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## *Aphelenchoides besseyi* (Christie, 1942) on Rice: A New Record in Egypt

Amin W. Amin

Department of Agriculture Zoology and Nematology, Faculty of Agriculture, Cairo University, Egypt

**Abstract:** A survey of plant parasitic nematodes in the paddies of Dakahlia and Sharkia governorates in Nile Delta of Egypt revealed the presence of *Aphelenchoides besseyi* for the first time in Egypt. The nematode observed is "White tip" leaf disease symptoms of 3-5 cm of the rice leaf tip which become necrotic, followed by reduction in size of the panicle and decrease in the size and number of grains. Morphological feature and morphometric measurements of female and male specimens corresponded very well with *A. besseyi* recorded before. Egyptian population may had a shorter spear length and shorter male spicules length.

**Key words:** *Aphelenchoides besseyi*, *Oryza sativa*, white tip disease

### Introduction

Rice plant, *Oryza sativa* L. can stimulate many plant parasitic nematodes, which are recorded to infect the rice. *Hirschmanniella oryza*, *Ditylenchus angustus*, *Meloidogyne graminicola*, *Heterodera oryzicola* and *Aphelenchoides besseyi* are the most important nematodes, associated with rice plant parts. The most common nematode on foliage and flowering part of plant on rice is *Aphelenchoides besseyi* (Christie, 1942) that cause white tip leaf disease symptoms. *A. besseyi* is widely prevalent in many countries causing yield losses up to 17% (Zhang, 1987) and may reach 20% (Prasad *et al.*, 1987). In India, Dwivedi (1989) reported that nematode can cause up to 45% yield losses, while in Brazil, Da-Silva (1992) reported up to 50% yield loss of rice. Age of seedlings, placement distance, developmental stage of the nematode and temperature influenced the attractiveness of rice seedlings to *A. besseyi*. A six-days-old seedling and 30 °C were the most favorable and the basal part of seedling appeared to be the main source for release of a possible attractant (Gokte and Mathur, 1988). The nematode can survive for one year inside the rice seeds and 53 days in water under 10 °C (Qiu *et al.*, 1991). *A. besseyi* infected many field crops and ornamental plants like Chili peppers, onion, strawberry, *Setaria*, *Fragaria* and *Ficus elastica*. The white tip nematode is infected by rice ectoparasitically in the beginning and penetrates the rice flowers and hibernates beneath the seed glumes as fourth stages juveniles and adults (Nandakumar *et al.*, 1975). Once the nematodes revive and leave the seeds to attack new rice seedlings. Its ectoparasitic feeding on the growing points of rice results in whitening or light browning of 3-5 cm of the leaf tips. Which are later become necrotic, twisting include tattered white to brownish leaf tip and distortion of the flag leaf enclosing the panicle, which may be hindered from emerging, and reduction in size and length of the panicle and distorted kernels. The aim of this study was to describe and record, for the first time, the occurrence of seed-borne nematode, *A. besseyi* in some rice growing areas of Egypt. Reported herein is the result of *A. besseyi* measurements of males and females.

### Materials and Methods

During routine survey, we noticed outbreak symptoms of white tip leaf in some paddies in Dakahlia and Sharkia governorates (Nile Delta of Egypt). The nematodes were extracted and morphometric data, description and illustration of this species are presented herein with the help of the keys given by Allen (1952) and Sanwal (1961). The rice white tip nematode, *A. besseyi* is recorded for the first time in Egypt.

**The white tip nematode extraction:** The rice seed samples were collected at flowering and harvest time. Rice seeds from nematode-infected rice plants cvs. Sakha 101 and 102 showing "white tip" leaf symptoms were collected from paddies and stored at 10 °C until use for extraction. The nematode extraction from rice seeds by modified Baermann tray technique followed by Cobb's sieving technique. Rice seed samples were soaked on modified Baermann tray technique for 48 hours at 20 °C ± 2. The nematode concentrated through Cobb's sieves No. 350 mesh (Cobb, 1918). The nematodes were killed and fixed in 5% hot

formalin at 50 °C. Processed by mounting in 5% formalin solution. Measurements were made under compound microscope. List of abbreviations for table:

a= body length/greatest width

b= body length/ distance from the anterior end of the nematode to the base of the esophagus

c= body length/length of tail ( anus or cloaca to terminus)

V= position of vulva as a percentage of body length from anterior

### *Aphelenchoides besseyi* measurements:

**After Christie (1942):** Female (10 individuals): L= 0.66-0.75 mm; a= 32-42 (width = 17-22 μ); b= 10.2-11.4 (esophagus = 64-68 μ); c = 17-21 μ (tail = 36-42 μ); V = 68-70 %.

Male (10 individuals): L = 0.54-0.62 mm; a = 36-39 (width = 14-17 μ); b = 8.6-8.8 (esophagus = 63-66 μ); c = 15-17 (tail = 34-37 μ) (Fig. 1).

