New Record on the Occurrence of Cyst Nematode, *Heterodera cajani* Koshy, 1967 on Sesame, *Sesamum indicum* in Myanmar

Yi Yi Myint[1], Thein Lwin[1], Khin Hnin Thwe[1], Yu Yu Min[1], Seint San Aye[1], Myat Lin[1], Pyone Pyone Kyi[2], Zin Thu Zar Maung[2] and Po Po Than[3]
1 Department of Plant Pathology, Yezin Agricultural University
2 Plant Protection Division, Myanma Agriculture Service
3 Ph.D student, Chiang Mai University

Abstract

Sesame, *Sesamum indicum* L. occupies for nearly half of the area sown to oilseed crops in Myanmar. It is cultivated for domestic consumption and export. During 2003, sesame cultivars, Sinyadnar3, Sinyadanar5, Magway7/9 and Khwaylayni grown in Oilseed Crop Research Farm, Department of Agricultural Research, Magway were found to be heavily infected with *Heterodera* cyst nematodes. In 2004, cysts were also found from the soil samples collected from the previously infested plots.

Infested field showed patches in which the plants were stunted, chlorotic, and caused wilting. When the infected plants were uprooted, curving of tap root, and red-girdling and dark browning of lateral and tap roots were observed. Lemon-shaped cysts were found attaching to the root surface. Young females were white or creamy colour whereas old cysts with eggs were tan colour. A few bullae were found on the posterior portion of the female. Larvae were vermiform with elongate conoid tail. Males were cylindrical or elongated with short tail without bursa.

According to the morphological characters of the nematode and disease symptoms of sesame, the nematode was supposed to be identified as *Heterodera cajani*. There was no report on cyst nematode, *Heterodera* spp. in Myanmar. The present finding, the occurrence of *Heterodera cajani* on sesamum, is the first record of *Heterodera* spp. in Myanmar.

Introduction

Oilseed crops account for approximately 2.7 million hectares in Myanmar and are the second most important group of crops after rice. Among oilseed crops, sesame, *Sesamum indicum* occupies for nearly half of the area sown to oilseed crops in Myanmar. The crop is grown on 1.4 million hectares throughout the country, however, the major areas of production are the central plains of Magway, Mandalay and Sagaing Divisions where over 94 percent of area is sown (FAO/TCP/MYA/2904, 2004). The government laid down the plan for sesame to target the yield for 1.2 ton ha^{-1} to fulfill the requirement for local consumption and export. However, pests and diseases are major constraints in yield increasing of sesame.

Among the sesame diseases, black stem rot caused by *Rhizoctonia bataticola* and phyllody disease by mycoplasma are very serious, destructive and common in sesame growing areas of Myanmar. Root-knot caused by *Meloidogyne javanica* is the only one nematode disease of sesame found in Myanmar. (Mya Mya et al., 1983). It has been reported that pigeon pea (*Cajanus cajan*), cowpea *(Vigna unguiculata)* and sesame (*Sesamum indicum)* were the most

favoured hosts of *Heterodera cajani* (Koshy and Swarup, 1973). It was also mentioned that pigeon pea , (*Vigna radiata*) and garden pea (*Pisum sativum*), winged -bean (*Cyamopsis tetragonoloba*), and sesame were the primary hosts of *H. cajani* (Evans and Rowe, 1998; Bhatti and Gupta,1973).

There was no report on cyst nematode, *Heterodera* spp. in Myanmar previously. The cyst nematode was newly discovered on sesame cultivars, Sinyadanar 3, Sinyadanar 5, Magway 7/9 and Khwaylayni grown in Oilseed Crop Research Farm, Department of Agricultural Research, Magway, Myanmar, during July, 2003. This study was, thus, undertaken with the objectives to identify cyst nematode and to determine the level of infection on different varieties of sesame.

