

Effect of Plastic Mulch on *Heterodera schachtii* Population in Chinese Cabbage

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I. Introduction

The sugar-beet cyst nematode (*Heterodera schachtii*) is now considered as a serious pest of economic importance on Chinese cabbage in Korea (Lee *et al.*, 2013; Kabir *et al.*, 2015). Currently, management practices of the pest on Chinese cabbage in the highland areas are limited to prevention of spread and multiplication through proper disposal of infested waste soil and sanitation to avoid transfer of cysts to non-infested fields through farm machinery (Kwon *et al.*, 2015). As plastic mulches are used in many horticultural crops to raise soil temperature, suppress weeds and conserve soil water (Brault *et al.*, 2002), we assume additional raising temperature in the root zone could suppress the nematode population.

II. Materials and Methods

2.1. Experimental site

The experiment was conducted from 14th August to 11th October 2015 in Jeongseon of Gungwondo province of South Korea. Jeongseon is located at N 37° 26' 23.20" and E 128° 51' 23.80". The average altitude of the area is 536 m above the sea level. The annual rainfall is 60,34 mm and the average temperature is 11.53°C.

2.2. Mulching and planting Chinese cabbage

Black, transparent and bare soil (as control) were used for this study. Consequently, three mulching covers with black, transparent and bare soil were prepared at 10 feet long and 1.5 feet width. 30 days old Chinese cabbage plants (variety: Chungwang) were used for this experiment.

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Twelve plants were planted in each row. Initial nematode population was counted on 14th August, first population counted on 21st September and the final count was done on 11th October 2015.

2.3. Counting cysts

Foliar part of the plant was cut from the ground and the soil with root was collected with the soil sampler and collected in a zipper bag for laboratory analysis. In lab condition, the soils were washed by tap water very carefully to separate the root. This part was done with extra care so that maximum number of roots could be obtained intact or undamaged. Extraction of cysts was done using Cobb's decanting and sieving method over 20, 60 and 400 mesh sieves. Cysts were collected on a 60 mesh sieve and filtered with Whatman no. 100 filter paper to remove the water content. Then the filter paper was placed under Nikon SM2 1000 electron microscope to count the female, brown and the total cysts.

2.4. Counting eggs

Five healthy cysts for each sample were taken for counting the number of eggs. The 5 selected healthy cysts were transferred to a small vial with 1.5 ml water and sonicated in 700 rpm by using Polytron PT 1300D sonicator (Kinematica AG, Swizerand). The content was transferred into a petri dish to count the number of eggs.

2.5. Counting juveniles

Infective juveniles were extracted using a Baermann funnel method from the substrates of the 400 mesh sieve obtained during cyst separation. After 24hour, the juveniles were collected in a petri dish and placed under Nikon SM2 1000 electron microscope for counting.

2.6. Weight of plant

Separated roots and foliar part were measured individually by a weight measuring scale.

2.7. Statistical analysis

All the statistical tests were done by using SAS 9.4.1.

III. Results

3.1. Nematode population before planting

The nematode population, already present in the field was counted before planting the Chinese cabbage. No female cysts were recorded from the population. The average number of brown cyst was 195,193 and 140 in black, transparent and bare soils mulching plots respectively. There were no significant differences in the recorded initial brown cyst populations. Number of eggs per cyst was recorded highest in bare soil mulching plot.

3.2. Nematode population after 30 days

Nematode populations were higher than the initial populations recorded before planting. However, there were no significant differences in nematode populations between the different mulching treatments and no adult females were recorded.

3.3. Final nematode population

Sixty days after planting, the number of brown cysts from transparent mulch was significantly lower compared to black mulch ($df=2$, $F=19.78$, $p=0.002$.) and control. And the number of eggs per cyst were significantly higher than in black mulch and control. Additionally, the number of brown cysts was highest on bare soil treatments (almost 3 times higher than populations in transparent mulch treatment).

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