Available online www.jsaer.com

***Journal of Scientific and Engineering Research*, 2019, 6(2):134-136**

Research Article

ISSN: 2394-2630
CODEN(USA): JSERBR

The reactions of kale plants infected to *Turnip mosaic virus*

Mehmet Ali SEVIK*, Nuran CANSIZ

Department of Plant Protection, Faculty of Agriculture, University of Ondokuz Mayis, Samsun, Turkey
*Corresponding author: malis@omu.edu.tr

Abstract Kale (*Brassica oleracea* var. *acephala* L.) is a leafy herbaceous, biennial or perennial, plant in the Brassicaeae family. Kale growing has not been common in the other regions of Turkey, but it is widely grown as a leafy green vegetable in the Black Sea Region of Turkey. Species of the Brassica genus may be infected by various viruses. Although several viruses are known to infect cruciferous plants, *Turnip mosaic virus* (TuMV) is one of the most important viruses infecting a wide range of plant species, primarily from the Brassicaceae family. The objective of this study was to assess the reactions to TuMV of kale cultivars grown in Samsun, Turkey. Kale plants were screened under greenhouse conditions by sap inoculation method. The number of infected plants and average intensity of symptoms expressed in the nine-degree scale was detected during eight weeks. The grade of reaction to TuMV in kale plants was evaluated using a combination of biological and serological assays. Kale plants showed mosaic, mottle, necrosis, yellowing, and symptoms developed at 15 days post inoculation (dpi). Data for disease severity were recorded weekly after inoculation in TuMV-inoculated plants and the average weekly scales were 0, 0.2, 0.4, 0.7, 0.9, 1.1, 1.2, and 1.3, respectively. The virus infection was detected as 76.4% using DAS-ELISA by the end of the 8th week.

Keywords Bioassay, disease severity, kale, 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 was also determined in Brassica vegetables in Turkey [2-5].

Kale (*Brassica oleracea* L. var. *acephala*) is one of the oldest forms of the Brassicaceae (Cruciferae) family and is probably the first brassicas to be cultivated which are quite similar to wild cabbage. It is quite similar to cabbage and is a green leafy vegetable in which central leaves do not form head [6].

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 [7].

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

Materials and Methods

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

Seeds of kale cultivars commonly used in kale-growing were sown on plastic pots with commercial peat and kale plants were grown in a plant growth room at 24-26°C. Twenty seedlings, using 0.01 M potassium phosphate buffer (pH 7.0) [8], were mechanically inoculated with TuMV (Figure 1).

Figure 1: Mechanical inoculation of TuMV using infected leaf tissues

For eight weeks after inoculation (wai), plants were inspected weekly for symptoms. Samples from inoculated and tip leaves were tested by DAS-ELISA (Figure 2). The symptoms on the plants were assessed using the following disease rating scale (0-9) as by [9; 10].

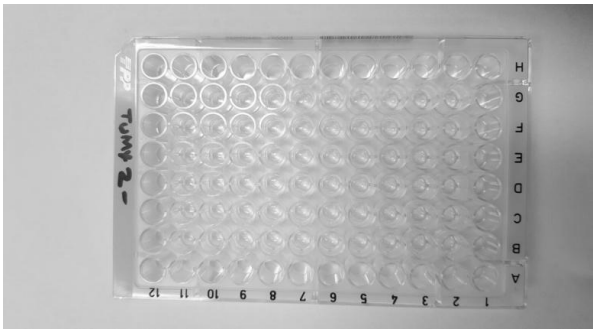

Figure 2: Detection of TuMV by DAS-ELISA

Results and Discussion

Symptoms of infection by TuMV first appeared on kale plants within two weeks after inoculation. The majority of plants was systemically infected with TuMV and showed the typical mosaic symptoms ranging from mild to severe in intensity, corresponding to those observed by other authors [11; 12] (Figure 3).

Figure 3: Symptoms on kale plants inoculated with the TuMV

The symptom severity score for cabbage cultivars varied eight weeks after inoculation. The average weekly scales were 0, 0.2, 0.4, 0.7, 0.9, 1.1, 1.2, and 1.3, respectively. The course of symptom expression was assessed and the results of virus detection in symptomless leaves were documented using DAS-ELISA. The virus infection was detected as 76.4% using DAS-ELISA by the end of the 8th week.

Conclusion

TuMV is one of the economically most important pathogens in Brassica vegetables [13-15]. Establishment of resistance to TuMV in white cabbage is an effective way to control this disease [16]. 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.

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]. Akcura, C., & Sevik, M. A. (2016). Determination of viruses in leaf cabbage production areas in Samsun province. *Yuzuncu Yıl University Journal of Agricultural Sciences*, 26(2):196-201.

[3]. Sevik M. A. (2016a). Viruses infecting brassica crops in the Black Sea Region of Turkey. *Acta Agriculturae Scandinavica, Section B-Soil & Plant Science*, 66(7):553-557.

[4]. Sevik, M. A. (2016b). *Turnip mosaic virus* infecting kale plants in Ordu, Turkey. *Phyton- International Journal of Experimental Botany*, 85:231-235.

[5]. Sevik, M. A., & Cansız, N. (2018). Evaluation of broccoli (*Brassica oleracea* var. *italica*) plants reaction to *Turnip mosaic virus. 1st International Eurasian Conference on Science, Engineering and Technolog*. 22-23 November, Ankara-Turkey. p.1562-1565.

[6]. Gorka, S., Samnotra, R. K., Kumar, S., Chopra, S., & Gupta, M. (2018). Analysis of genetic diversity in kale (*Brassica oleracea* L. var. *acephala*) genotypes of Jammu and Kashmir Region based on morphological descriptors. *International Journal of Current Microbiology and Applied Science*, 7(2):2176-2181.

[7]. 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.

[8]. 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.

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

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

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

[12]. 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.

[13]. Sevik, M. A., & Deligoz, I. (2016). The reaction of cabbage (*B. oleracea* L.) breeding lines against *Turnip mosaic virus. Acta Scientiarum Polonorum. Hortorum Cultus*, 15(4):111-119.

[14]. Sevik, M. A., & Cansız, N. (2018). Reaction of turnip plants to *Turnip mosaic virus* (TuMV). *Journal of Scientific and Engineering Research*, 5(7):256-258.

[15]. Sevik, M. A., & Cansız, N. (2018). Effects of *Turnip mosaic virus* on morphological and physiological parameters of turnip. *International Congress on Agriculture and Animal Sciences.* 7-9 November, Antalya-Turkey. p. 910-914.

[16]. 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.