Materials and Methods

Collection of soil and plant samples

Sesame plants showing disease symptoms, and soil sample around the rhizosphere from infested plots in which Sinyadanar 3, Sinyadanar 5, Magway 7/9 and Khwaylayni were grown, from Oilseed Crops Research Farm, Department of Agricultural Research, Magway were collected in July, 2003. Below ground and above ground symptoms were studied. Soil samples from previously infested plots were also collected in December 2004 to check the presence of cysts in the soil.

Extraction of nematodes

Cysts were extracted from the soil samples by floatation method. About 250ml of soil samples was placed in a bucket containing 1 liter of water and stirred homogenously. After a few seconds of settlement, the upper soil suspension was poured on to 65μ- mesh sieve. The residue on the sieve was collected in a petridish and checked for the presence of cysts. The cysts were counted for infection level.

To extract the males and larvae, Whitehead's tray method was used. About 200ml of soil sample was spread on a plastic sieve containing a piece of muslin cloth. The sieve was placed in a tray, and water was added to soak the soil surface. The tray was then left for overnight and the water containing nematodes was collected in a beaker. The extracted nematodes were examined under the microscope.

Identification of nematodes

Cysts were singly picked up by a fine forceps and collected in a glass block. Cones, posterior portions of cysts were cut with a sharp blade on a slide and teased with fine needle to examine bullae under the microscope. Second stage larvae and males from nematode suspension were handpicked out under the binocular microscope. Killing, mounting the nematodes and making the semi permanent slides were done for identification. Morphological characters such as shape, length and width of cysts, males and second stage larvae were studied.

Results

When infested plots were examined in July, 2003, the plots showed patches in which the sesame plants were stunted and chlorotic, and wilt occurred. Some plants exhibited poor growth. As below ground symptom, tap roots were curved when compared with healthy roots. Intermittent red-girdling of both lateral and tap roots were observed. In seriously infected plants, the roots were dark brown in colour (Plate 1, 2 & 3).

Cysts attaching to the root surface were young, lemon-shaped and white or creamy colour (Plate 4&5). Old cysts from infested soil were also lemon-shaped, 480-640 µ in length and 285-480 µ in width, with thick cuticle, protruding neck and vulva region, light brown to reddish brown (Plate 6). Vulva cone was prominent and a few bullae were present. Eggs were present within the body of cyst. When cyst body was crushed with a fine needle, second stage larvae came out of the eggs (Plate 7).

Males were elongated or cylindrical, Head was setoff from the body; stylet was prominent with distinct basal knobs. Tail was short and blunt without bursa (Plate 8 & 9). Second stage larvae were vermiform, tapering posteriorly. Head was offset. Stylets were well developed.

