

THE MEADOW-GRASS NEMATODE--ANGUINA POOPHILA  
KIRJANOVA, SP. NOVA

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Parasitic nematodes of the genus Anguina Scopoli, 1777, which cause galls on the vegetative parts of plants of cultivated and wild flora (on the spikelet, leaves, and stalks), usually cause them extremely serious harm and noticeably reduce the nutritional qualities of infected cultures. So, for example, it is known that Anguina tritici (Steinbuch, 1799) strongly reduces the bakery properties of flour which has been obtained from wheat with a large mixture of galls of the wheat nematode.

According to the indication of some authors (Shaw & Muth [4]), cattle and sheep which had eaten, along with the customary field forage, the fescue Festuca rubra commutata infected with the nematode Anguina agrostis (Steinburch, 1799), became seriously ill with signs of a nervous disorder. The animals fell down, trembled with all their muscles and exhibited general lack of coordination of movements. Abortions were observed with sheep. Those animals which under the same circumstances ate forage not infected by the nematode, remained healthy.

In the light of these facts, the great interest produced by the finding of parasitic nematodes of the genus Anguina on the wild grasses of Tadzhikistan becomes understandable. The present report is devoted to the description of one of such findings.

On March 29, 1950 a certain quantity of meadow-grass plants, Poa sp., was gathered by an expedition of the Botanical Institute of the Tadzhikistan SSR Academy of Sciences, consisting of P. N. Ovchinnikov, V. I. Zapryagaeva and I. A. Il'inska. The specimens were taken on the south slope of the Peter the First Range, on the right bank of the Garm River, below the glacier at an altitude of 3,400 meters. When the herbarium was processed, it was found that a significant amount of the plant Poa sp. was infected with the nematode Anguina poophila sp. n., a description of which is given below. This nematode was found living parasitically on the spikelet, on which it caused the formation of peculiar galls of the torus [= caryopsis?] (Fig. 1).

The infected spikelets look larger than the uninfected; the base of the stalk of the infected spikelets is characteristically curved (Figure 2), but the glumes of the spikelet fit more loosely and look thickened in comparison with healthy ones. With removal of the glumes of the spikelet, the cigar-shaped gall of the meadow-grass nematode is observed, dark brown or almost black in color with a light brown, almost white apex, and slightly bifurcated at the very end (Fig. 1). The dimensions of the galls vary around 4 millimeters in length (or a few more) and approximately 0.7 - 0.8 mm in width. The sheath of the gall is quite thick and porous, but inside of it is a cavity filled with adult nematodes some of which already



Fig. 1. Galls of the meadow-grass nematode Anguina poophila Kir'yanova sp. n. on the spikelet of Poa sp. (from Tadzhikistan)

1 - gall with partially removed spikelet glumes; 2 - the same greatly enlarged with glumes almost completely removed. (Drawing by Y. A. Podlesnev, original).

Fig. 2. External view of the spikelets of an ear of Poa sp., infected with the meadow-grass nematode Anguina poophila Kir'yanova sp. n.

Typical distortions of the stems at their basal parts are visible, a fact that is characteristic for spikelets infested by the nematode. (Drawing by Y. A. Podlesnev, original).

partially dying out, and their eggs in all stages of development. In the material placed at my disposal there were found only galls containing adult nematodes and from the egg but not from the second stage larvae as this is observed in mature galls of the wheat nematode [this sentence is not clear in the Russian text - translator]. It is possible of course that the galls were collected while not quite mature and they dried up with the contents at the egg stage; to the outward view they looked mature. On soaking the galls in water a massive hatching of second stage larvae from eggs was observed.

Several adult males and females of the meadow-grass nematode are simultaneously encountered in a single gall. Thus, for example, in one gall I observed four males and eight females, and in another once, two males and one female. I did not make a more careful calculation of the [number of] adult nematodes inside the galls in light of the relatively small material which I had available.

The eggs of the meadow-grass nematode have an oval form with a rather thick, double-contoured sheath about  $0.9\mu\text{m}$  thick; their dimensions vary from 90 up to  $110\mu\text{m}$  in length and from 38 up to  $40\mu\text{m}$  in width (Fig. 3).

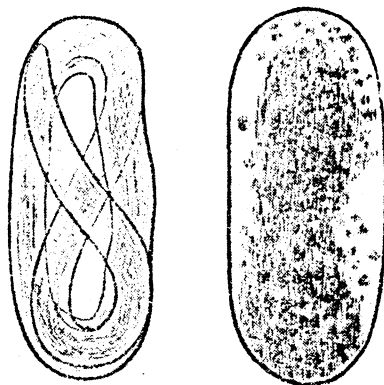


Fig. 3. Eggs of the meadow-grass nematode Anguina poophila Kir'yanova sp. n. at different stages of development. (Drawing by Y. A. Podlesnev. original)

The first stage larvae have the appearance of light, transparent rods with a strongly pointed posterior, and a blunt anterior end of the body. Their dimensions vary from 570 up to  $680\mu\text{m}$  in length and from 11 up to  $14\mu\text{m}$  in width;  $a = 55 - 60$ ;  $b = 3.9 - 4.2$ ;  $c = 12.6 - 14$ . The stylet is about  $6\mu\text{m}$  in length. The length of the esophagus varies from 170 up to  $216\mu\text{m}$ , while the length of the tail is approximately 50 -  $52\mu\text{m}$ . The larvae have a well-developed esophageal bulb which has an oval form and is somewhat exaggerated in its posterior half; its dimensions are approximately  $17\mu\text{m}$  in length and about  $9\mu\text{m}$  in width.

