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Research Article

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Evaluation of garden cress (*Lepidium sativum* L.) reactions to *Turnip mosaic virus*

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Abstract Garden cress (*Lepidium sativum* L.) belonging to the Brassicaceae family is a crop grown on small plots in Samsun, Turkey. Plants belonging to the Brassicaceae family may be infected by various viruses. *Turnip mosaic virus* (TuMV; genus *Potyvirus*) is one of the most destructive viruses the family. Objective of the present study was to determine the reactions to TuMV of garden cress plants. A study was conducted in greenhouse at Faculty of Agriculture, the University of Ondokuz Mayis. The saps obtained by grinding TuMV-infected leaves in 0.01 M phosphate buffer (pH: 7.0) were mechanically inoculated to garden cress plants using carborundum powder as abrasive. Observations were recorded according to the disease rating scale (0-9) throughout 60 days of each experiment. The results of study showed that the incidence of virus in garden cress crop was 61.5%. Radish plants showed *systemic symptoms* (mosaic, mottle, and curling) developed at two weeks post inoculation (wpi). For eight weeks, the average weekly scales were 0, 0.1, 0.4, 1.1, 1.1, 1.4, 2.4, and 2.6, respectively. The virus infections were detected in radish plants using double-antibody sandwich enzyme-linked immunosorbent assay (DAS-ELISA) method.

Keywords Brassicacae, cress, disease severity, reaction, TuMV

1. Introduction

Lepidium sativum known as garden cress belongs to the Brassicaceae family. Brassicaceae also known as the mustard family consists of around 3350 species and 340 genera [1]. It has major scientific and economic importance [2]. *Lepidium* has around 175 species with a widespread distribution among all continents [3]. It is distributed worldwide, primarily in temperate and subtropical regions. It is known as peppergrass, garden cress, garden peppercress, pepperwort, or poor man's pepper. Cress is an important medicinal plant in some countries including Turkey [4]. In Europe and America, the leaves are used in salad. In various countries of Africa, *L. sativum* seeds are thought to be an effective medicinal remedy to cure respiratory disorders, like bronchitis and asthma [5]. In Asia, it is used in traditional medicine to treat asthma, bronchitis, and cough and is considered useful as abortifacient, antibacterial, aphrodisiac, diuretic, expectorant, gastrointestinal stimulant, gastro protective, laxative, and stomachic [6].

L. sativum can be grown indoor or outdoor. According to the latest data provided by TUIK, the total amount of garden cress production in Turkey was 6.629 tons [7]. Samsun is one of the important provinces for its high agricultural potential in Turkey.

Crop losses due to pests and diseases are a major threat to incomes of rural families. Plants are frequently exposed to infection by a wide array of pathogens that show different responses in the host plant. Plant viral diseases cause significant losses by reducing plant growth and yield. Plants belonging to the Brassicaceae family

may be infected by various viruses. Among the brassica crop viral diseases, *Turnip mosaic virus* (TuMV) is one of the most destructive viral diseases affecting various brassica species [8].

TuMV, genus *Potyvirus*, has filamentous and flexuous particles with an average length of 720 nm [9]. TuMV genome, which is a single-stranded, is a positive-sense RNA molecule of approximately 10.000 nt. In many cultivated Brassica crops, TuMV causes a variety of leaf symptoms including mottles, mosaics, and black necrotic ring spots [10]. It has a very wide host range infecting at least 318 species in 156 genera of 43 families including various cultivated Brassicaceae and numerous wild plants [11]. The virus is transmitted in a non-persistent manner by over 40 aphid species, particularly by *Myzus persicae*, *Aphis craccivora*, and *Macrosiphum euphorbiae* [12].

Due to the viral infection, various changes occur in the host plants, thereby leading to various biological, morphological and physiological changes. Symptom variation mainly depends on the virulence of the virus and on the susceptibility or resistance of the host [13]. The present study was carried out to explore the morphological responses in garden cress cultivars against the *Turnip mosaic virus*.

Materials and Methods

Plant material and Source of Infection

Cultivars commonly used in garden cress-growing in Samsun province were used in the current investigation. TuMV was isolated from cabbage and was maintained in garden cress seedlings.

Confirmation of TuMV Presence in the Infected Samples

The presence of the virus was confirmed by double-antibody sandwich enzyme-linked immunosorbent assay (DAS-ELISA) in propagation hosts. The leaf samples from the healthy plants of each cultivar were taken as control.

