RICE WHITE TIP NEMATODE (*APHELENCHOIDES BESSEYI*) IN RICE GROWING AREAS OF TURKEY

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ABSTRACT

Kepenekci, I. 2013. Rice white tip nematode (*Aphelenchoides besseyi*) in rice growing areas of Turkey. Nematropica 43:181-185.

White tip nematode (*Aphelenchoides besseyi* Christie, 1942) is economically important in rice growing areas and it has been recorded in many countries. In this study systematic sampling of rice seed samples of different region in Turkey was done. *Aphelenchoides besseyi* individuals obtained were evaluated morphologically and fit the original definition of previous morphometric and morphological characteristics. We found Turkey specimens to have a shorter spear (8.95 µm) but Allen (1952) and Fortuner (1970) found the spear length to be 10 µm and 11.9 µm, respectively.

Key words: Aphelenchoides besseyi, Turkey, rice

RESUMEN

Kepenekci, I. 2013. El nematodo de la punta blanca del arroz (*Aphelenchoides besseyi*) en zonas de cultivo de arroz de Turquía. Nematropica 43:181-185.

El nematodo de punta blanca (*Aphelenchoides besseyi* Christie, 1942) es económicamente importante en zonas de cultivo de arroz y se ha registrado en muchos países. En este estudio se realizó un muestreo sistemático de semillas de arroz de diferentes regiones de Turquía. Los individuos obtenidos de *A. besseyi* se evaluaron morfológicamente y coincidieron con las características morfométricas y morfológicas de la especie. Los especimenes de Turquía poseen un estilete más corto (8.95 µm) mientras que Allen (1952) y Fortuner (1970) señalaron una longitud del estilete de 10 µm y 11.9 µm, respectivamente.

Palabras clave: Aphelenchoides besseyi, Turquia, arroz

INTRODUCTION

The white tip nematode, *Aphelenchoides besseyi* Christie, 1942 is an ectoparasite of rice, *Oryza sativa* L. The nematode enters rice florets and proliferates with a short generation time of about 10 days at 25 ºC. The nematodes enter a state of anhydrobiosis as adults and fourth-stage juveniles within seeds beneath the glumes (Chiyonishio and Nakazawa, 1988; Nandakumar *et al*., 1975).

In Turkey *A. besseyi* was first reported in 1995 in Ipsala (Edirne) and Gonen (Balikesir) (Ozturk and Enneli, 1997). In a survey carried out from 1997 to 1998, *A. besseyi* was found in Balıkesir and Canakkale province, northwest of Turkey where the nematode occurred in 11.7% of seed samples (Mısırlıoglu and Pehlivan, 2000). The infestation rates of *A. besseyi* were determined in seed samples at 7.80% in Cankırı province and 15.26% in Corum province (Karatas *et al*., 2007).

A survey was undertaken to determine the areas infected with the nematode by utilizing systematic sampling method in the Thrace Region. The contribution rice production in Turkey from Edirne in the Thrace region is 49.3%. This rate is 3.97 % for Tekirdag and 1.9% for Kırklareli province in Thrace. In a survey conducted, the ratio of infected fields was found as 18.8% and 43.0% in 2007 and 2008, respectively (Tulek and Cobanoglu, 2010).

MATERIALS AND METHODS

In this study *A. besseyi* (Fig. 1) individuals obtained from rice seed samples of different region in Turkey were evaluated by morphological measurements.

