

REASERCH REGARDING THE PATHOGEN AGENT *Phytophthora parasitica* Dast. ON THE HOST *Petunia hybrida* Hort.

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Abstract

The fungus *Phytophthora parasitica* Dast., produces crown and root rot and has a wide circle of host plants, mostly horticultural crops. The fungus once installed can cause significant damage, leading even to the point of crop loss. Although this fungus has been described in earlier works, it has not been reported in recent years, but the climatic conditions of the year 2014 were favorable to the appearance and evolution of the micromycetes in the *Pythiaceae* family. In the last decade the pathogen *Phytophthora parasitica* Dast. Has been reported only sporadically. Also the increase in imports of horticultural material in the past few years favors the risk of transmission and spread of the fungus. In the crops of *Petunia hybrida* Hort. from the Municipality Greenhouses of Iasi and the Botanical Garden of Iasi, in the month of April 2014, there have been established a number of plants attacked by the pathogen agent *Phytophthora parasitica* Dast. Within this paper observations were made both in the field and in the laboratory. Measurements were made based on the symptoms of attack, the fungal morphological characters and the reference monographs.

Key words: *Phytophthora parasitica*, *Petunia hybrida*, root and crown rot.

Phytophthora parasitica Dast. (syn. *Phytophthora nicotianae* Breda de Haan.) is a polyphagous species occurring in particular in the Mediterranean climate, where the temperatures are above 27°C, and where the soil temperature and humidity are high (Lamour K., 2013). This fungal resistant in soil as chlamydospores or infected plant debris.

The circle of host plants of this pathogen agent is usually compound of plants with a high economical importance such as: species from the *Solanaceae* family (*Solanum lycopersicum* L., *Capsicum annuum* L., *Solanum melongena* L., *Solanum tuberosum* L., *Nicotiana tabacum* L.), species from the *Rosaceae* family (*Prunus*, *Malus*, *Pyrus*), species from the *Lythraceae* family (*Punica*), species from the *Juglandaceae* family (*Juglans*), species from the *Rutaceae* family (*Citrus*), species from the *Cucurbitaceae* and *Brassicaceae* family and a series of ornamental plants (*Petunia hybrida* Hort., *Dianthus caryophyllus* L., *Vinca minor* L.) (Becktell M. C. et al., 2006).

The pathogen agent was first signaled by the arab botanist Ibn el Awan in the year 1832. In 1913 in India, Dastur describes an organism similar to *Phytophthora nicotianae* Breda de Haan

on the host plant *Ricinus communis* L. and names it *Phytophthora parasitica*. In 1993 Hall describes this pathogen agent under the name of *Phytophthora nicotianae* (Lamour K., 2013). In Romania this disease was first signaled in the year 1968, causing significant damage both in the field (5-20%) as well as in greenhouses and solaria (10-60%) (Ulea E., 2003). In the last decade the pathogen *Phytophthora parasitica* Dast. Has been reported only sporadically. Also the increase in imports of horticultural material in the past few years favors the risk of transmission and spread of the fungus. On the host plant *Petunia hybrida* Hort. the disease is described for the first time in Colorado, by Phillips and Baker in the year 1962 (Phillips DJ., Baker R., 1962).

METHOD AND MATERIAL

In the month of April 2014 15 *Petunia hybrida* plants Dast. were taken from two different locations: the Greenhouses of the Municipality of Iasi, respectively the Botanical Garden Iasi. Sections were made in the right of the attacked areas, the sections were then placed in a humid chamber at a temperature of 28°C for 24 hours. Then using the microscope slides and the microscope, observations were made to establish the systematic classification considering the fungal morphology, and then

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determined the pathogen with the help of specialty literature. The determinations were accomplished in the laboratory of Plant protection, within the University of Agricultural Science and Veterinary Medicine of Iași.

RESULTS AND DISCUSSIONS

The pathogen agent *Phytophthora parasitica* Dast. attacks both young plants as well as plants which are farther along in the period of vegetation. On young plants, the literature describes the attack as a root and crown rot, determining wilting and eventually their death (figure 1). It can be observed that the trend of plant is to form adventitious roots above the attacked area (Hao W. et al., 2012).



Figure 1 *Petunia hybrida* Hort. infected with *Phytophthora parasitica* at three weeks after seeding (original)

Regarding the attack on the plants which are farther along in the period of vegetation, the following symptoms are observed: the wilting of the basal leaves and the rot and crown root (Olson H. A. et al., 2013). In the literature, the described plant tissues are attacked and softened and then finally dried giving a spongy texture (figure 2).



Figure 2 *Petunia hybrida* Hort. infected with *Phytophthora parasitica* at six weeks after seeding (original)

Crown rot is the most common symptom of the disease, and with it brown-grey spots appear, and in their right, in time, small depressions appear (Hu J. and Li Y., 2014). In these areas, the marrow inside of the strain browns, desiccates and cavities appear, where later in favourable conditions of temperature and humidity, the mycelium of the fungus is developed (figure 3).

