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Research Article

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Detection of Viruses in Onion Production Areas in Samsun, Turkey

Mehmet Ali SEVIK

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

Abstract Onion (*Allium cepa* L.) is an important *Allium* crops cultivated throughout the world, but significant reductions in quality and yield have been documented for onion production due to the many viral diseases associated with the crop. Surveys were conducted in Samsun province to determine the occurrence of onion viruses including; *Onion yellow dwarf virus* (OYDV), *Garlic common latent virus* (GCLV), *Iris yellow spot virus* (IYSV), *Leek yellow stripe virus* (LYSV), and *Shallot latent virus* (SLV). Onion leaf samples were collected from three districts of Samsun province and tested by Double antibody sandwich-Enzyme linked immunosorbent assay (DAS-ELISA). OYDV was only detected in Samsun province (6%) in the current study, but the GCLV, IYSV, LYSV, and SLV were not detected in samples from onion plants.

Keywords *Allium*, onion, OYDV, survey, virus

Introduction

Allium is the largest and most important genus of the Amaryllidaceae family and comprises more than 800 species, widely distributed in the world [1]. Of the over 50 diseases that infect cultivated *Allium* crops [2; 3], there are four viruses consistently documented as infecting these crops; *Onion yellow dwarf virus* (OYDV), *Leek yellow stripe virus* (LYSV), *Garlic common latent virus* (GCLV), and *Shallot latent virus* (SLV) [4; 5; 6]. Crops of cultivated *Allium* species are commonly infected with one or more viruses, especially when propagated vegetative [7].

OYDV, belonging to the *Potyvirus* genus, is an economically important pathogen causing severe disease in onion and other *Allium* crops [8]. In infected leaves OYDV cause mosaic symptoms and can cause yield reductions [9]. These are the most important viruses in terms of the damage, with bulb weight reduced between 24-60% for OYDV [10]. Aphids are major vectors for *Potyviruses* [11] and play an important role as vector to spread OYDV [12].

In Turkey, onion, garlic, and leek are the most important *Allium* crops. There has been no comprehensive study on the occurrence and distribution of viruses in onion crop in Samsun province, located in the Black Sea Region of Turkey. The study was conducted to determine which viruses infect onion plants in the major production areas of Samsun province.

Materials and Methods

Onion fields were selected randomly from various locations in Samsun province of Turkey (Figure 1). Field inspections were conducted in Bafra, Çarşamba, and Atakum districts during vegetation periods. Onion leaf samples were collected randomly and two or three leaves from each plant were taken. A total of eighty-four leaves were obtained from all sampling sites. Within 24 h after harvest, leaves were kept at –20ºC until the serological tests were performed.

