

THE CABBAGE (BRASSICA OLERACEA SUB SP. CAPITATA L) ROOT AND RHIZOSPHERE SOIL PHYTONEMATODES

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Introduction. Protecting agricultural crops from various pests and diseases and identifying harmful organisms are among the most pressing issues worldwide. The demand for high-yield, high-quality, and export-oriented agricultural products continues to grow daily. Among cultivated vegetables, cabbage holds a significant place due to its richness in vitamins. However, cabbage crops are affected by various pests and parasites, causing damage as a result of their impact. Phytonematodes are also among the parasites that affect cabbage. Therefore, identifying the species composition of cabbage phytonematodes and analyzing their population density in the soil hold significant scientific and practical importance.

Research Method In January 2025, research samples were collected from cabbage (*Brassica oleracea* subsp. *capitata* L.) agroecosystems belonging to “Agro Gold Premium” LLC, located in the Ko'ksoy neighborhood citizens' assembly, Nuriston town, Nishon district, Kashkadarya region. The route method was used for sample collection [2]. To collect samples from the cabbage plant, the area around the plant's roots was excavated to a depth of 20 cm and a width of 25 cm, separating the roots and soil. From the rhizosphere soil, 200–250 grams of soil was collected. Using this method, 10 samples each were taken from stems, leaves, roots, and rhizosphere soil, totaling 30 samples.

The plant and soil samples collected in the field were placed separately into polyethylene bags and labeled with identification tags. The collected samples were transported to the laboratory, where soil particles adhering to the vegetative parts of the plants were washed off with tap water. To extract nematodes from the cabbage stem, leaves, roots, and rhizosphere soil samples, the Baermann funnel technique was employed [1]. Permanent and temporary slides were prepared to identify the species of nematodes, and their taxonomy was determined.

Results. As a result of our research, 27 species of phytonematodes were identified in the organs of cabbage plants and their rhizosphere soils. The



classification of the identified phytonematodes was based on the systems proposed by B. Chitwood [3] and M.A. De Ley and Blaxter [4]. According to this system, the 27 species of phytonematodes detected in cabbage belong to the phylum Nematoda (Nematodes) and are categorized into 2 classes (Adenophorea and Secernentea), 4 subclasses (Enoplia, Chromadoria, Rhabditia, and Diplogastria), 7 orders, 17 families, and 22 genera.

The class Adenophorea includes the subclasses Enoplia and Chromadoria, while the class Secernentea comprises the subclasses Rhabditia and Diplogastria. The subclass Enoplia includes the orders Triplonchida and Dorylaimida, whereas the subclass Chromadoria encompasses the orders Monhysterida and Araeolaimida. Similarly, the subclass Rhabditia includes the order Rhabditida, and the subclass Diplogastria includes the order Tylenchida.

Our research analyzed the nematodes identified, categorizing them by order as follows:

Order Triplonchida consisted of 1 family (Prismatolaimidae), 1 genus (Prismatolaimus), and 1 species (Prismatolaimus dolichurus).

Order Dorylaimida included 4 families (Dorylaimidae, Qudsianematidae, Diptherophoridae, and Alaimidae), 4 genera (Mesodorylaimus, Eudorylaimus, Diphtherophora, and Alaimus), and 6 species (Mesodorylaimus bastiani, Eudorylaimus centrocerus, E. pratensis, Diphtherophora communis, D. obesus, and Alaimus primitivus).

Order Mononchida comprised 1 family (Mononchidae), 1 genus (Clarcus), and 1 species (Clarcus papillatus).

Order Monhysterida contained 1 family (Monhysteridae), 1 genus (Monhystera), and 1 species (Monhystera paludicola).

Order Araeolaimida consisted of 1 family (Plectidae), 1 genus (Plectus), and 1 species (Plectus cirratus).

Order Rhabditida included 4 families (Rhabditidae, Mesorhabditidae, Cephalobidae, and Panagrolaimidae), 8 genera (Rhabditis, Mesorhabditis, Cephalobus, Panagrolaimus, Acrobeles, Acrobeloides, Chiloplacus, and Cervidellus), and 10 species (Rhabditis brevispina, Mesorhabditis monhystera, Cephalobus persegna, Panagrolaimus rigidus, Acrobeles ciliates, Acrobeloides buetschlii, A. emarginatus, Chiloplacus bibigulae, Ch. symmetricus, and Cervidellus insubricus).

Order Tylenchida consisted of 5 families (Aphelenchidae, Tylenchidae, Hoplolaimidae, Psilenchidae, and Paratylenchidae), 6 genera (Aphelenchus, Tylenchus, Ditylenchus, Helicotylenchus, Filenchus, and Paratylenchus), and 7



species (*Aphelenchus avenae*, *Tylenchus davainei*, *Ditylenchus dipsaci*, *Helicotylenchus erythrinae*, *H. multicinctus*, *Filenchus filiformis*, and *Paratylenchus hamatus*).

