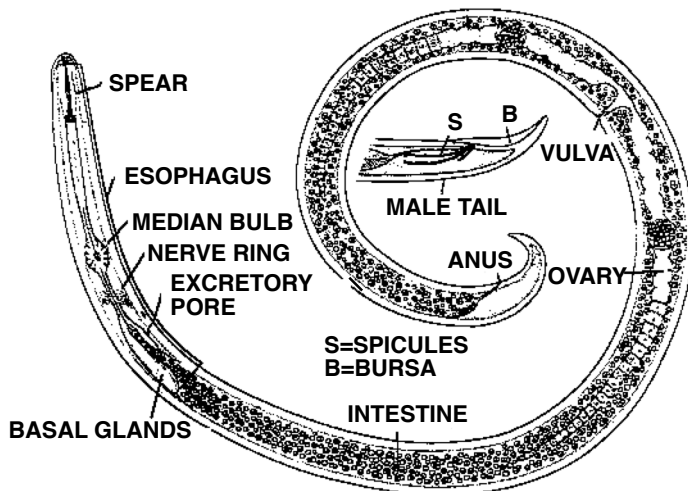
Tomatoes	13.4
Cotton	9.8
Sweet potatoes	7.5
Potatoes	0.4
Carrots	15.1
SUGARBEET CYST(SBCN)& (RKN)	
Broccoli	15.7
Cauliflower	7.9
Sugar beets	6.1
Brussel sprouts	0.7

**WORLDWIDE 5 -12%
ANNUAL LOSSES
DUE TO PLANT
PARASITIC
NEMATODES
(SASSER AND
FRECKMAN, 1987)**

**ROOT-KNOT NEMATODE
ON TOMATO**

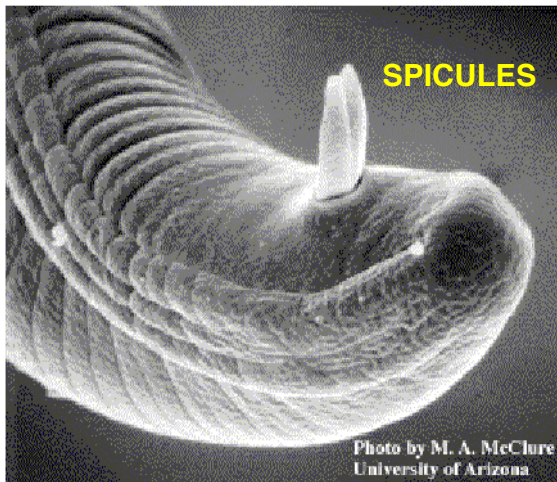


**NEMATODES
ARE AQUATIC
ORGANISMS.**

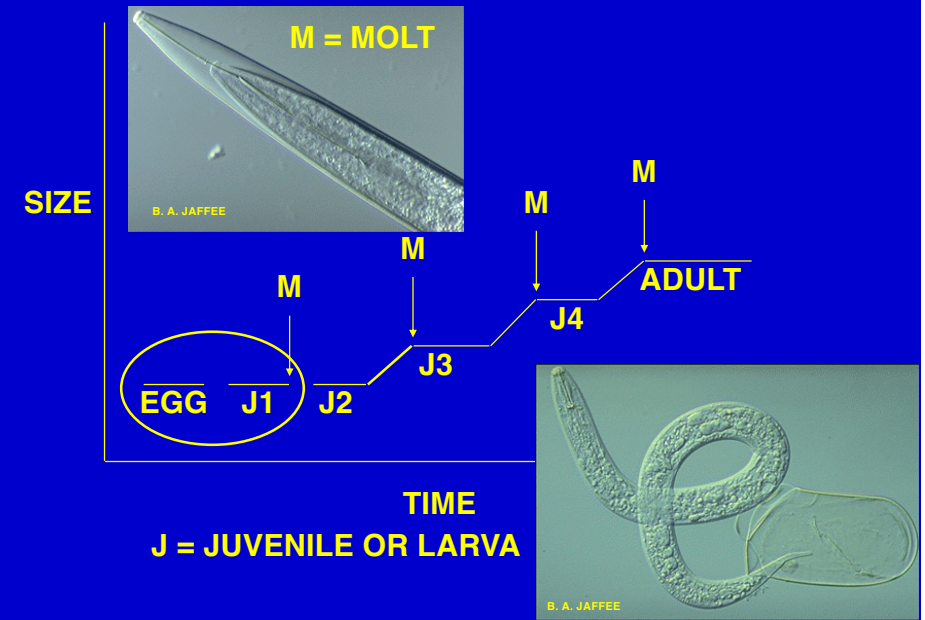


TYPICAL PLANT PARASITIC NEMATODE





LIFE CYCLE OF A TYPICAL PLANT PARASITIC NEMATODE:



THE MOST COMMON GENERA OF PLANT PARASITIC NEMATODES IN CALIFORNIA:

*Vectors of plant viruses

ECTOPARASITES

- Trichodorus* - Stubby Root*
- Xiphinema* - Dagger*
- Longidorus* - Needle*
- Helicotylenchus* - Spiral
- Mesocriconema* - Ring
- Paratylenchus* - Pin
- Hemicycliophora* - Sheath

SOME GENERA CONTAIN SEVERAL IMPORTANT SPECIES

(Quarantine pests: *Globodera*, *Belonolaimus*, *Radopholus*, *Rotylenchulus*)

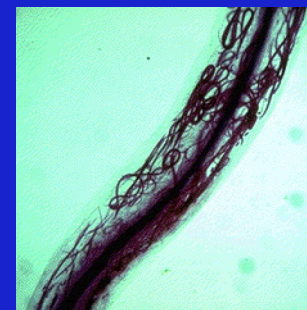
MIGRATORY ENDOPARASITES

- Pratylenchus* - Lesion
- Ditylenchus* - Stem & Bulb
- Aphelenchoides* - Foliar

SEDENTARY ENDOPARASITES

- Meloidogyne* - Root Knot
- Anguina* - Seed & Leaf Gall
- Tylenchulus* - Citrus
- Heterodera* - Cyst

Dorylaim vs Tylench



MIGRATORY ENDOPARASITE

ECTOPARASITE



SEDENTARY ENDOPARASITE

**NEMATODES OF GREATEST CONCERN WORLDWIDE:
 CYST (*HETERODERA SP, GLOBODERA SP*),
 ROOT-KNOT (*MELOIDOGYNE SP*), LESION
 (*PRATYLENCHUS SP*) [FAO, LAMBERTI, 1997]**



**SUGARBEET
 CYST
 NEMATODE
 (*HETERODERA
 SCHACHTII*)**



COLE CROPS

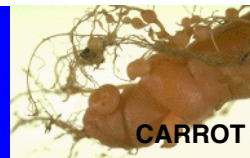
ROOT-KNOT NEMATODE (*MELOIDOGYNE SP.*)



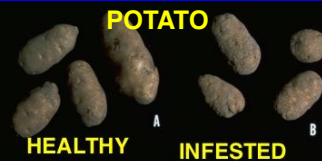
COTTON



SUGARBEET



CARROT



POTATO

HEALTHY

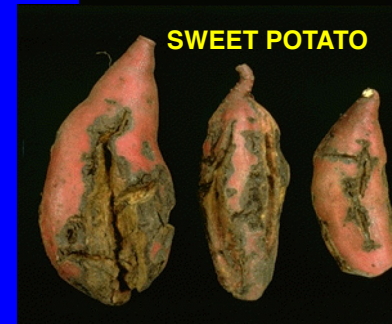
INFESTED



WATERMELON

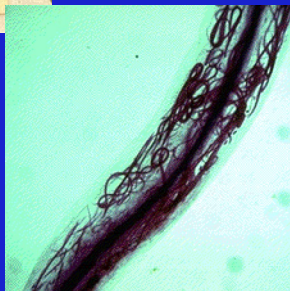
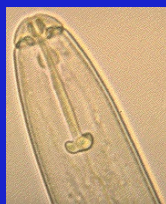
HEALTHY