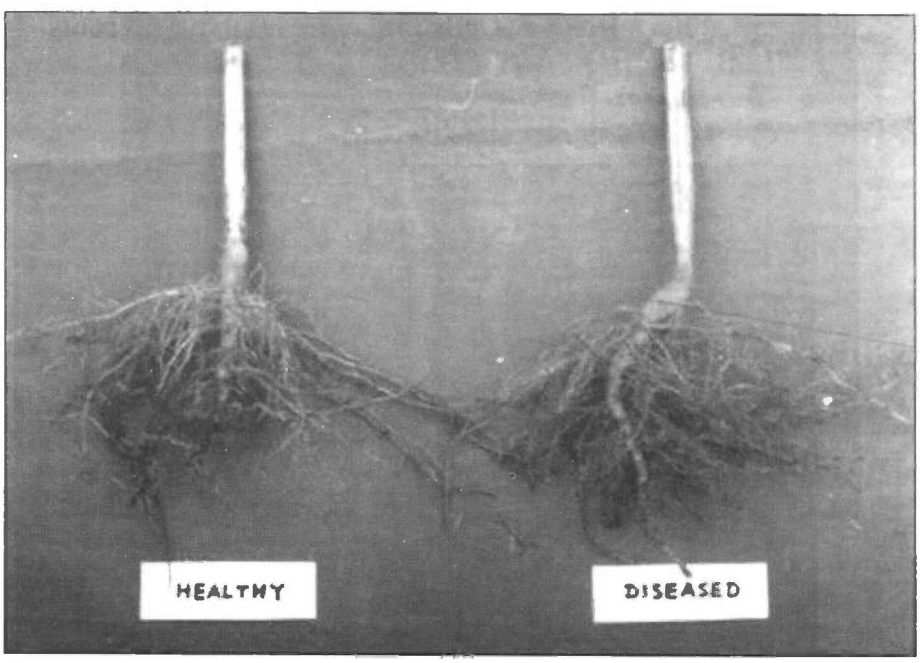

Plate 1. Curving of tap root of infected sesame.