Adult nematodes on the whole differ noticeably in size; the males are relatively smaller than the females. In individual galls the males were almost two times smaller than the females, reaching in length from 915 up to 990  $\mu\text{m}$  at the same time that the females had 1,760 - 1,875  $\mu\text{m}$  in length. In other galls such a sharp difference in measurements of both sexes has not been observed, but the females were always of somewhat larger sizes. On the whole the size of adult males varies from 870 up to 1,485  $\mu\text{m}$  in length and from 30 up to 90  $\mu\text{m}$  in width. Sizes of females vary from 1,320 up to 1,870  $\mu\text{m}$  in length and from 55 up to 100  $\mu\text{m}$  in width. It should be noted that the body of adult worms is usually strongly exaggerated in the anterior part (Figures 4 and 5) and often noticeably exceeds its diameter in the area of the vulva in females and in the area of the ejaculatory duct in males (usually one takes the width in these locations for the maximum width of the body of nematodes). The transverse diameter of the body immediately behind the esophagus in the females is usually equal to 110 - 135  $\mu\text{m}$ , but in the males is 60 - 130  $\mu\text{m}$ , whereas the width generally accepted for measurement in corresponding sections of the body does not exceed 55 - 100  $\mu\text{m}$ . The detailed formulas of the male and the female are given below:

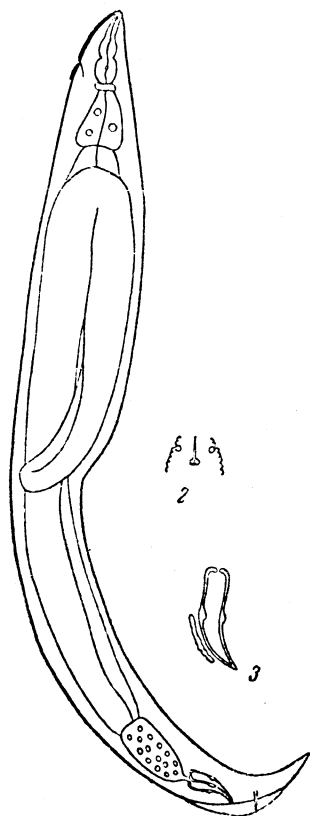


Fig. 4. Male of the meadow-grass nematode Anguina poophila Kir'yanova sp. n. (schematically)

1 - general view of the body; 2 - head end with much greater enlargement; 3 - spicules and gubernaculum. (Original).

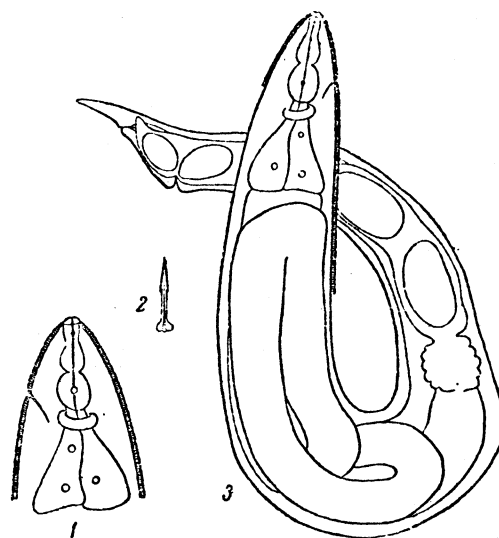


Fig. 5. Female of the meadow-grass nematode Anguina poophila Kir'yanova sp. n. (schematically)

1 - head end; 2 - stylet; 3 - general view of the body. (Original).

♂: 870 - 1485  $\mu\text{m}$  x 35 - 90  $\mu\text{m}$ ; a = from 11 up to 28 (in young males); b = 6.6 - 7; c = 12 - 16.5

♂	12	78	122	16.5	928	990 $\mu\text{m}$ .
	11	38	50	35	29	

♀: 1820 - 1870  $\mu\text{m}$  x 55 - 100  $\mu\text{m}$ ; a = from 17 up to 34; b = 7 - 12; c = 15.6 - 16.5

