

INVESTIGATION INTO VEGETATIVE COMPATIBILITY GROUPS AND PATHOGENESITY OF *Colletotrichum coccodes*, THE CAUSAL AGENT OF POTATO BLACK DOT IN IRAN*

M. BINAEIAN^{1**}, K. SHARIFI² and H. R. ZAMANIZADEH²

(Received: 10.11.2010 ; Accepted: 16.2.2011)

Abstract

Potato black dot disease, caused by *Colletotrichum coccodes*, is a common disease in many potato planting areas in Iran. This pathogen causes yield loss in field and tuber rot in storage conditions. Genetic diversity and pathogenicity of *C. coccodes* was unknown in Iran. In this study, *C. coccodes* was isolated from potato plants with black dot symptoms from Ardebil, Isfahan and Hamadan provinces. Amongst 108 isolates, 48 isolates were studied for vegetative compatibility groups and aggressiveness. Ten VCGs including four multi-member groups (IRN-VCG1, IRN-VCG2, IRN-VCG3 and IRN-VCG4) as well as six single-member groups were detected. Isolates of Ardebil were grouped in IRN-VCG1 and IRN-VCG2 with 50 and 12.5% frequency and other isolates were single-member. Three groups of IRN-VCG1 (55%), IRN-VCG2 (13%) and IRN-VCG3 (13%) were constituted for Hamadan province isolates. Isfahan isolates were grouped as IRN-VCG1, IRN-VCG2 and IRN-VCG4 at 25, 19 and 12 percentage respectively, and 44% of isolates were not assigned to any of the four VCGs. The aggressiveness of the isolates were investigated using potato tuber decay assessment and root inoculation method. Most of isolates were able to decay potato tubers, while all isolates colonized the roots and were considered as aggressive isolates. Comparison of root and tuber inoculation methods showed no relationship between tuber rot severity and microsclerotia spreading in roots and stems. There was no correlation between VCGs and virulence while some correlation was detected for VCGs and geographical origin of the isolates. This study demonstrated that there is a significant VCG diversity in *C. coccodes*.

Keywords: Genetic diversity, Potato early dying, Nit mutant, disease diversity, *Colletotrichum coccodes*.

See Persian text for figures and tables (Pages ۳۱-۴۶).

*: A part of MSc. Thesis, Submitted to College of Agriculture and Natural Science, Science and Research Branch, Islamic Azad University, Tehran, Iran.

** : Corresponding Author, Email: Mazaherbn@gmail.com

1. Former MSc. Student and Assoc. Prof. of Plant Pathology, Respectively, Science and Research Branch, Islamic Azad University, Tehran, Iran.