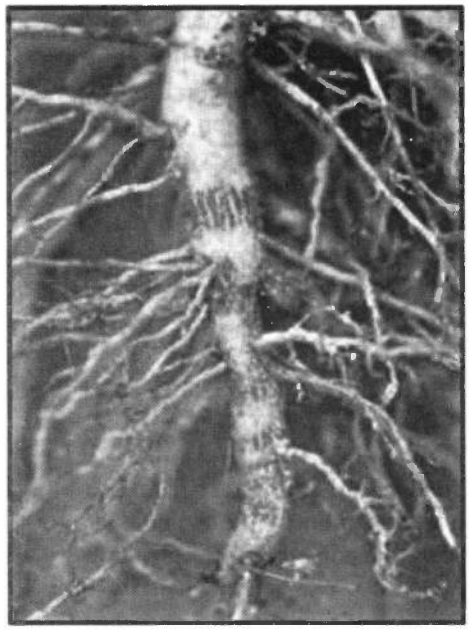

Plate 2. Intermittent red-girdling of tap and lateral roots

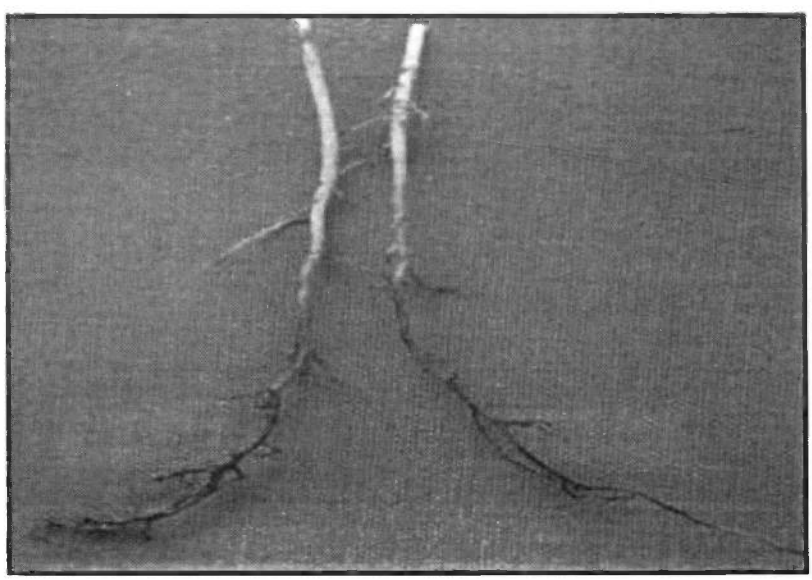

Plate 3. Severely infected roots

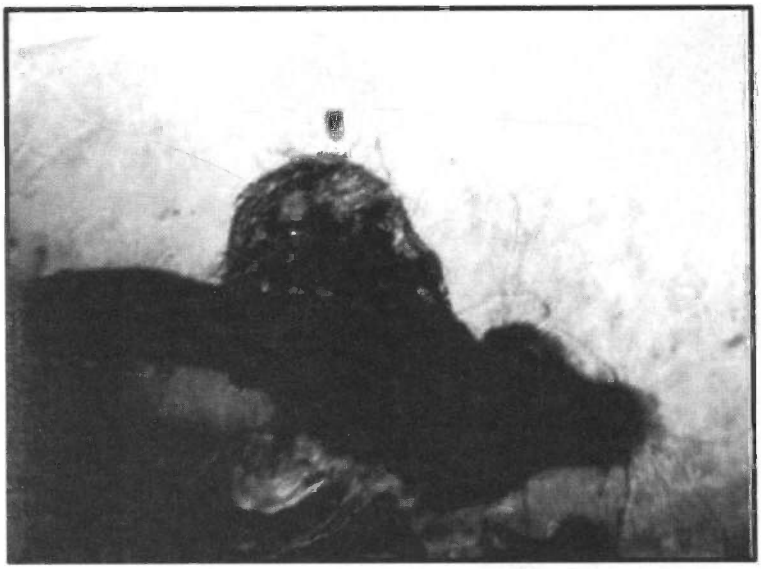

Plate 4. Female attaching to root surface

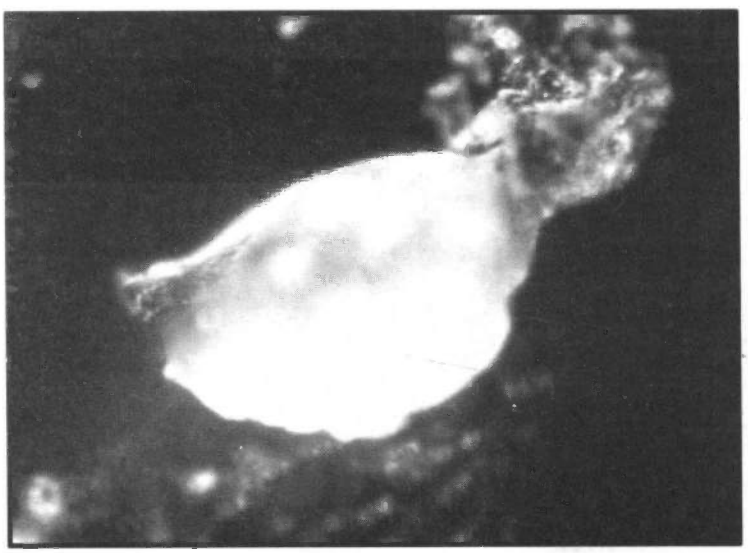

Plate 5. Young female

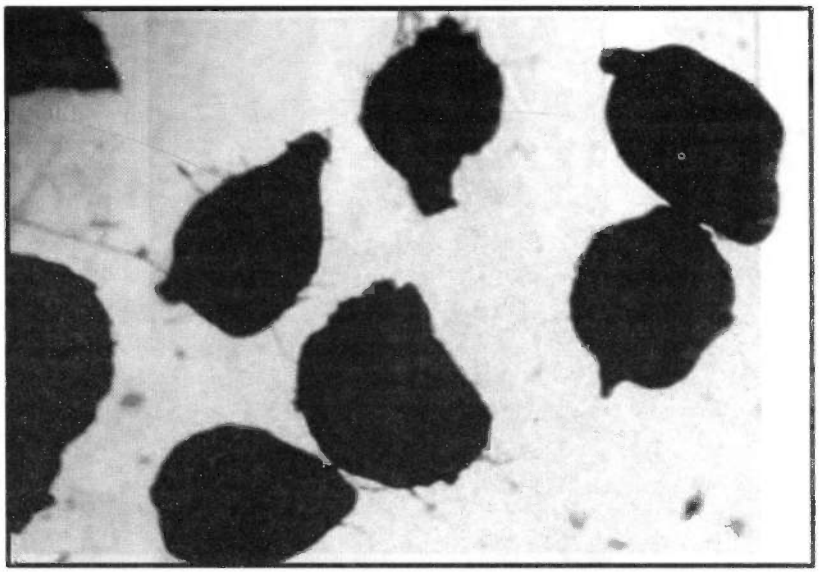

Plate 6. Old cyst from infested soil

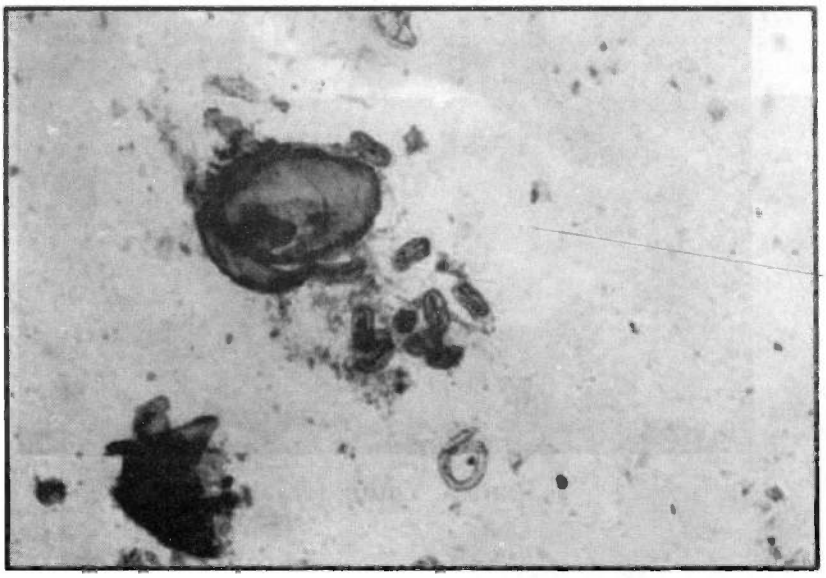

Plate 7. Eggs and second stage larvae

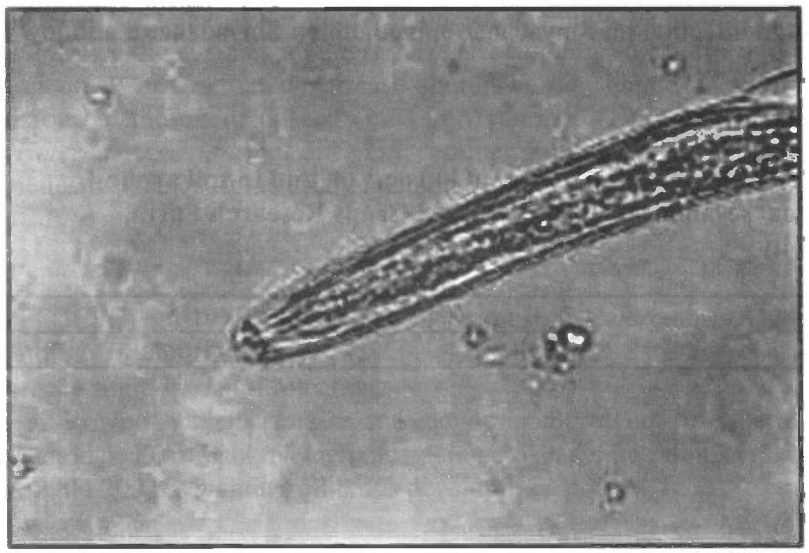

Plate 8. Head of male

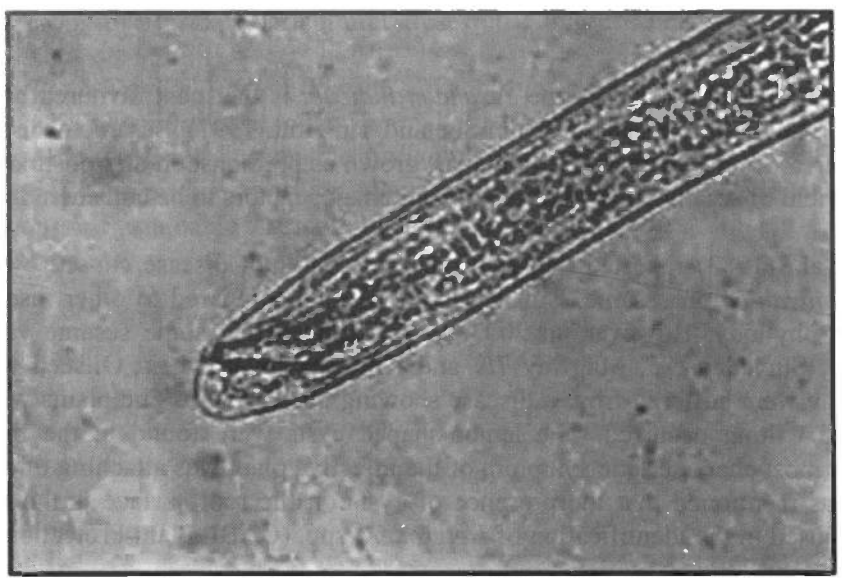

Plate 9. Tail of male

In determination of infection level in terms of number of cysts per 250 gm of soil, it was found that there was high infection on Sinyadanar 3, medium on Sinyadanar 5 and low on Magway 7/9 and Khwaylayni (Table1).

Table 1. Cysts of *Heterodera cajani* found in roots of, and in soil around, infected sesame varieties at Oilseed Crops Research Farm, Magway

Sesamum Variety	*Heterodera cajani*	
	Soil	Roots
Sinyadanar 3	+++	+++
Sinyadanar 5	+	++
Magway 7/9	+	+
Khwaylayni	+	+

Population + = Low/Trace
++ = Medium
+++ = High

Discussion