INFESTED

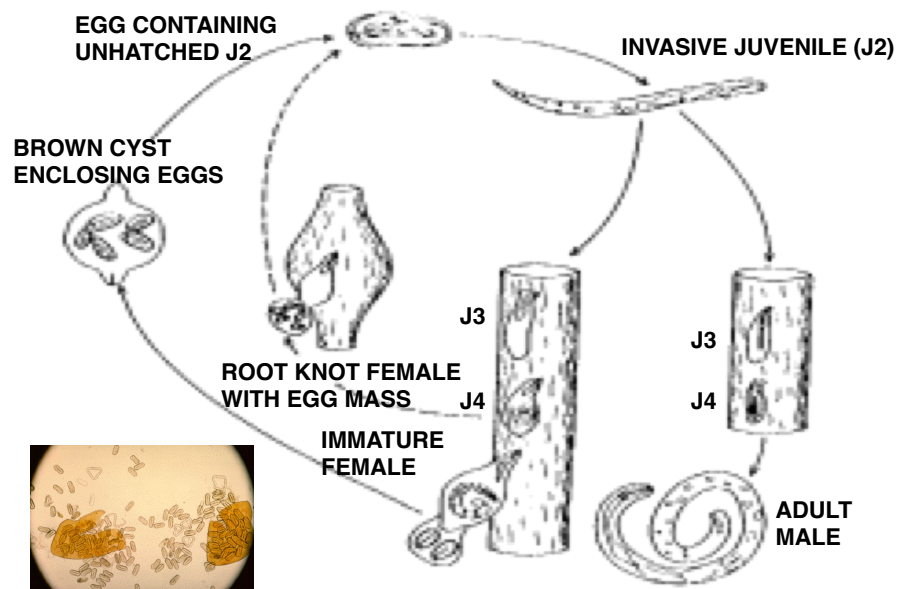


SWEET POTATO

**LESION NEMATODE (*PRATYLENCHUS PENETRANS*)
 EASTER LILIES**



LIFE CYCLE OF CYST AND ROOT KNOT NEMATODES:



PHYLUM: NEMATA (OR NEMATODA)

CLASS: ADENOPHOREA (no phasmids)

ORDER: DORYLAIMIDA

ORDER: STICHOSOMIDA

CLASS: SECERNENTEA (phasmids = caudal sensory organ)