The survey was undertaken in 2007, 2008 and

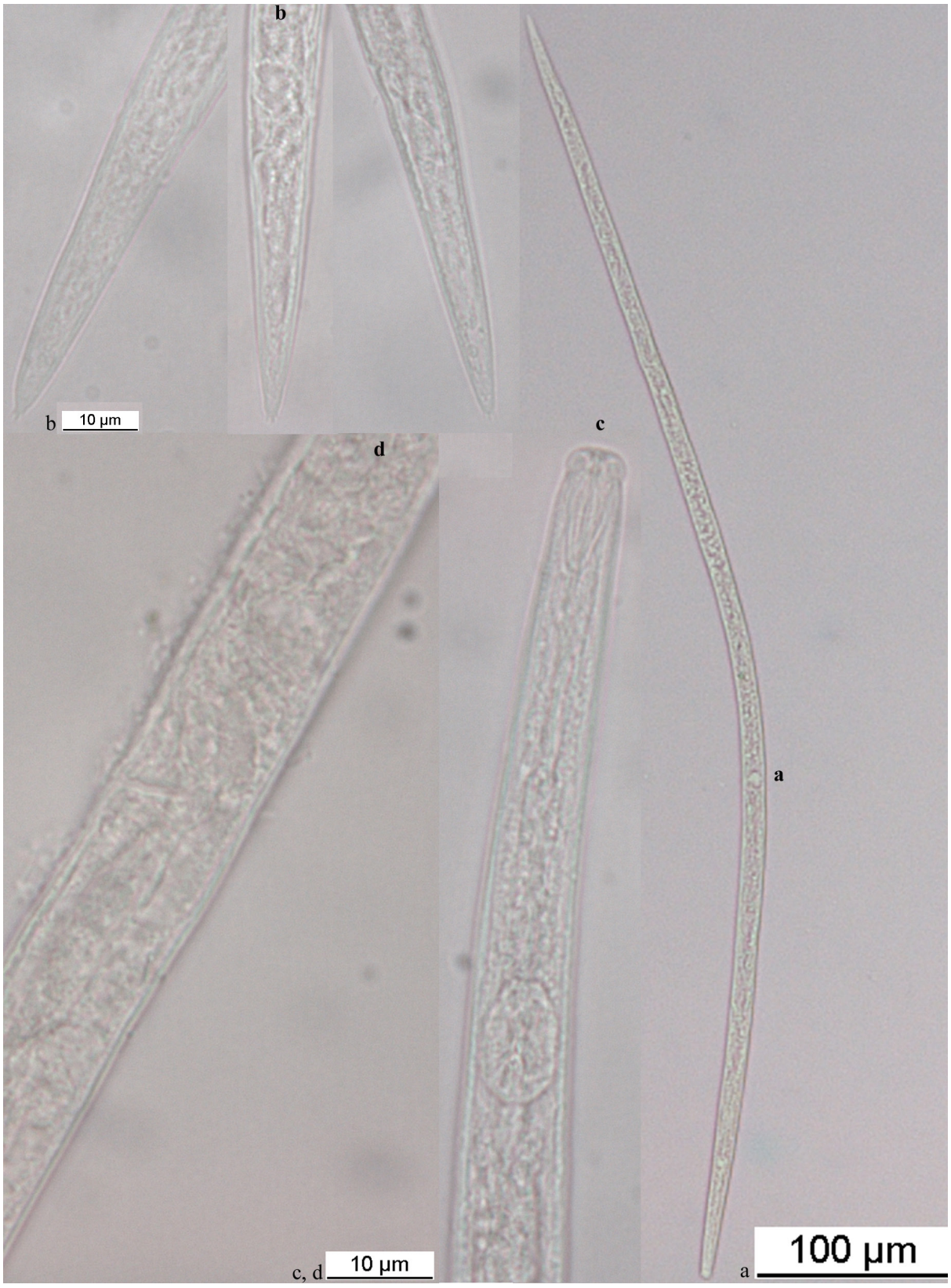

Fig. 1. An over view of *Aphelenchoides besseyi* Christie. Female (a-d), general appearance (a), anterior view (c), posterior view (b), vulval region (d).

2009. Paddy panicles were collected from the rice growing areas during the harvesting period using systematic sampling methods. The Global Positioning System (GPS) was used to determine the coordinates of the sampling sites. Rice was harvested when 80% of the paddy seeds had become straw yellow colour, during September and October. Based on chlorotic discolouration of the flag leaf, 4-month-old plant of the irrigated rice cultivars were collected at harvesting stage. Obtained panicles of each plant which has white tip symptom on flag leaf of plant were threshed. At least 50 paddy panicles (50 in 1 - 5 decare [decare = daa = 1000 square metres], 100 in 5 - 10 daa, 150 in 10 - 50 daa and 150 in each 50 daa which are larger than 50 daa) were collected from twenty different points of the same field and taken to the laboratory, where they were held at 10°C until processed. Seed samples were also collected from rice processing factories (the sample was removed twice from side, top and middle which represents 10% from the each 10 tons of rice seed). A total of 372 seed samples were collected from two different regions in Turkey of which 152 samples were from Edirne province and 120 samples from Cankırı province of Turkey in 2007 - 2008 and 2008 - 2009, respectively. In 2008 (Edirne province) and 2009 (Cankırı province), instead, only panicles showing white tip symptoms were sampled.