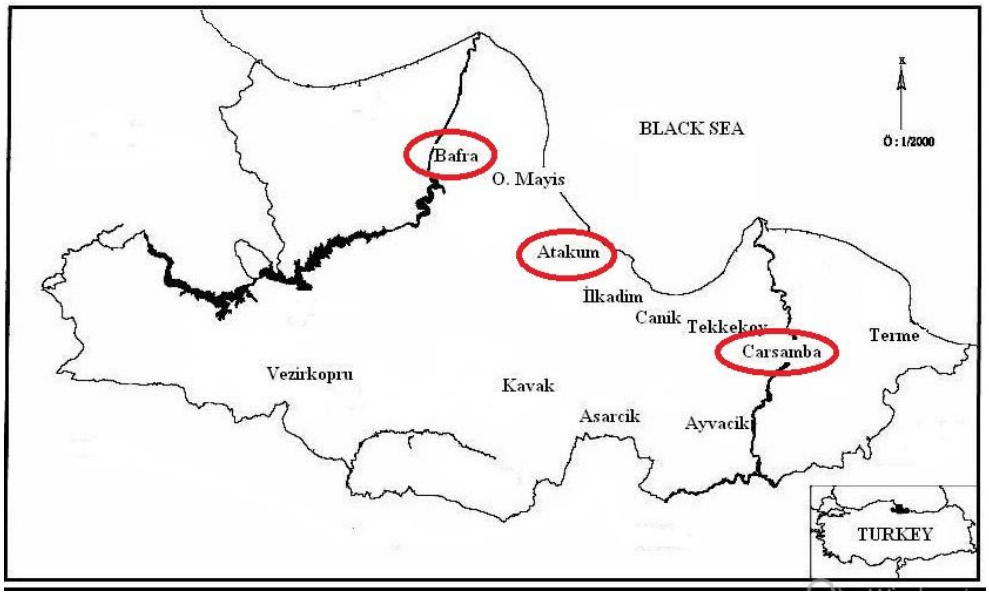

Figure 1: *Map of Samsun province showing surveyed onion-growing areas*

All samples were tested using the double antibody sandwich-enzyme linked immunosorbent assay (DAS-ELISA), described by Clark and Adams [13]. Samples for DAS-ELISA were prepared by grinding of leaf tissue in phosphate buffered saline, pH 7.4 with 2% polyvinylpyrrolidone (PVP-40) and 0.2% of bovine albumin, in the ratio 1:10. Commercial OYDV, LYSV, GCLV, SLV, and IYSV specific polyclonal antibodies were used according to the manufacture's manual (Bioreba, and Agdia). Absorbance values were read at 405 nm using a microplate reader (Tecan) and also confirmed visually. All samples tested in two replicate wells and the absorbance value greater than three times that of a negative control and with a visually detectable yellow colour was rated as positive [14].

Mechanical inoculation were carried out by rubbing sap from virus source samples that gave high absorbance values in ELISA on the true leaves of test plants dusted with carborundum. Sap was prepared by grinding infected onion leaves in a mortar and pestle with 0.05 M phosphate buffer (pH: 7.0) [15]. The isolates were mechanically inoculated onto onion plants, maintained in a plant growth room at 24°C and monitored daily for symptoms. Inoculated plants were tested for the presence of the virus by DAS-ELISA [16].

Results and Discussion

In the present study, surveys of viral diseases were carried out on onion-growing areas in Samsun province of Turkey. Symptoms of the most commonly observed disease in prevalence were mosaic consisting of light and dark green stripes along the leaves, yellowing and stunting which is caused by the viruses. Symptoms were visually assessed in the growing areas and the samples were analyzed by laboratory testing using biological and serological methods for OYDV, LYSV, GCLV, SLV, and IYSV. The result of occurrence and distribution of onion viral pathogens are shown in Table 1.

Table 1: Occurrences of viruses in onion samples collected from Samsun province

Districts	No. of samples tested	Viruses (%)*				
		OYDV	LYSV	GCLV	SLV	IYSV
Bafra	40	12.5	-	-	-	-
Çarşamba	24	-	-	-	-	-
Atakum	20	-	-	-	-	-
Total	84	6.0	0.0	0.0	0.0	0.0

* OYDV: *Onion yellow dwarf virus*, LYSV: *Leek yellow stripe virus*, GCLV: *Garlic common latent virus*, SLV: *Shallot latent virus*, IYSV: *Iris yellow spot virus*

Based on serological tests, only OYDV was detected in onion samples. The other viruses were not detected in the samples (Table 1). In the present study, OYDV was detected in 6% of all onion leaf samples, the percentages of onion plants infected with OYDV in Bafra district was 12.5%. OYDV was not detected in onion leaf samples from Atakum, and Carsamba districts (Table 1). In Samsun province, infections with LYSV, GCLV, SLV, and IYSV were not detected by serological methods on onion crop in this study.

OYDV were analyzed in biological tests to confirm the findings in ELISA. Onion plants mechanically inoculated with extracts of ELISA-positive onions showed yellow lines on the leaves three weeks after inoculation. These symptoms were similar to those that were described previously for the virus. The symptoms observed on indicator plants for OYDV corresponded to the results of DAS-ELISA.

