Available online www.jsaer.com

***Journal of Scientific and Engineering Research*, 2018, 5(7):256-258**

Research Article

ISSN: 2394-2630
CODEN(USA): JSERBR

Reaction of turnip plants to *Turnip mosaic virus* (TuMV)

Mehmet Ali SEVIK*, Nuran CANSIZ

Department of Plant Protection, Faculty of Agriculture, University of Ondokuz Mayis, Samsun, Turkey

Abstract *Turnip mosaic virus* (TuMV), a member of the genus Potyvirus, is one of the most important viruses infecting a wide range of plant species, primarily from the Brassicaceae family. The family includes a large variety of economically important crops belonging to different genera. Turnip (**Brassica rapa** var. **rapa**) is an important cole crop in Turkey. The tuberous root of turnip is used as food, and forage. TuMV has adapted to such diversified cruciferous crops. The study was designed and carried out to detect the response of turnip plants to TuMV in a greenhouse at Faculty of Agriculture, the University of Ondokuz Mayis, during late autumn season. Seeds of turnip were germinated in plastic pods. The experiments were performed in four replications with positive and negative controls. Twenty seedlings were grown for each experiment and were inoculated with sap from TuMV-infected plants. Weekly observations were recorded according to the disease rating scale (0-9) throughout the 8-weeks duration of each experiment. In turnips, TuMV showed chlorotic or necrotic local lesions, systemic vein clearing and veinal flecking developing into severe mosaic. Host reaction studies showed that the mean weekly scales were 0, 0.1, 0.2, 0.2, 0.4, 0.5, 1.1, and 2.0, respectively. Average infection rate was detected as 27.3% using DAS-ELISA after eight weeks.

Keywords *Brassica rapa*, mechanical inoculation, response, TuMV, virus

Introduction

Turnip mosaic virus (TuMV) is is one of the most widespread and destructive viral agents affecting species of the Brassicaceae family. It affects cultivated Brassica species worldwide [1]. TuMV causes a variety of leaf symptoms including mottles, mosaics, and black necrotic ring spots. Symptom variation mainly depends on the virulence of the virus and on the susceptibility or resistance of the host [2]. TuMV is a member of genus Potyvirus, family Potyviridae and it has flexuous filamentous particles 700–750 nm long, each of which contains a single copy of the genome, which is a single-stranded, positive-sense RNA molecule of about 9833 nt [3].

TuMV was first reported in Australia and New Zealand in the 1930s [4] and was characterized by symptoms, host range, and sap and aphid transmission. TuMV occurs in many parts of the world, including Europe, Asia, Africa, Oceania, and North and South America [5]. In earlier studies, TuMV was determined in Brassica vegetables in Turkey [6]. Although it has been present in Turkey and is associated with significant yield losses in brassica crops, little is known about some of the biological and serological features of TuMV isolates. Such information may be critical for the understanding of disease epidemiology and breeding for resistant varieties.

The objective of this study was to assess the reactions to TuMV of the turnip cultivars from Turkey. Infection time and the severity of symptoms were also evaluated in turnip plants.

Materials and Methods

TuMV was isolated from cabbage and was maintained in turnip plants. The presence of the virus was confirmed by double-antibody sandwich enzyme-linked immunosorbent assay (DAS-ELISA) in propagation hosts.

Seeds of cultivars commonly used in turnip-growing were sown on plastic pots with commercial peat and turnip plants were grown in a plant growth room at 24-26°C. Twenty seedlings, using 0.01 M ***potassium*** phosphate buffer (pH 7.0) [7], were mechanically inoculated with TuMV. For eight weeks after inoculation (wai), plants were inspected weekly for symptoms. Samples from inoculated and tip leaves were tested by DAS-ELISA.

The symptoms on the plants were assessed using the following disease rating scale (0-9) as by [8; 9]. The rating was on a scale of 0–9 (0= no symptoms; 1= chlorotic or necrotic lesions on the inoculated leaves; 3= chlorotic or necrotic lesions on the inoculated leaves, slightly mottle on new growth; 5= chlorotic or necrotic lesions on the inoculated leaves, mottle on new growth, stunting but no leaf deformation; 7= chlorotic or necrotic lesions on the inoculated leaves, the plant heavily mottle, deformation, and stunting of new growth; 9= chlorotic or necrotic lesions on the inoculated leaves, the plant severe mottle, stunting or died.

Results and Discussion

Symptoms of infection by TuMV first appeared on turnip plants within 15 days after inoculation. In turnips, TuMV showed chlorotic or necrotic local lesions, systemic vein clearing and veinal flecking developing into severe mosaic, corresponding to those observed by other authors [10; 11]. Host reaction studies showed that the mean weekly scales were 0, 0.1, 0.2, 0.2, 0.4, 0.5, 1.1, and 2.0, respectively. Average infection rate was detected as 27.3% using DAS-ELISA after eight weeks (Figure 1).