Among various oilseed crops, sesame *Sesamum indicum* is the most favoured by the Myanmar consumers as well as foreign market (Tin Soe and Tin Htut, 1997). Sesame occupied about 50% of net sown area of oilseed crops in Myanmar, grown as premonsoon and postmonsoon crop. To increase the yield of sesame, pests and diseases are major factors to be considered.

Mya Mya et al., (1983) reported the occurrence of root-knot disease caused by the nematode, *Meloidogyne javanica* on sesame. But it was not serious compared to other diseases like black stem rot and phyllody. However, in 2003, it was noticed that some sesame varieties such as Sinyadanar 3, Sinyadanar 5, Magway 7/9 and Khwaylayni grown in Oilseed Crops Research Farm, Magway were suffered from a disease showing poor growth. The plants were stunted and chlorotic, and wilting occurred. The lemon-shaped cysts were found in the rhizosphere soil. However, the most characteristic symptom of the infective plant was attaching of cysts to the root surface. It was mentioned that the presence of cysts on the root surface is the most important characteristic used in the identification of *Heterodera* spp. (CABI, Plant Protection Compendium, 2004).

It had been shown that sesame was one of the primary hosts of pigeonpea cyst nematode, *Heterodera cajani* (Evans and Rowe, 1998; Bhatti and Gupta, 1973). *Heterodera cajani* is the only one cyst nematode attacked on sesame (Koshy and Swarup, 1973). Shapes and measurement of the cysts, larvae and males were similar to those mentioned by Koshy (1967). Since cysts are soil-borne plant pathogens, they are able to survive in the soil for a long time. The result also revealed that cysts were still present in the previously infested soil even in the off season.

Based on the observations of disease symptoms, and morphological characters of the nematode, it can be concluded that, the nematode attacked on sesame in Myanmar was supposed to be *Heterodera cajani.* Since the cyst nematode, *Heterodera cajani* is soil-borne and they can survive in soil for a long time, cyst nematode disease should be considered as an important one on sesame, which is one of the major oilseed crops in Myanmar. Therefore, further studies on the occurrence of *Heterodera cajani* in different sesame growing areas, population dynamics, screening of varieties resistance to the cyst nematode and other control methods should be carried out.

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