FIRST REPORT OF PLANT-PARASITIC NEMATODES ASSOCIATED WITH CHAYOTE (*SECHIUM EDULE* (JACQ.) SW.) IN VIETNAM

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Abstract: *Chayote, known for its nutrition, is a perennial vine originating from Mesoamerica and now cultivated globally. This study documents the first report of plant-parasitic nematodes associated with chayote (Sechium edule (Jacq.) Sw.) in Vietnam, addressing a critical knowledge gap in the pest management of this underutilized crop. Three genera, including Hirschmanniella, Helicotylenchus, and Tylenchorhynchus, were identified, with Tylenchorhynchus being the most predominant, averaging 152 nematodes per 250g of soil and found in 100% of soil samples. Hirschmanniella, despite a lower density, showed a high frequency of 92.9% in soil samples. Cluster analysis indicated no clear geographic correlation in nematode distribution, suggesting other environmental and agricultural factors play significant roles. The findings highlight the urgent need for targeted pest management strategies, including integrated pest management practices, to mitigate nematode infestations and improve chayote cultivation in Vietnam. This research underscores the importance of investigating underutilized crops to enhance agricultural sustainability and food security.*

Keywords: *chayote, Cluster analysis, first report, underutilized crops, Vinh Phuc*

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1. INTRODUCTION

Humanity's reliance on a diverse range of cultivated species, with thousands of species used for various purposes, underscores the significant contribution of both major and minor crops to global food security and agricultural sustainability. While staple crops dominate the majority of food production, the role of minor, underutilized, and neglected crops cannot be underestimated [1]. Despite their importance, these crops have received relatively little attention from the scientific community, particularly in developing countries, leading to a scarcity of research funding and limited information on their biological characteristics and genetic potential [2].

Chayote (*Sechium edule* (Jacq.) Sw.), known by various names such as vegetable pear, christophene, and mirliton, is one such underutilized crop [3]. Originating from Mesoamerica, specifically southern Mexico and Guatemala, chayote has been cultivated since the pre-Columbian era and has spread to other regions including South America, Europe, Africa, Asia, and Australia. This monoecious, perennial, herbaceous vine is valued for its nutritious, pale-green, ridged, fleshy fruit with a single seed. Despite its widespread cultivation and economic importance in many countries, chayote remains relatively under-researched, particularly in terms of its pest management [1,3].

Vietnam, with its diverse agro-ecological zones, presents a unique environment for the cultivation of various crops, including chayote [4]. However, the agricultural sector in Vietnam faces numerous challenges, including the threat posed by plant-parasitic nematodes [5]. Nematodes, such as *Meloidogyne incognita* and *Meloidogyne javanica*, are known to cause significant damage to various crops, including chayote, by affecting their root systems as reported in the world [6, 7]. However, the impact of plant-parasitic nematodes on chayote cultivation in Vietnam has never been documented.

This study aims to address this knowledge gap by reporting for the first time the association of plant-parasitic nematodes with chayote (*Sechium edule* (Jacq.) Sw.) in Vietnam. By documenting the presence of these nematodes, this research seeks to contribute to the understanding of chayote's pest challenges in the region, thus aiding in the development of effective management strategies. This report not only highlights the importance of investigating underutilized crops but also emphasizes the need for comprehensive agricultural research to ensure the sustainable development and improvement of these valuable resources.

2. MATERIALS AND METHODS

Sampling: Soil and root samples were collected randomly at four different sampling fields in the growing areas of chayote in Vinh Phuc, Vietnam. At each sampling site, approximately 1 kg of soil and 15 g of roots from the rhizosphere of chayote were collected from the upper 30 cm of the soil layer [5]. The soil and roots were placed in a nylon bag and brought to the laboratory for further steps.

Extraction: Nematodes from the 250g of soil and 5g of roots were extracted using the method described by Nguyen (2003).

Identification: For morphological examination, nematodes were observed using a stereo microscope and confirmed using a light microscope. Nematodes were identified following Nguyen (2003) and Nguyen et al., (2000)[8].

Calculating Density and Frequency: After extraction, the nematode suspension was placed in a counting dish under a microscope to count the number of nematodes of each genus.

- **Average Density:** Total number of nematodes belonging to a specific genus in all samples / Total number of positive samples.
- **Frequency:** (Number of samples having a specific genus / Total number of samples) × 100%.

Cluster analysis: To investigate the relationships between nematode compositions in four sampling fields, we conducted a Cluster Analysis using Primer version 6.1.12 [9]. Prior to the analysis, we normalized all data to account for differences in measurement units. We then created a resemblance matrix using the Euclidean distance measure.

3. RESULTS

In the chayote growing areas of Vinh Phuc, three plant-parasitic nematode genera were recorded: *Hirschmanniella*, *Helicotylenchus*, and *Tylenchorhynchus*. Among these, *Tylenchorhynchus* appeared with the highest density, averaging 152 nematodes per 250g of soil (Table 1), and comprised 70% of the total number of individuals (Fig. 1).