ORDER: RHABDITIDA

ORDER: STRONGYLIDA

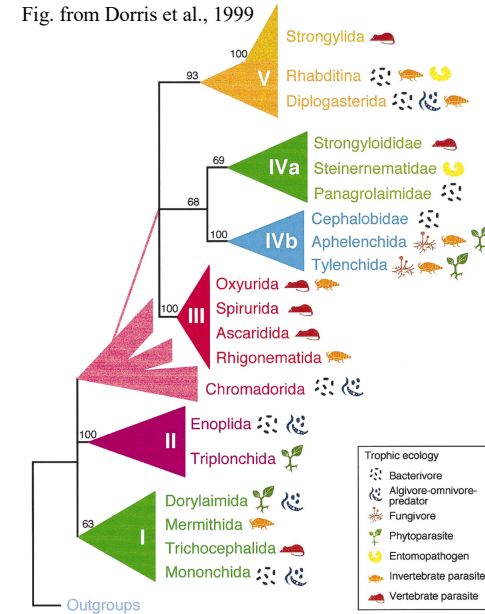
ORDER: ASCARIDIDA

ORDER: SPIRURIDA

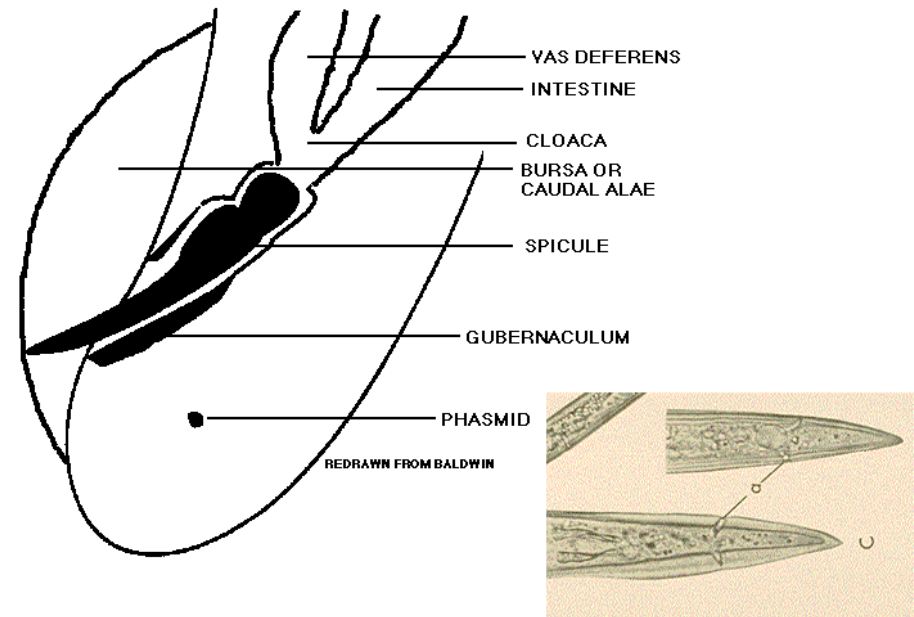
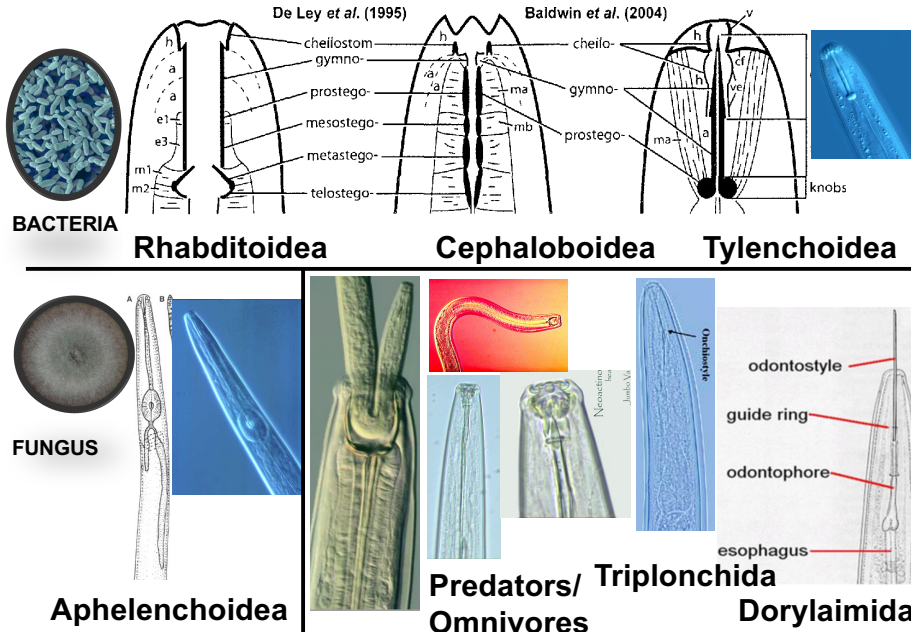
ORDER: TYLENCHIDA

SSU Tree

Blaxter et al. 1998, Nature
Fig. from Dorris et al., 1999



THE EVOLUTION OF PLANT PARASITISM



**PRACTICAL CHARACTERISTICS
USED TO IDENTIFY NEMATODES**

- SHAPE OF ADULT FEMALES –
VERMIFORM OR SPHERICAL
- ROOT SYMPTOMS –
CYSTS OR GALLS
- STYLET SHAPE AND LENGTH –
WITH OR WITHOUT KNOBS
- ESOPHAGUS
TWO VS THREE PART
- CUTICULAR ANNULATION
- NUMBER OF OVARIES
- LOCATION OF VULVA