♀	11	135	?	--	1625	--	1700	1760 $\mu\text{m}$ .
	11	58	90		65		55	

Cuticle annulated in both sexes. On the head end the first four cuticle annules are segregated into a "head" immediately behind which are located amphids with a rounded form in this species (Fig. 4, 2). Stylet small, about 9  $\mu\text{m}$  in length in males and females. Opening of excretory pore situated at level of the bulb, somewhat in front of the nerve ring. Digestive organs arranged typically for the genus Anguina. Esophagus noticeably widened in front of the bulb; immediately behind the bulb is situated the nerve ring followed by the greatly exaggerated posterior part of the esophagus. Sexual organs not paired; gonad reflexed several times; the body cavity in this area is so greatly overcrowded that the front part of the body appears thicker than that situated behind. Spicules approximately 29 - 30  $\mu\text{m}$  in length and 9  $\mu\text{m}$  in width; gubernaculum equal to 11  $\mu\text{m}$ . Length of male tail varies, approximately 58 - 62  $\mu\text{m}$ ; bursa relatively small, not reaching the tip of the tail by a distance of approximately 14.5 - 15  $\mu\text{m}$ . Female tail also short, from 60 up to 96  $\mu\text{m}$  in length. Vulva situated at a distance of 82 - 90 percent from the head end of the body. At one time several eggs can be lodged in the uterus, following one after another in a chain as this is often observed in the wheat nematode.

The meadow-grass nematode Anguina poophila has a very great similarity to A. agrostis which affects wild grasses of the genera Agrostis, Festuca, Hordeum, Koeleria, Phalaris, Phleum, and Poa and is prevalent in Norway, Germany, America and England. Both nematodes come close to each other in common average body measurements, in the presence of a small stylet about 9  $\mu\text{m}$  in length, in a strong widening of the glandular part of the esophagus, and in a similarity of gall-formations which are caused by them in infected plants. At the same time the meadow-grass nematode A. poophila differs from A. agrostis by the very characteristic form of the body, exaggerated in the latter two-thirds of the body's front half (Figures 4 and 5); by the relatively smaller dimensions; by the absence of a separate tip on the end of the tail; by the location of the excretory pore, which is situated on the level of the bulb, but not near the base of the esophagus as with A. agrostis; by the smaller measurements of the spicules and the gubernaculum, to wit: with A. poophila the length of the spicules does not exceed 29 - 30  $\mu\text{m}$  or the gubernaculum, 11  $\mu\text{m}$ , whereas with A. agrostis the spicules reach 42  $\mu\text{m}$  in length and the gubernaculum, 14  $\mu\text{m}$ . The tail of the meadow-grass nematode is noticeably longer and c = 12.6 - 14 for its males, whereas c = 20 - 23 for the males of A. agrostis; with the females c is correspondingly equal to 15.6 - 16.5 for the first species, and 32 - 44 for the second. The eggs of the meadow-grass nematode (90 - 110  $\mu\text{m}$  x 38 - 40  $\mu\text{m}$ ) are smaller than the eggs of A. agrostis (150 x 50  $\mu\text{m}$ ). The first stage larvae of the meadowgrass nematode are noticeably thinner, having a length of 570 - 680  $\mu\text{m}$  and a

thickness of 11 - 14,um (a = 50 - 60); with A. agrostis the first stage larvae are 550,um in length and 15,um in width (a = 36.6). Both species cause cigar-shaped galls on affected plants but the galls of A. agrostis have a purple color, those of A. poophila are dark-brown. The stalks of the spikelets which bear galls are straight with A. agrostis but strongly convoluted at the base with A. poophila.

The meadow-grass nematode differs from other species even more greatly, by the structure of the worms themselves, by the forage plants, and by the gall-formations which the nematode causes.

The described discovery of the meadow-grass nematode Anguina poophila Kir'yanova sp. n. is possibly not unique. According to a written communication of E. P. Luppova, in the process of collection of material of plants with fungus diseases, Y. I. Karbonskaja repeatedly encountered analagous galls on different grasses in Tadzhikistan while collecting material of plants with fungus diseases.

A number of species of the genus Anguina Scopoli, 1777 are encountered in the USSR: the wheat nematode Anguina tritici (Steinbuch, 1799), a cosmopolitan species observed in several regions of the country; the nematode Anguina picridis Kir'yanova, 1944, prevalent in the Gissar Valley of Tadzhikistan; and Anguina sp. observed in the Varzob district of that same republic (Kir'yanova [2,3]).

#### LITERATURE

1. Kir'yanova, E. S., 1941. [The nematodes of cereals.] Izv. Vissh. Kurs. Prikl. Zool. i Fitopatol. 12: 235-266.
2. Kir'yanova, E. S., 1944. [Plant parasitic nematodes of Tadzhikistan.] Izv. Tadzh. Filiala Akad. Nauk. USSR 5: 83-94.
3. Kir'yanova, E. S., 1951. [Nematomorpha and round worms of Kondar Gorge.] Monograph, ZIN, Akad. Nauk USSR Pbl., M.-L.
4. Shaw, J. N. & Muth, O. H., 1949. Some types of forage poisoning in Oregon cattle and sheep. J. Am. vet. med. Ass. 114(866): 315-317.