Allium species, especially onion, garlic, and leek are economically important crops for several agricultural regions in Turkey. In the current study, OYDV was isolated from naturally infected onion plants in Samsun, the Middle Black Sea Region of Turkey. OYDV seems to be spread in the onion growing areas in Samsun province and in many other countries around the world causing significant degeneration of the crop [17]. OYDV has been considered an economically important viral pathogen in Allium crops [18]. The results showed that OYDV is a common *Potyvirus* in Bafra district. LYSV, GCLV, SLV, and IYSV were not detected in the samples tested in the current study. Similar findings were obtained by Klukackova et al. [19]. Partially similar results were obtained by Dovas et al. [4] who proved incidence of viruses infecting onion, garlic, and leek crops in Greece. The high incidence of OYDV was noticed by them. As well, high occurrence of LYSV was detected by contrast to our results. Although the occurrence of OYDV and LYSV has been described in Greece [4], Brazil [5], Japan [17] and Italy [20], LYSV was not detected in tested onion samples in the present study.

OYDV, a filamentous *Potyvirus, has* been previously detected in Allium crops from many countries [21; 22]. The *Carlavirus, Allexivirus, Rymovirus*, and *Tospovirus* have been reported infecting *Allium* crops from many countries [23]. *Carlavirus* (GCLV and SLV), and *Tospovirus* (IYSV) were not detected in any sample from onion crop in this study.

Vegetative propagation of *Allium* crops and the transmission of most of their viruses by arthropod vectors have significantly contributed to their wide dissemination in the world [23]. OYDV is transmitted by aphid vectors, and infected onion plants can serve as reservoir of the virus for other economically important *Allium* crops. Also, the production and use of virus-free propagation material is vital to sustain productivity [24]. If the viruses are to be controlled effectively, it is first necessary to establish their identity and to determine their prevalence in a given region. Therefore, understanding of the epidemiology of viruses is very important for the development of appropriate management strategies.

Conclusion

This is the report of surveys to identify the viruses of onion crops in Samsun province. The results obtained in this study demonstrate that OYDV was a prevalent virus in onion crop. In this study, the information was presented for the virus infections in the region. However, considering the potential damage caused by OYDV, detailed studies towards determining effective control strategies are required.

References

[1]. Fritsch, R.M., Blattner, F.R., Gurushidze, M. (2010). New classification of *Allium* L. subg. *Melanocrommyum* (Webb & Berthel) Rouy (Alliaceae) based on molecular and morphological characters. *Phyton.* 49:145–220.

[2]. Schwartz, H.F., & Mohan, S.K. (2008). *Compendium of onion and garlic diseases and pests*. 2nd Ed. American Phytopathological Society, St. Paul, MN. 127 p.

[3]. Dugan, F.M. (2007). Diseases and disease management in seed garlic: Problems and prospects. American *J Plant Sci Biotech.,* 1:47–51.

[4]. Dovas, C.I., Hatziloukas, E., Salomon, R., Barg, E., Shiboleth, Y., & Katis, N.I. (2001). Comparison of methods for virus detection in *Allium* spp. *J Phytopath.,* 149:731–737.