Table 1. The composition of nematodes recorded on chayote plants

Nematode		Total	Average density (per positive samples)	Frequency
Soil	*Hirschmanniella*	262	20	92.9

	Helicotylenchus	530	106	35.7
	Tylenchorhynchus	2134	152	100
Root	*Hirschmanniella*	2	2	7.1
	Tylenchorhynchus	72	8	64.3

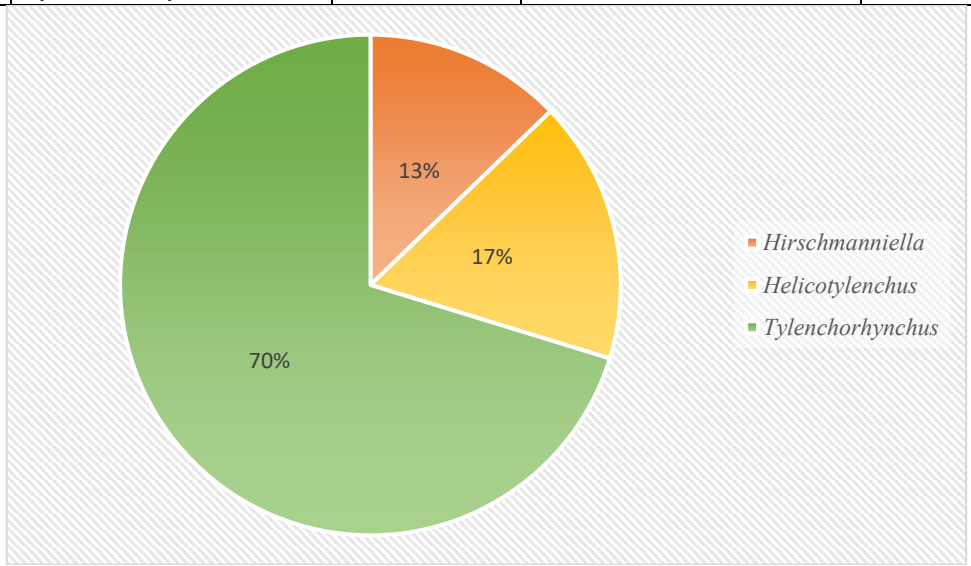

Figure 1. *Percentages of the number of plant-parasitic nematodes in the rhizosphere of chayote in Vinh Phuc*

Although *Hirschmanniella* was recorded at a low density (an average of 20 nematodes per positive soil sample), it was present at a very high frequency of 92.9%. *Tylenchorhynchus* had the highest frequency, being found in 100% of the soil samples.

In the root samples, only two genera, *Hirschmanniella* and *Tylenchorhynchus*, were recorded. However, the average densities of these plant-parasitic nematodes were relatively low, with 2 and 8 nematodes per 5g of root, respectively.

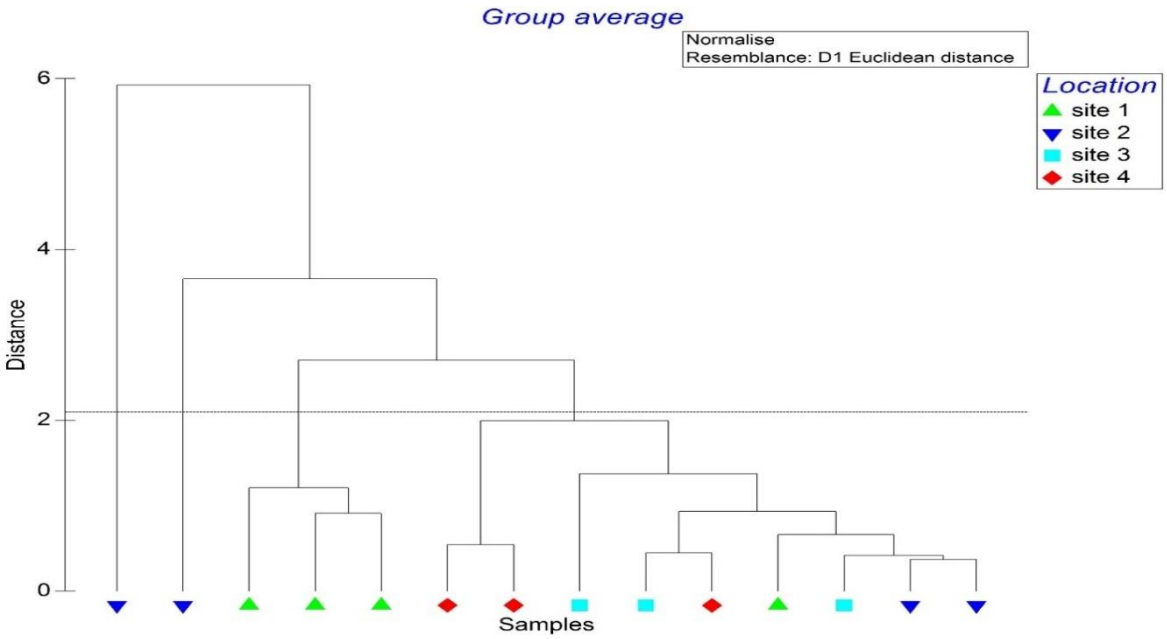

Figure 2. *Cluster analysis of nematode composition from different sampling fields.*