It is evident from the data that most of the identified species belong to the orders Rhabditida (10 species, accounting for 37% of the total identified species) and Dorylaimida (6 species, accounting for 22%). Representatives of other orders were found in smaller numbers.

The distribution of nematodes in the organs of the cabbage plant and the rhizosphere soil was analyzed. Two species of nematodes found in the leaves and stems of the cabbage plant (*Chiloplacus simmetricus* and *Aphelenchus avenae*) belong to 2 genera. In the aboveground parts of the plant, *Aphelenchus avenae* was found with 13 individuals, and *Chiloplacus simmetricus* was found with 1 individual.

From the root system, a total of 161 individuals were collected, representing 11 species (*Cephalobus persegnis*, *Acrobeles siliatus*, *Acrobeloides emarginatus*, *Chiloplacus bibigulae*, *Ch. simmetricus*, *Cervidellus insubricus*, *Panagrolaimus rigidus*, *Mesorhabditis monhystera*, *Aphelenchus avenae*, *Helicotylenchus multicinctus*, *Paratylenchus hamatus*), which constitutes 40.7% of the total identified species and 45.1% of the total individuals. Among the mentioned species, *Aphelenchus avenae* had the highest number of individuals (100), followed by *Cephalobus persegnis* (17), *Acrobeloides emarginatus* (13), and *Helicotylenchus multicinctus* (11). Species with 1-2 individuals included *Acrobeles siliatus*, *Chiloplacus bibigulae*, *Panagrolaimus rigidus*, and *Mesorhabditis monhystera*. *Chiloplacus simmetricus* had 6 individuals, *Cervidellus insubricus* had 4, and *Paratylenchus hamatus* had 4 individuals.

Among the root samples of the cabbage plant, *Aphelenchus avenae* was the most abundant species, with a higher number of individuals than other species, making it a dominant species. On the other hand, *Chiloplacus bibigulae* and *Panagrolaimus rigidus* were present in very low numbers, with only one individual of each species found. *Acrobeles siliatus*, *Chiloplacus bibigulae*, *Cervidellus insubricus*, *Panagrolaimus rigidus*, and *Mesorhabditis monhystera* were found exclusively in the root part of the plant.

In the rhizosphere soil, 194 individuals of 22 species were identified, accounting for 81.5% of the total identified species and 45.1% of the total individuals. The nematodes found in the rhizosphere soil include: *Monhystera*



paludicola, *Plectus cirratus*, *Alaimus primitivus*, *Clarcus papillatus*, *Prismatolaimus dolichurus*, *Mesodorylaimus bastiani*, *Eudorylaimus pratensis*, *E. centrocerus*, *Diphtherophora communis*, *D. obesus*, *Cephalobus persegnis*, *Acrobeloides buetschlii*, *A. emarginatus*, *Chiloplacus symmetrius*, *Rhabditis brevispina*, *Aphelenchus avenae*, *Tylenchus davainei*, *Filenchus filiformis*, *Helicotylenchus erythrinae*, *H. multicinetus*, *Paratylenchus hamatus*, and *Ditylenchus dipsaci*.

Among the nematodes found in the rhizosphere soil, the species *Chiloplacus symmetrius* (27 individuals), *Rhabditis brevispina* (32 individuals), and *Helicotylenchus multicinetus* (80 individuals) were observed in higher numbers, making them the dominant species. In contrast, species with fewer individuals included *Monhystera paludicola*, *Plectus cirratus*, *Alaimus primitivus*, *Clarcus papillatus*, *Eudorylaimus pratensis*, *D. obesus*, *Acrobeloides buetschlii*, *Tylenchus davainei*, *Filenchus filiformis*, *Helicotylenchus erythrinae*, and *Ditylenchus dipsaci*, with only 1-2 individuals of each species observed.

The species *Monhystera paludicola*, *Plectus cirratus*, *Alaimus primitivus*, *Clarcus papillatus*, *Prismatolaimus dolichurus*, *Mesodorylaimus bastiani*, *Eudorylaimus pratensis*, *E. centrocerus*, *Diphtherophora communis*, *D. obesus*, *Acrobeloides buetschlii*, *Rhabditis brevispina*, *Tylenchus davainei*, *Filenchus filiformis*, *Helicotylenchus erythrinae*, and *Ditylenchus dipsaci* were exclusively found in the rhizosphere soil of the cabbage plant.

Our research identified 27 species of nematodes in the organs of cabbage plants and the rhizosphere soil. The majority of these species belong to the orders Rhabditida (10 species) and Dorylaimida (6 species), with representatives from other orders being less common. The distribution of these nematodes varied across different plant organs and soil regions. While the majority of species were found in the rhizosphere soil, those present in the leaves, stems, roots, and rhizosphere soil were primarily representatives of the genera *Chiloplacus* and *Aphelenchus*. In the rhizosphere soil, the most widespread genera included *Eudorylaimus*, *Chiloplacus*, *Rhabditis*, and *Helicotylenchus*.

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