[5]. Fajardo, T.V.M., Nishijima, M., Buso, J.A., Torres, A.C., Avila, A.C., & Resende, R.O. (2001). Garlic viral complex: Identification of potyviruses and carlaviruses in Central Brazil. *Fitopatologia Brasil.*, 26:619–626.
[6]. Pappu, H.R., Hellier, B.C., & Dugan, F.M. (2008). Evaluation of the national plant germplasm system's garlic collection for seven viruses. Online. *Plant Health Progress* doi:10.1094/PHP-2008-0919-01-RS.
[7]. Bos, L. (1983). Viruses and virus diseases of *Allium* species. *Acta Hort.* 127:11–29.
[8]. Manglli, A., Mohammed, H.S., El Hussein, A.A., Agosteo, G.E., Albanese, G., & Tomassoli, L. (2014). Molecular analysis of the 3' terminal region of *Onion yellow dwarf virus* from onion in southern Italy. *Phytopath Mediter.*, 53:438–450.
[9]. Walkey, D.G.A., & Antil, D.N. (1989). Agronomic evaluation of virus-free and virus infected garlic. *J Horticultural Sci.*, 64:53–60.
[10]. Lot. H., Chovelon, V., Souche, S., & Delecolle, B. (1998). Effects of *Onion yellow dwarf* and *Leek yellow stripe viruses* on symptomatology and yield loss of three French garlic cultivars. *Plant Dis.*, 82:1381–1385.
[11]. Garzo, E.I., Duque, M., & Fereres, A. (2004). Transmission efficiency of different non-persistent viruses infecting melon by four aphid species. *Span J Agr Res.*, 2:369–376.
[12]. El-Wahab, A.A. (2009). Aphid-transmission efficiency of two main viruses on garlic in Egypt, *Onion yellow dwarf virus* (OYDV-G) and *Leek yellow stripe virus* (LYSV-G). *J Plant Pathol.*, 2:40–42.
[13]. Clark, M.F., & Adams, A.N. (1977). Characteristics of the microplate method of Enzyme-Linked Immunosorbent Assay for the detection of plant viruses. *J Gen Virol.*, 34:475–483.
[14]. Mullis, S.W., Langston, D.B.Jr., Gitaitis, R.D., Sherwood, J.L., & Csinos, A.C. (2004). First report of vidalia onion (*Allium cepa*) naturally infected with *Tomato spotted wilt virus* and *Iris yellow spot virus* (family Bunyaviridae, genus Tospovirus) in Georgia. *Plant Dis.*, 88:1285–1285.
[15]. Conci VC, Nome SF, & Milne RG, 1992. Filamen tous viruses of garlic in Argentina. Plant Dis., 76: 594–596.
[16]. Celli, M.G., Torrico. A.K., Kiehr. M., & Conci. V.C. (2013). Striking differences in the biological and molecular properties of onion and garlic isolates of *Onion yellow dwarf virus*. *Arc Virol.*, 158:1377–1382.
[17]. Takaichi, M., Nagakubo, T., & Oeda, K. (2001). Mixed virus infection of garlic determined by a multivalent polyclonal antiserum and virus effects on disease symptoms. *Plant Dis.*, 85:71–75.
[18]. Shukla, D.D., Ward, C.W., & Brunt, A.A. *(1994). The Potyviridae.* CAB International Press, *Wallingford. 516 p.*
[19]. Klukackova, J., Navratil, M., & Duchoslav, M. (2007). Natural infection of garlic (*Allium sativum* L.) by viruses in the Czech Republic. *J Plant Dis and Protec.*, 114:97–100.
[20]. Dovas, C.I., & Vovlas, C. (2003). Viruses infecting *Allium* spp. in southern Italy. *J Plant Path.*, 85:135–135.
[21]. Mahmoud, S.Y.M., Maaty, S.A., El-Borollosy, A.M., & Abdel-Ghaffar, M.H. (2008). Identification of *Onion yellow dwarf potyvirus* as one of the major viruses infecting garlic in *Egypt. Int J Virol.*, 4:1–13.
[22]. Fayad-Andre, M.deS., Dusi, A.N., & Resende, R.O. (2011). Spread of viruses in garlic fields cultivated under different agricultural production systems in Brazil. *Tropical Plant Path.*, 36:341–349.
[23]. Katis, N.I., Maliogka, V.I., & Dovas, C.I. (2012). Viruses of the genus Allium in the Mediterranean region. *Adv Virus Res.*, 84:163–208.
[24]. Kumar, S., Baranwal, V.K., Joshi, S., Arya, M., & Majumder, S. (2010). Simultaneous detection of mixed infection of *Onion yellow dwarf virus* and an Allexivirus in RT-PCR for ensuring virus free onion bulbs. *Indian J Virol.*, 21:64–68.