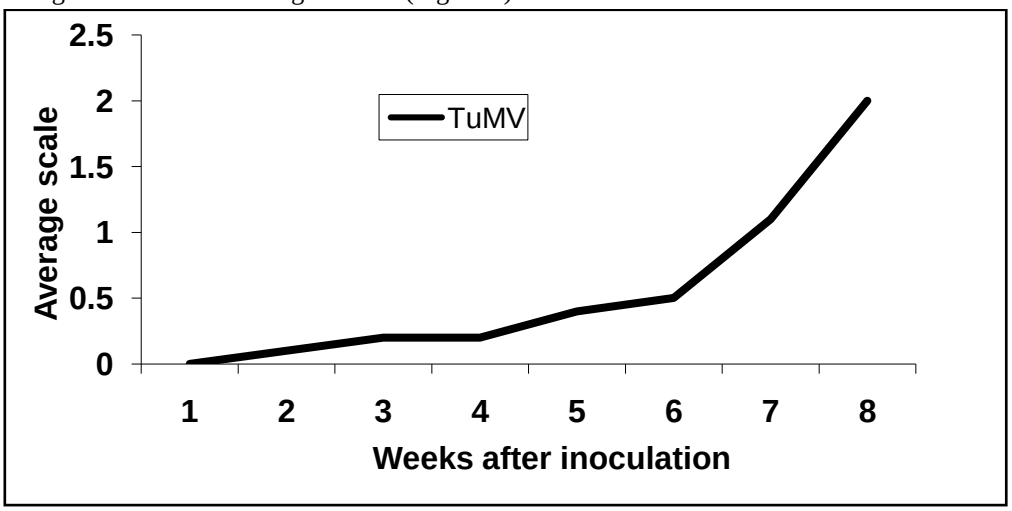

Figure 1: Infection and development period of the disease after inoculation of turnip plants with TuMV

The symptom expression and severity of turnip infected with TuMV were investigated in the present study. Similar work carried out by Gładysz and Hanus-Fajerska [12] to evaluate the reaction of cabbage cultivars to mechanical inoculation with selected isolates of the TuMV. The TuMV-CAR37A and TuMV-CAR39 isolates from horseradish proved to be infective towards 'Amager' and 'Langedijker'. Both tested cultivars showed a similar level of susceptibility.

TuMV is one of the economically most important pathogens in Brassica vegetables. Establishment of resistance to TuMV in Brassicas is an effective way to control this disease [13]. The findings obtained during the study help better understand the native isolates and develop efficient control strategies, and may help to understand the processes leading to the emergence of epidemic outbreaks.

Conclusion

Experiments were carried out to evaluate the reaction of turnip plants to TuMV. The saps obtained by grinding TuMV-infected leaves were mechanically inoculated to turnip plants. After inoculation, the plants were kept in a growth room. The reactions were evaluated weekly for eight weeks after inoculation. For eight weeks, the average weekly scales were 0, 0.1, 0.2, 0.2, 0.4, 0.5, 1.1, and 2.0, respectively. Samples from inoculated plants were tested by DAS-ELISA. The virus infection was detected as 27.3% using DAS-ELISA by the end of the 8th week.

References

[1]. Walsh, J. A., Rusholme, R. L., Hughes, S. L., Jenner, C. E., Bambridge, J. M., Lydiate, D. J., & Green, S. K. (2002). Different classes of resistance to turnip mosaic virus in *Brassica rapa*. *European Journal of Plant Pathology*, 108(1):15-20.

[2]. Tomlinson, J. A., & Ward, C. M. (1978). The reactions of swede (Brassica napus) to infection by turnip mosaic virus. *Annals of Applied Biology*, 89(1):61-69.

[3]. Yasaka, R., Ohba, K., Schwinghamer, M. W., Fletcher, J., Ochoa-Corona, F. M., Thomas, J. E., & Ohshima, K. (2015). Phylodynamic evidence of the migration of turnip mosaic potyvirus from Europe to Australia and New Zealand. *Journal of General Virology*, 96(3):701-713.

[4]. Chamberlain, E. E. (1936). Turnip mosaic. A virus disease of crucifers. *New Zealand Journal of Agricultural Research*, 53:321–330.

[5]. Ohshima, K., Yamaguchi, Y., Hirota, R., Hamamoto, T., Tomimura, K., Tan, Z., Sano, T., Azuhata, F., Walsh, J. A., Fletcher, J., Chen, J., Gera, A., & Gibbs, A. J. (2002). Molecular evolution of Turnip mosaic virus: evidence of host adaptation, genetic recombination and geographical spread. *Journal of General Virology*, 83:1511-1521.

[6]. Sevik, M. A. (2016). Viruses infecting brassica crops in the Black Sea Region of Turkey. *Acta Agriculturae Scandinavica, Section B-Soil & Plant Science*, 66:553-557.

[7]. Nguyen, H. D., Tomitaka, Y., Ho, S. Y. W., Duchene, S., Vetten, H. J., Lesemann, D., & Ohshima, K. (2013). *Turnip mosaic potyvirus* probably first spread to *Eurasian Brassica* crops from wild orchids about 1000 years ago. *PLoS One*, 8:1-13.

[8]. Fjellstrom, R. G., & Williams, P. H. (1997). Fusarium yellows and *Turnip mosaic virus* resistance in *Brassica rapa* and *B. juncea*. *HortScience*, 32:927-930.

[9]. Jiagang, S., & Xinke, N. (1995). Genetics of the resistance to TuMV in Chinese cabbage. *Acta Horticulturae*, 402:243-248

[10]. Hunter, P. J., Jones, J. E., & Walsh, J. A. (2002). Involvement of *Beet western yellows virus*, *Cauliflower mosaic virus*, and *Turnip mosaic virus* in internal disorders of stored white cabbage. *Phytopathology*, 92(8): 816-826.

[11]. Pink, D. A. C., & Walkey D. G. A. (1990). Resistance to *Turnip mosaic virus* in white cabbage. *Euphytica*, 51:101-107.

[12]. Gładysz, K., & Hanus-Fajerska, E. (2009). Evaluation of the infectivity of selected *Turnip mosaic virus* isolates towards white cabbage cultivars. Folia Horticultutae, 21:129-138.

[13]. Kramer, R., Scholze, P., Marthe, F., Ryschka, U., Klocke, E., & Schumann, G. (2003). Verbesserung der Krankheitsresistenz von Kohlgemüse: 1. *Turnip mosaic virus* (TuMV). *Gesunde Pflanzen*, 55(7):193-198.