Aphelenchoides besseyi were extracted by modified Cobb's (1918), Christie and Perry's (1951) sieving technique and Baermann funnel methods. Permanent slides were prepared using the Seinhorst (1959) method and the nematodes were identified using Siddiqi key (2000). White tip nematodes from Edirne province were cultured on carrot disc (Tulek *et al*., 2009). All measurements were made using a drawing tube attached to the light microscope. Definition of female and male individuals determined in this study matched morphometric measurements and morphological characteristics of individuals described by Christie (1942), Allen (1952), Fortuner (1970), Amin (2002) and Khan *et al*. (2012) (Table 1).

All measurements were taken at 1000X. The following set of parameters used to characterize nematode species for both sexes are those standard for this genus.

RESULTS AND DISCUSSION

The range of linear measurements of *A. besseyi* and some of the de Man ratios, along with their mean values and standard deviations are given in Table 1. In addition, comparison between Turkish population of *A. besseyi* measurements and other population recorded earlier are presented in Table 1. Except for having shorter stylet length, the *A. besseyi* specimens found in this study fit morphometric and morphological characteristics from the original description.

Aphelenchoides besseyi measurement Edirne province (European) population; see Table 1. There are no measurements due to lack of male individuals.

Aphelenchoides besseyi measurement Cankırı province (Asian) population; see Table 1.

The ratio 'MB' proposed by Geraert (1968) gives the position of the median oesophageal bulb, at the middle of the valve-apparatus, as % of total oesophageal length in tylenchids having an offset terminal oesophageal bulb. In this study means of MB value (%) was 94.41 ± 4.89 (89.72 - 106.41), 88.81 (85.04 - 92.58) Edirne population and Cankırı population, respectively.

Comparison measurement of female individuals between Edirne and Cankırı populations are similar to each other nonetheless there are some differences. Individuals of Edirne are longer (0.74 mm vs. 0.63 mm); b and c′ valve bigger (5.09 vs. 4.21 and 18.99 vs. 15.26), spear and tail length longer (8.95 µ vs. 12.07 µ and 38.48 µ vs. 41.96 µ)

The females of *A. besseyi* detected in the study fit the original definition of Allen (1952) and Fortuner (1970) in morphometric measurement and general morphological characteristics, but the spear is shorter (8.95 µ vs. 10 µ for Allen, 1952 and 11.9 µ for Fortuner, 1970). The study fit the original definition of Khan *et al.* (2012) (Table 1).

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Table 1. Comparison between two different populations [Edirne province, northwest of Turkey, located in Europe and Cankırı province, northern of Turkey, located in Asia] of *Aphelenchoides besseyi* (Christie) measurements (mean values and standard deviations) in Turkey and compared with populations recorded by Christie (1942), Allen (1952), Fortuner (1970), Amin (2002) and Khan *et al.* (2012).