**After Allen, (1952):** Female: L = 0.62-0.88 mm; a= 38-58; b= 9-12; c = 15-20; V = <sup>43-33</sup>66-72<sup>4-8</sup>, spear = 10 μ. Male: L = 0.44-0.72 mm; a = 36-47; b = 9-11; c = 14-19.

**After Fortuner (1970):** Female (20 individuals): L = 0.57-0.84 (0.68) mm; a = 39-53 (47.7); b = 9.2-13.1 (11.46); b' = 4.06-5.77 (4.85); c = 13.8-20.4 (17.7); V = <sup>39.1-19.9</sup>68.7-73.6 (71.2)<sup>4.1-6.2</sup>; spear = 10.0-12.5 μ (11.9 μ). Males (9 individuals): L = 0.53-0.61 (0.57) mm; a = 40.07-46.9 (44.4); b = 8.87-10.7 (9.52); b' = 3.57-4.91 (4.09); c = 16-20 (17.97); spear = 10-12.5 (11.4) μ; spicules (dorsal limb) = 18-21 (19.2) μ.

### Description:

**Female:** Body slender. Cuticle marked with fine striae. Lateral field occupying one-fourth the body diameter, marked by four incisures. Lip region expanded, wider than neck at the base of lips. Lips without annulation. Six radial head sclerotization delicate. Cheilorhabdions near oral aperture moderately sclerotized, and appearing as dark cuticularized pieces. Spear, 10 μ long with moderately well developed knobs. Median esophageal bulb well developed. Nerve ring one body width behind median bulb. Excretory pore located anterior to nerve ring. Esophageal gland extending 5 body widths behind median bulb, joining esophagus immediately behind median bulb. Intestine joining the esophagus as a slender tube immediately behind median bulb. Ovary relatively short. Oocytes not arranged in tandem, several in a cross section. Posterior uterine conoid. Terminus armed with four mucronate points. Mucrons usually divergent with star-shaped appearance.

**Male:** Male tail curvature about 180 degrees when relaxed by gentle heat. Three pairs of vento-submedian papillae, the anterior pair being adanal. Spicules ventrally curved. The ventral piece with a moderate ventral process at the distal end. Terminus armed with four variable mucronate points.

### Results and Discussion

***Aphelenchoides besseyi* measurements:** Egyptian population: females (25 individuals): L = 0.54-0.77(0.66) mm; a = 36-51.2 (41.5); Width = 15-18 (15.9) μ; b = 9.7-12.7 (11.5); oesophagus

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Table 1: Comparison between population of *Aphelenchoides besseyi* recorded in Egypt and *Aphelenchoides besseyi*(Christie, 1942) , Allen (1952) and Fortuner (1970)

Measurements	<i>Aphelenchoides besseyi</i>			
	Egyptian population	After Christie, (1942)	After Allen, (1952)	After Fortuner, (1970)
<b>Female</b>				
Length	0.54-0.77 (0.66) mm	0.66-0.75 mm	0.62-0.88 mm	0.57-0.84 (0.68) mm
Width	15-18 (15.9)µ	17-22 µ	-	-
Spear length	8.5-13 (10.6) µ	-	10 µ	10.0-12.5 (11.9)
a	36-51.2 (41.5)	32-42	38-58	39-53 (47.7)
b	9.7-12.7 (11.5)	10.2-11.4	9-12	9.2-13.1 (11.46)
Oesophagus length	60-68 (64.1) µ	64-68 µ	-	-
b'	4.7-6.3 (5.67)	-	-	4.06-5.77 (4.85)
c	15.4-20.1 (18.0)	17-21	15-20	13.8-20.4 (17.7)
Tail length	30-45 (36.7) µ	36-42 µ	-	-
V%	69.2-74.6 (71.7)	68-70	66-72	68.7-73.6
<b>Male</b>				
Length	0.52-0.66 (0.58) mm	0.54-0.64 mm	-	0.53-0.61 (0.57)
Width	15-18 (15.9) µ	14-17 µ	-	-
Spear length	9-12 (9.9) µ	-	-	10.0-12.5 (11.4) µ
a	33-41.6 (34.7)	36-39	36-47	40.7-46.9 (44.4)
b	8.98-10.6 (9.8)	8.6-8.8	-	8.87-10.7
Oesophagus length	55-67 (60.6) µ	63-66.4	-	-
b'	3.8-5.1 (4.3)	-	-	3.57-4.91 (4.09)
c	15.5-22 (18.3)	15-17	14-19	16-20 (17.97)
Tail length	30-39 (33.3) µ	34-37 µ	-	-
Spicules length	15-18 (15.8) µ	-	-	18-21 (19.2) µ

a= body length /greatest width b= body length/ distance from the anterior end of the nematode to the base of the esophagus c= body length/length of tail ( anus or cloaca to terminus) V= position of vulva as a percentage of body length from anterior  
Number within paranthesis represents the mean