2. Res. Instructor of Plant Pathol., Iranian Research Institute of Plant Protection, Tehran, Iran.

References

- AHN, I. P., CHUNG, H. S. and LEE, Y. H. 1998. Vegetative compatibility groups and pathogenicity among isolates of *Fusarium oxysporum f. sp. cucumerinum*. **Plant Dis.** 82:244-246.
- AQEEL, A. M., PASCHE, J. S., and GUDMESTAD, N. C. 2008. Variability in morphology and aggressiveness among vegetative compatibility groups of *Colletotrichum coccodes*. **Phytopathology** 98:901-909.
- BAILEY, J. A. and JEGER, M. J. 1992. *Colletotrichum* (biology, pathology and control). **C.A.B. Intl.** Wallingford, UK.
- BEHDAD, E. 1996. **Iranian Plant Protection Encyclopedia, Pests, Disease & Weeds**. Vol. 1, Yadbud Press., Esfahan, Iran.
- BINAIYAN, M., SHARIFI, K. and ZAMANIZADEH, H. 2008. Identification and distribution of Potato black dot in Ardabil, Esfahan and Hamedan provinces. **Proc. 18th Iran. Plant Protec. Cong., Hamedan, Iran.** 61(Abst.)
- BROOKER, N. L., LESLIE, J. F. and DICKMAN, M. B. 1991. Nitrate non-utilizing mutants of *Colletotrichum* and their use in studies of vegetative compatibility and genetic relatedness. **Phytopathology** 81:672-677.
- CHEN, W. 1994. Vegetative compatibility group of *Verticillium dahliae* from ornamental woody plants. **Phytopathology** 84:214-219.
- CORRELL, J. C., KLITTICH, C. J. R. and LESLIE, J. F. 1987. Nitrate nonutilizing mutants of *Fusarium oxysporum* and their use in vegetative compatibility tests. **Phytopathology** 77:1640-1646.
- COVE, D. J. 1976. Chlorate toxicity in *Aspergillus nidulans*: The selection and characterization of chlorate resistant mutants. **Heredity** 36:191-203.
- FAZLI, M., ZAFARI, D., KHODAKARAMIAN, GH. and BAGHERI, A. 2008. Pathogenic variability of *Colletotrichum coccodes* isolates from Potato in Hamedan province. **Proc. 18th Iran. Plant Protec. Cong., Hamedan, Iran.** 132 (Abst.)
- GLAIS-VALET, I., BOUCHEK-MECHICHE, T., K. and ANDRIVON, D. 2004. Growth in vitro and infectivity of *Colletotrichum coccodes* on Potato tuber at different temperatures, **Plant Pathol.** 53:398- 404.
- GLASS, N. L., and KULDAU, G. A. 1992. Mating type and vegetative incompatibility in filamentous Ascomycetes. **Annu. Rev. Phytopathol.** 30:201-224.
- HELMANN, L. J., NITZAN, N., JOHNSON, D. A., PASCHE, J. S., DOETKOOT, C. and GUDMESTAD, N. C. 2006. Genetic variability in the Potato Pathogen *Colletotrichum coccodes* as determined by amplified fragment length polymorphism and vegetative compatibility group analyses. **Phytopathology** 96:1097-1107.
- HAWTHORNE, B. T. and REES-GEORGE, J. 1996. Use of nitrate non-utilizing mutants to study vegetative incompatibility in *Fusarium solani* (*Nectria haematococca*) especially members of mating populations I, V and VI. **Mycol. Res.** 100:1075-1081.
- KLITTICH, C. J. R. and LESLIE, J. F. 1988. Nitrate reduction mutants of *Fusarium moniliforme* (*Gibberella fujikuroi*). **Genetics** 118:417-423.
- LEES, A. K. and HILTON, A. J. 2003. Black dot (*Colletotrichum coccodes*): An increasingly important disease of potato. **Plant Pathol.** 52:3-12.
- LESLIE, F. j. 1993. Fungal vegetative compatibility groups. **Annu. Rev. Phytopathol.** 31:127-150.
- LESLIE, J. F. and SUMMERELL, B. A. 2006. **The Fusarium Laboratory Manual**. 1st ed., Blackwell Pub., Malden Boston, USA.

- MOHAMADI, H. and BANIHASHEMI, Z. 2007. Vegetative compatibility groups of *Fusarium solani* f. sp. *pisi* the causal agent of chickpea black root rot in Fars province of Iran. **Iran. J. Plant Pathol.** 42:179-194 (In Farsi With English Summary).
- NITZAN, N., HAZANOVSKY, M., TAL, M., and TSROR (LAHKIM), L. 2002. Vegetative compatibility groups in *Colletotrichum coccodes*, the causal agent of black dot on potato. **Phytopathology** 92:827-832.
- NITZAN, N., TSROR (LAHKIM), L., and JOHNSON, D. A. 2006. Vegetative compatibility groups and aggressiveness of North American isolates of *Colletotrichum coccodes*, the causal agent of Potato black dot. **Plant Dis.** 90:1287-1292.
- OMATI, F. and KARIMI, A. 2002. *Colletotrichum coccodes* from Potato growing area of Semnan province. P. 47 , In: ABBASI, M. and ALIABADI, F. 2009. **The list of fungi recorded in proc. of 12th to 18th Iran. Plant Protec. Cong., Elm and Honar Pub., Tehran, Iran.**
- PUHALLA, J. E. 1985. Classification of strains of *Fusarium oxysporum* on the basis of vegetative compatibility. **Can. J. Bot.** 63:179-183.
- THERON, D. J. and HOLS, G. 1987. Laboratory assessment of Potato tuber resistance to dry rot caused by *Fusarium solani*. **Phytopathology** 19:521-523.
- TSROR (LAHKIM), L., ERLICH, O. and HAZANOVSKY, M. 1999. Effect of *Colletotrichum coccodes* on potato yield, tuber quality, and stem colonization during spring and autumn. **Plant Dis.** 83:561-565.
- WIERSEMA, H. T. 1977. Laboratory testing for the resistance of potato tubers to dry rot. **Potato Res.** 20: 268-269.