SHAPE OF ADULT FEMALES

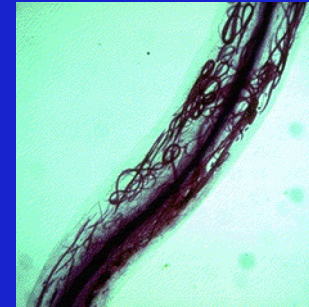


SPHERICAL



VERMIFORM

SPHERICAL



ROOT SYMPTOMS - CYSTS OR GALLS



CYST



GALLS



HEALTHY

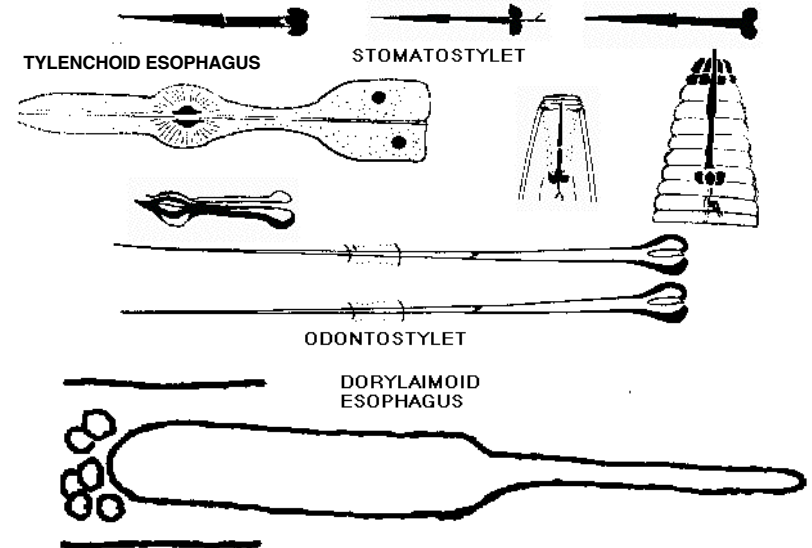
INFESTED

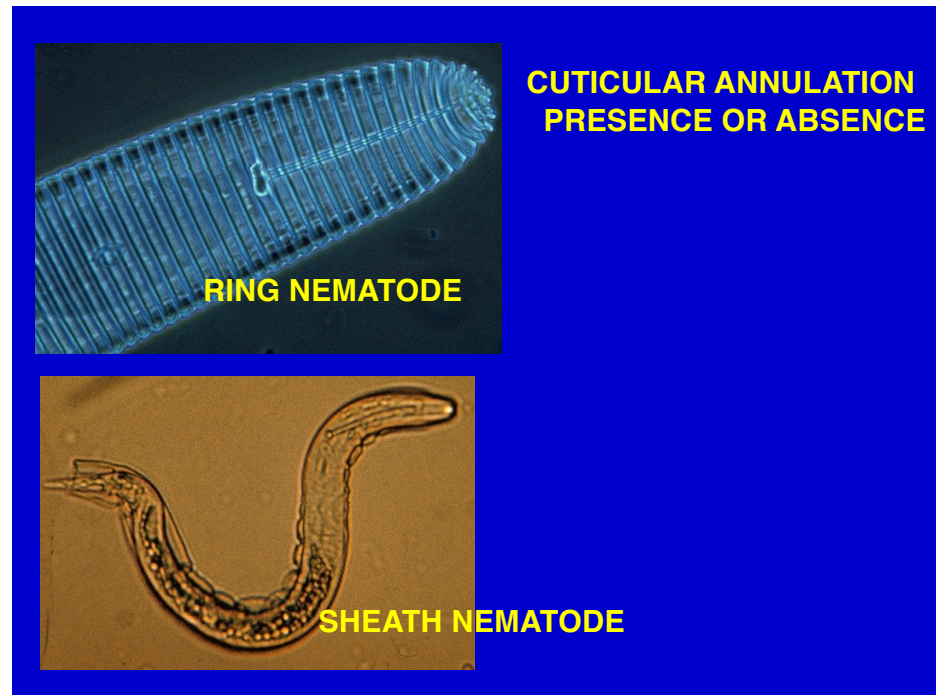
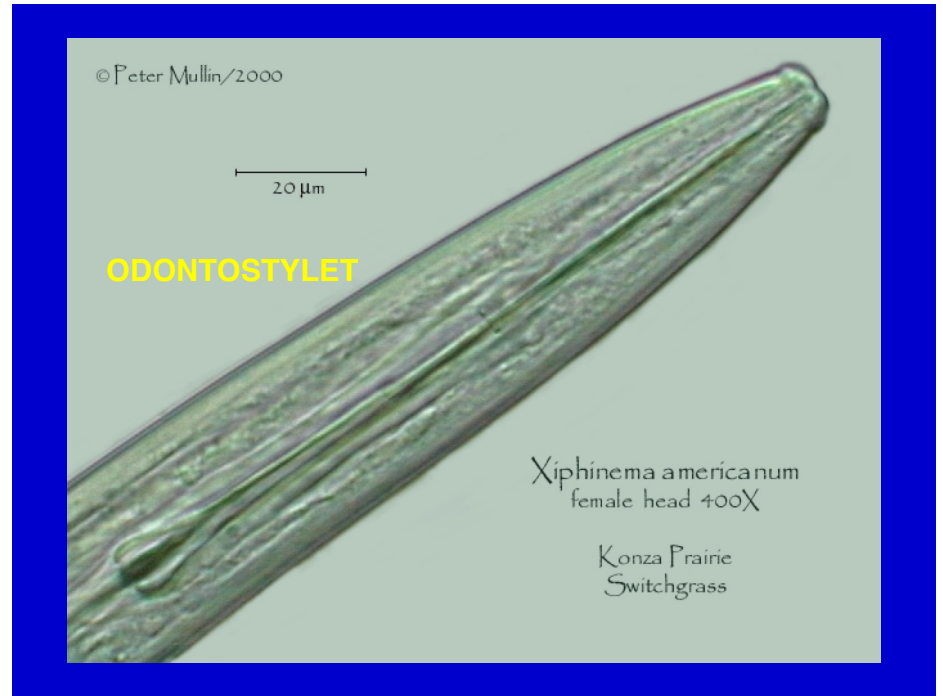
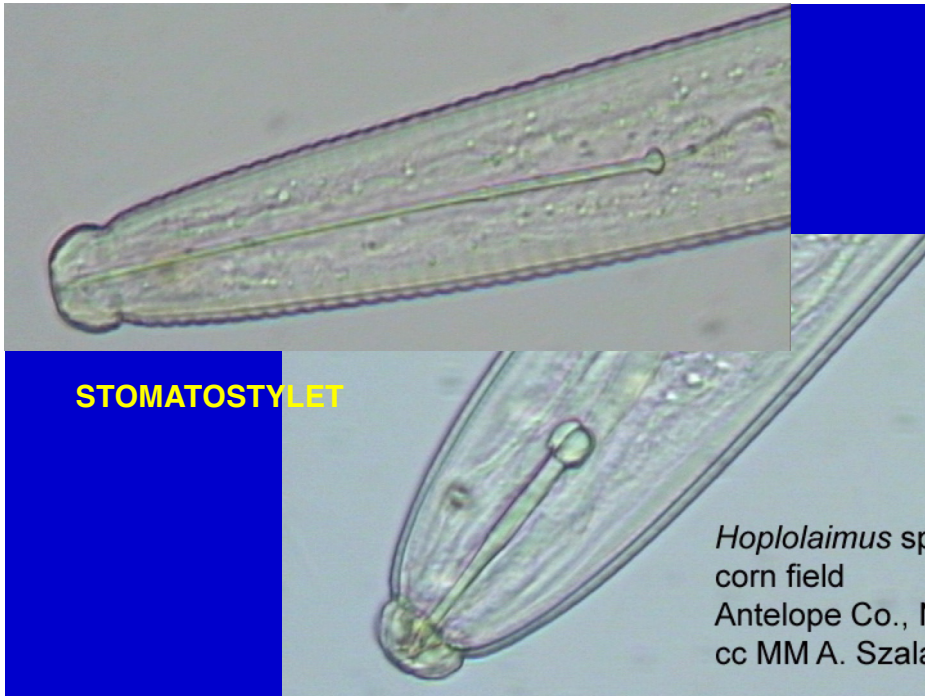