Biological Tests

Seeds of cultivar commonly used in cress-growing were sown on plastic pots with commercial peat and plants were grown in a climate room under a 16 h light 8 h dark cycle at 24°C. Twenty seedlings, using 0.01 M potassium phosphate buffer (pH 7.0), were mechanically inoculated with TuMV. For sixty days after inoculation, plants were inspected weekly for symptoms.

Leaf Samples Analyses

The leaves of TuMV infected plants were collected for various analyses. Samples from inoculated and tip leaves were tested by DAS-ELISA. The symptoms on the plants were assessed using the disease rating scale as by [14; 15]. All the experiments were performed in two duplicates. The significance of differences between healthy and infected samples was determined.

Results and Discussion

The presence of TuMV in symptomatic leaves of cress plants was confirmed by DAS-ELISA. The plants infected with TuMV showed mosaic, curling symptoms (Figure 1) ranging from mild to severe in intensity, corresponding to those observed by other studies [16; 17].

Figure 1: Garden cress plants showed systemic symptoms after mechanical inoculation with TuMV

The symptom severity score for garden cress plants varied eight weeks after inoculation. The average weekly scales were 0, 0.1, 0.4, 1.1, 1.1, 1.4, 2.4, and 2.6, respectively (Figure 2).

The results of study showed that the incidence of virus in garden cress crop was 61.5%.

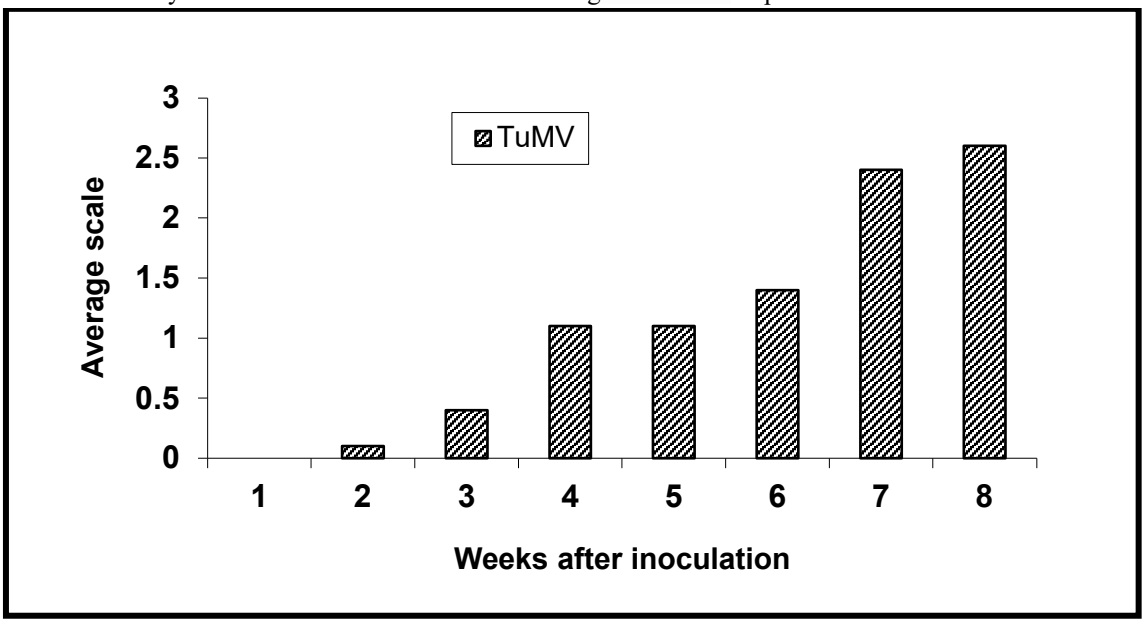

Figure 2: Development period of the disease after inoculation of cress plants with TuMV

Conclusion

In Brassica crops, TuMV is one of the most important viral pathogens [18-21]. The deployment of crop varieties that are genetically resistant to plant pathogens provides an efficient means of disease control [22]. It is well known that plant defense mechanism is complex, and the evolution of new strains of pathogens makes it a very difficult task to study. Various morphological parameters were analyzed in TuMV infected and healthy cress plants. The results indicated significant increase in the symptom severity in the TuMV infected plants compared

to the healthy. The findings of this study will help in better understanding of various morphological changes that occur in garden cress species against the TuMV.

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