	Edirne (European) population	Cankırı (Asian) population	Christie, 1942	Allen, 1952	Fortuner, 1970	Amin, 2002	Khan *et al.*, 2012 (rice)			
							AP-rice	MP-rice	WB-rice	GT-rice
Female										
n[Z]	20	20	10	-	20	10	37	50	30	30
L[X]	0.74±0.04(0.70-0.84)	0.63±0.05(0.53-0.68)	0.66-0.75	0.62-0.88	0.68(0.57-0.84)	0.66(0.54-0.77)	0.65±0.08(0.52-0.75)	0.65±0.06(0.52-0.77)	0.72±0.01(0.52-0.84)	0.68±0.01(0.54-0.87)
W[Y]	13.42±0.11(12-14)	15.02±0.14(12-16)	17-22	-	-	15.9(15-18)	11.55±0.17(9.75-13.40)	12.12±1.18(9.40-14.35)	14.51±0.18(11.88-15.84)	12.95±0.28(10.89-16.83)
Spear[Y]	8.95±0.36(8.07-9.48)	12.07±0.46(11.20-12.88)	-	10	11.9(10.0-12.5)	10.6(8.5-13)	10.56±0.10(9.35-11.90)	10.53±0.51(9.10-11.88)	10.59±0.10(9.71-11.98)	10.63±0.14(9.90-12.87)
a	58.15±5.92(46.2-68.9)	53.3±5.24(42.75-60.28)	32-42	38-58	47.7(39-53)	41.5(36-51.2)	56.12±0.75(46.15-64.75)	53.84±3.66(48.34-65.66)	49.76±0.89(34.97-55.94)	53.16±0.87(44.86-61.52)
b	11.52±0.62(10.78-12.65)	9.43±0.18(8-11)	10.2-11.4	9-12	11.46(9.2-13.1)	11.5(9.7-12.7)	11.17±0.16(9.92-13.15)	9.35±0.104(7.75-11.22)	9.05±0.19(7.20-11.18)	9.12±0.13(7.12-10.68)
ES[Y]	61.09±0.22(60-62)	58.12±0.41(57-61)	64-68	-	-	64.1(60-68)				
MB (%)	94.41±4.89(89.72-106.41)	88.32±2.04(85.04-92.58)	-	-	-	-				
b′	5.09±0.19(4.83-5.33)	4.21±0.35(3.49-4.62)	-	-	4.85(4.06-5.77)	5.67(4.7-6.3)	5.07±0.10(3.96-6.01)	4.89±0.056(3.68-6.03)	4.77±0.10(3.57-5.95)	4.83±0.05(4.22-5.26)
c	18.99±1.12(17.54-20.88)	15.26±1.38(12.97-17.16)	17-21	15-20	17.7(13.8-20.4)	18.0(15.4-20.1)	19.27±0.28(16.67-21.60)	18.93±1.04(17.01-21.54)	19.14±0.34(13.82-22.90)	19.05±0.24(17.40-22.15)
c′	4.23±0.20(3.95-4.68)	4.29±0.30(3.89-4.96)	-	-	-	-	3.72±0.06(3.00-4.20)	4.58±0.40(3.70-5.71)	3.75±0.04(3.36-4.22)	4.35±0.07(3.62-5.44)
Tail[Y]	38.48±1.12(36.59-39.92)	41.96±1.32(40.00-44.70)	36-42	-	-	36.7(30-45)	33.43±0.85(27.20-42.50)	34.40±2.80(27.72-39.60)	37.76±0.59(30.04-44.54)	36.03±0.70(28.70-44.55)
V (%)	69.18±2.89(64.44-74.48)	71.65±1.20(69.77-73.38)	68-70	66-72	68.7-73.6	71.7(69.2-74.6)	72.25±0.72(66.60-79.90)	70.45±1.44(65.08-73.08)	78.90±0.91(57.69-84.96)	71.51±0.65(63.24-79.66)
Male										
n	-	20	10	-	9	12	-	-	-	-
L[X]	-	58.62±0.09 (0.54-0.60)	0.54-0.64	-	0.57(0.53-0.61)	0.58(0.52-0.66)	-	-	-	-
W[Y]	-	14.11±0.12(13-16)	14-17	-	-	15.9(15-18)	-	-	-	-
Spear[Y]	-	11.51±0.04(10-12)	-	-	11.4(10.0-12.5)	9.9(9-12)	-	-	-	-
a	-	42.56±1.09(40-45)	36-39	36-47	44.4(40.7-46.9)	34.7(33-41.6)	-	-	-	-
b	-	9.18±0.89(8.88-10.55)	8.6-8.8	-	8.87-10.7	9.8(8.98-10.6)	-	-	-	-
ES[Y]	-	66.04±0.77(65.3-67.8)	63-66.4	-	-	60.6(55-67)	-	-	-	-
b′	-	4.43±0.22(3.35-5.01)	-	-	4.09(3.57-4.91)	4.3(3.8-5.1)	-	-	-	-
c	-	18.56±0.42(17-20)	15-17	14-19	17.97(16-20)	18.3(15.5-22)	-	-	-	-
Tail[Y]	-	38.68±1.43(35-41)	34-37	-	-	33.3(30-39)	-	-	-	-
Spic.[Y]	-	19.55±0.32(18-20)	-	-	19.2(18-21)	15.8(15-18)	-	-	-	-

[X] µ
[Y] mm
[Z] n= number of specimens on which measurements are based, L = overall body length, W = maximum body width, a = L/W, b = L/ES, ES = esophagus length, MB = % position of median oesophageal bulb taken from anterior end of body up to half of the bulb/total oesophageal length taken up to the base of basal oesophageal glands, c = L/tail length (anus or cloaca to terminus), b' = L/distance from anterior to base of esophageal glands, c = L/tail length, c' = tail length/tail diameter at anus or cloaca.