RESISTANT

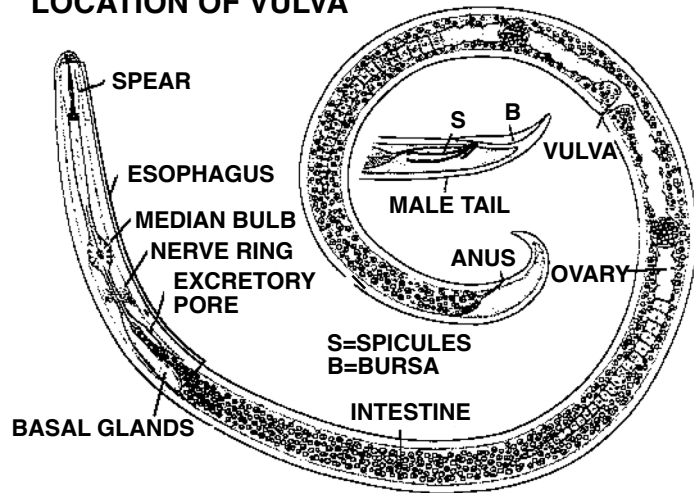
SUSCEPTIBLE

**STYLET SHAPE AND LENGTH (WITH OR WITHOUT KNOBS)
TWO VS THREE PART ESOPHAGUS**





NUMBER OF OVARIES
LOCATION OF VULVA



TYPICAL PLANT PARASITIC NEMATODE