

DISTRIBUTION AND PARTIAL BIOLOGICAL CHARACTERIZATION OF WHEAT AND BARLEY STRAINS OF WHEAT DWARF VIRUS IN IRAN*

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Abstract

Barley yellow dwarf viruses (BYDVs), Cereal yellow dwarf virus (CYDV) and Wheat dwarf virus (WDV) are the causes of dwarfing and yellowing in small grain cereal crops in Iran. WDV consists of at least two strains each adapted to wheat (WDV-W) or barley (WDV-B). In this research, the distribution and genetic variation of WDV-B and WDV-W isolates in Iran were investigated. Infected barley and wheat plants showing dwarfing and yellowing symptoms were collected from cereal fields of Chahar Mahal and Bakhtiari, Fars, and Yazd provinces during 2009-2010 and from other provinces in 2004-2006 growing seasons. These samples were subjected to DNA extraction, PCR, and sequencing, using specific WDV primers at species and strain levels. Results showed that WDV was detected in 155 of 270 samples. WDV-W and WDV-B accounted for 55% and 45% of WDV positive samples, respectively. While WDV-B was only isolated from naturally infected barley plants, isolates of WDV-W was isolated from both wheat and barley. The results of this study indicated that in addition to BYDVs, WDV is a major component of yellows complex in cereal fields in Iran. WDV was transmitted from wheat and barley infected plants to healthy plants using leafhoppers collected from cereal fields and reared on plants in the greenhouse. Morphological characteristics especially those of male genitalia indicated that *Psammotettix alienus* is the WDV vector in Iran.

Keywords: Barley, Geminivirus, *Mastrevirus*, *Psammotettix alienus*, Wheat, Wheat dwarf virus.

See Persian text for figures and tables (Pages ۱۷-۳۱).

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References

- BEHJATNIA, S. A. A., AFSHARIFAR, A., TAHAN, V., AMID MOTLAGH, M., EINI GANDOMANI, M., NIAZI, A. and IZADPANAH, K. 2011. Widespread occurrence and molecular characterization of *wheat dwarf virus* in Iran. **Aust. Plant Pathol.** 40: 12-19.
- BRIDDON, R. W., PINNER, M. S., STANLEY, J. and MARKHAM, P. G. 1990. Geminivirus coat protein gene replacement alters insect specificity. **J. Virol.** 177: 85-94.
- BOOM, R., SOL, C. J. A., SALIMANS, M. M. M., JANSEN, C. L., WERTHEIMUAN DILLEN, P. M. E. and VAN DER NOORDAA, J. 1990. Rapid and simple method for purification of nucleic acids. **J. Clin. Microbiol.** 28: 495-503.
- CONVERSE, R. H. and MARTIN, R. P. 1990. ELISA methods for plant viruses. Pp.179-196, *In*: R. Hampton, E. Ball and S. De Boer(Eds.), **Erological Methods for Detection and Identification of Viral and Bacterial Plant Pathogens, A Laboratory Manual**, APS Press.,USA.
- EKZAYEZ, M. A. and KUMARI, S. G. 2011. First report of *wheat dwarf virus* and its vector (*Psammotettix provincialis*) affecting wheat and barley crops in Syria. **ICARDA** 95: 76.
- GABRIELE, D., URCUQUI-INCHIMA, S., MILNER, M. and ROSAURA, G. 1999. The strategies of plant virus gene expression: Models of economy. **Plant Sci.** 148: 77-88.
- Greene, J. F. 1971. A revision of the nearctic species of the genus *Psammotettix* (Homoptera: Cicadellidae). **Smithson. Contrib. Zool.** 74:1-41
- IZADPANAH, K., AFSHARIFAR, A. and MASUMI, M. 2003. **Viral Disease of wheat in Iran**. The second workshop of wheat. 13-14 May 2003. Plant Virology Research Center, College of Agriculture, Shiraz University, Shiraz, Iran. 115 pp.
- KÖKLÜ, G., RAMSELL, J. N. and KVARNHEDEN A. 2007. The complete genome sequence for a Turkish isolate of wheat dwarf virus from barley confirms the presence of two distinct WDV strains. **Virus Genes** 34: 359-366.
- LEMMETTY, A. and HUUSELA-VEISTOLA, E. 2005. First report of wheat dwarf virus in winter wheat in Finland. **Plant Dis.** 89: 912-918.
- MACKENZIE, D. J., MCLEAN, M. A., MUKERJI, S. and GREEN, M. 1997. Improved RNA extraction from woody plants for the detection of viral pathogens by reverse transcription polymerase chain reaction. **Plant Dis.** 81: 222-226.
- NAHID, N., AMIN, I., MANSOOR, S., RYBICKI, E. P. and BRIDDON, R. W. 2008. Two dicot-infecting Mastreviruses occur in Pakistan. **Arch. Virol.** 153: 1441-1451.
- MAXINER, M., RUEL, M., DAIR, X. and BOUDON- PADIEU, E. 1995. Diversity of grape vine yellows in Germany. **Vitis** 34: 235-236.
- MEHNER, S., MANURUNG, B., GRUNTZIG, M., HABEKUSS, A., WITSACK, W. and FUCHS, E. 2003. Investigation into the ecology of the Wheat dwarf virus in Saxony-Anhalt, Germany. **J. Plant Dis. Protec.** 110: 313-323.
- Nielson, M. W. 1968. The leafhopper vectors of phytopathogenic viruses (Homoptera, Cicadellidae). Taxonomy, biology and virus transmission. **US Dept. Agric. Technol. Bull.** 1382-1386.
- SCHUBERT, J., HABEKUB, A., KAZMAIER, K. and JESKE, H. 2007. Surveying cereal-infecting geminivirus in Germany-Diagnostics and direct sequencing using rolling circle amplification. **Virus Res.** 127: 61-70.
- TAHAN, V. 2005. **Genetic diversity of Barley yellow dwarf virus in northern provinces of Iran**. MSc. Thesis , Submitted to Shiraz University, Shiraz, Iran, 129 pp.
- TOBIAS, I., SHEVCHENKO, O., KISS, B., BYSOV, A. and PALKOVICS, L. 2011. Comparison of the nucleotide sequences of wheat dwarf virus isolates from Hungary and Ukraine. **Pol. J. Microbiol.** 60: 125-131.
- VACKE, J. and CIBULKA, R. 1999. Silky bent grass (*Apera spica-venti* (L.) Beauv)- a new host and reservoir of wheat dwarf virus. **Plant Protec. Sci.** 35: 47-50.

- WANG, X., WU, B. and GUANGHE, Z. 2007. Occurrence and epidemics of *Psammoettix striatus* of wheat dwarf virus in China. Plant viruses: Exploiting Agricultural and Natural Ecosystems. **11th International Plant Virus Epidemiology Symposium and 3rd Workshop of the Plant Virus Ecology Network**. Poster # Ep3.
- ZILINISKY, F. J. 1983. Common diseases of small grain cereals, a guide to identification. **CIMMYT, Mexico**. 141 pp.