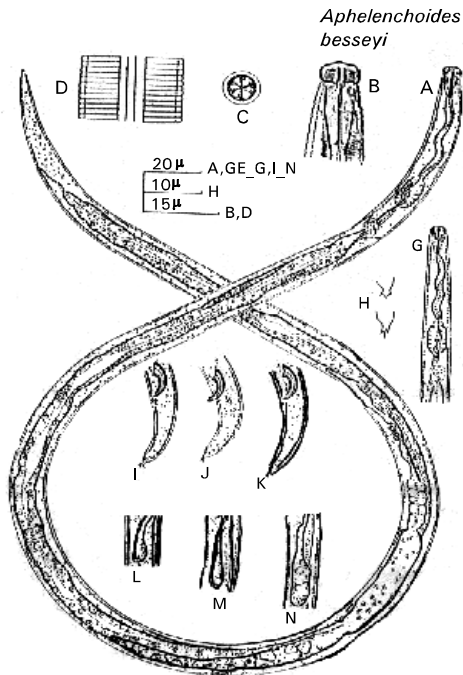


Fig. 1: An over-view of *A. besseyi*.

A= Body shape of nematode, B= Anterior region, C= Face view of lip region, G= Anterior part of esophagus, H= Tail tip, I,J,K= End to tail of male, L,M,N= Vulval region of female.

= 60-68 (64.1) µ; b' = 4.7- 6.3 (5.66); c = 15.4-20.1 (18.0); Tail length = 30-45 (36.7) µ; spear length = 8.5-13 (10.6) µ; %V = 69.2-74.6 (71.7).

Male measurements (12 individuals), L: 0.52-0.66 (0.58) mm; a = 33-41.6 (34.7); b = 8.97-10.6 (9.8); b' = 3.8-5.1 (4.3); oesphagus = 55-67 (60.6) µ; b' = 3.8- 5.1 (4.3); c = 15.5-22 (18.3); Tail length = 30-39 (33.3) µ; spear length = 9-12 (9.9) µ; spicules length (dorsal limb) = 15-18 (15.8) µ.

Comparison between Egyptian population of *A. besseyi* measurements and other population recorded by Christie (1942), Allen (1952) and Fortuner (1970) are presented in (Table 1). Measurements in (Table 1) revealed that the specimens of Egyptian population of *A. besseyi* corresponded very well with the description made by Allen, (1952) and Fortuner (1970). Females and males of Egyptian population may have a shorter spear, shorter male spicules length (dorsal limb) than those described by Allen (1952) and Fortuner (1970). In conclusion the present studies confirmed the presence of *A. besseyi* in paddies for the first time in Egypt. However, more studies are needed to evaluate the crop losses and their distribution in Egyptian paddies.

References

Allen, M.W., 1952. Taxonomic status of the bud and leaf nematodes related to *Aphelenchoides fragariae* (Ritzema Bos, 1891). Helminthological Society of Washington., 19: 108-120.  
Cobb, N.A., 1918. Estimating the nematode population of soil . U.S. Dep. Agric. Agric. Circ. No. pp: 1-48.  
Christie, J. R., 1942. A Description of *Aphelenchoides besseyi* n.sp. the summer-dwarf nematode of strawberries, with commence on the identify of *Aphelenchoides subtenuis* (Cobb, 1962) and *Aphelenchoides hodsonei* (Goodey, 1935) Proc. Helminthol. Soc. Washington, 9: 82-84.  
Da-Silva, G.S., 1992. White tip and national rice production. Informe Agropecuario Belo-Horizonte., 16: 57-59.  
Dwivedi, B.K., 1989. Pests problems of rice and their control. Ind. J. Helminthology., 41: 61-70.  
Fortuner, R., 1970. On the morphology of *Aphelenchoides besseyi* Christie, (1942) and *A. siddiqi* n.sp. (nematoda, Aphelenchidea) J. Helminthology, 44: 141-152.  
Gokte, N. and V.K. Mathur, 1988. On the attractiveness of paddy seedlings to *Aphelenchoides besseyi*. Ind. J. Nematol., 18: 239-243.  
Nandakumar, C., J.S. Prasad, Y.S. Rao and J. RAO, 1975. Investigation on the white-tip nematode, *Aphelenchoides besseyi* Christie (1942) of rice (*Oryza sativa* L.). Ind. J. Nematol., 5: 62-69.  
Prasad, J.S., M.S. Panwar and Y.S. RAO, 1987. Nematode problems of rice in India. Tropical Pest Management, 33: 127-136.  
QIU, T.X., M.F. YAN and Q. Lu, 1991. Study on the occurrence, regulation and control of *Aphelenchoides besseyi*. Zhejiang-Nongye kexue, 6: 290-292.  
Sanwal, K.C., 1961. A key to the species of the nematode genus *Aphelenchoides* (Fischer, 1894). Canadian J. Zool., 39: 143-148.  
Zhang, Y.L., 1987. The occurrence and control of *Aphelenchoides besseyi*. Hubei Agric. Sci., 1: 15-16.