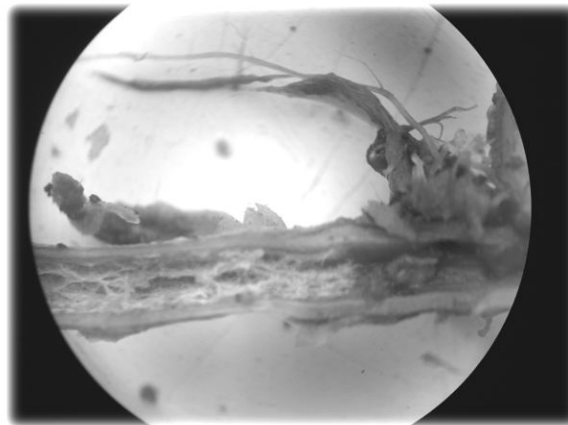


Figure 3 Section in the strain of *Petunia hybrida* Hort. infected with *Phytophthora parasitica* Dast. (original)

The disease is manifested also on fruits, especially on those who are in contact with the ground or it's proximity. For example, on the tomato fruits, whether they are green or ripe, brown-grey spots with an irregular contour appear, also a wet, soft, brown mold zoned concentrically appears on the fruit (Lamour K., 2013).

Mycosis symptoms can be confused with the disease caused by the pathogen *Phytophthora capsici* Leon., but there are some differences that help determine the pathogen agent. Thus, *Phytophthora capsici* does not produce rot on *Brassica rapa* var. *rapa*, meanwhile *Phytophthora parasitica* Dast. does not produce rot on *Daucus carota*. Another difference is the number of organs attacked on pepper plants which are fewer with *Phytophthora parasitica* Dast. than with *Phytophthora capsici* Leon., which attacks all the organs of the pepper plant. The two fungi can be distinguished by the size of the zoosporangia, which are higher (35 μm - 60 μm) in *Phytophthora parasitica* Dast., while *Phytophthora capsici* Leon. does not form chlamydo spores, but some thickening of hyphae mycelia while *Phytophthora parasitica* Dast. forms chlamydo spores with thick brown walls.

Phytophthora parasitica Dast. also produces the rot of the rhubarb. The attacked organs are the roots, the leaf petiole and the heart of the plant. Among the mycosis symptoms there can be observed: the wilting of the leaves, the leaf petiole breaks and the disease can be seen on the limb of

the leaf in particular over the nervures.

The pathogen agent *Phytophthora parasitica* Dast. is part of the Subphylum *Mastigomycotina*, the Breed *Oomycetes*, the Order *Peronosporales* and the family *Pythiaceae*.

In infected tissues appear long sporangiophores with dimensions between 100-300 μm , with spherical or ovoid zoosporangia, papilla, with dimensions between 25-35 μm X 30-45 μm , which during the germination give zoospore or mycelium directly. Zoosporangia are not caduceus. Oospores are spherical, colourless, with dimensions between 25-30 μm . Round chlamydospores with thick brown walls and with dimensions between 20-60 μm (Lamour K., 2013).

For the *Phytophthora parasitica* Dast. found on the host plant *Petunia hybrida* Hort. the following dimensions were determined: sporangiophores with dimensions between 120-270 μm , and for the zoosporangia the determined dimensions were between 25-30 μm X 30-42 μm , both sizes fit the cited literature (figure 4).

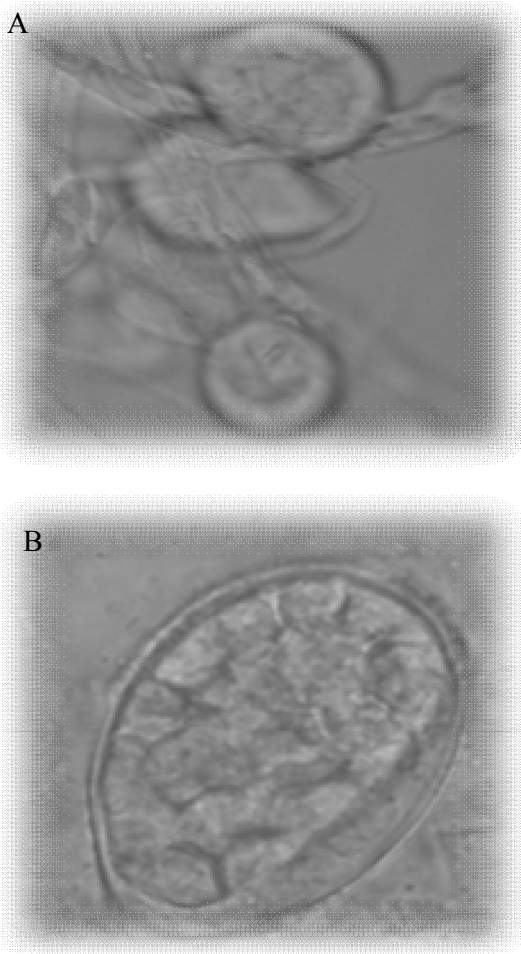


Figure 4 *Phytophthora parasitica* Dast.
A- Maturing zoosporangia
B- Mature zoosporangia (original)

Regarding the observations on the evolution of the pathogen agent in the field, the use of seedling free of pathogens is recommended, the avoidance of the depressionary areas poorly drained and the rotation of the cultures for three to four years in a row (Hao W. et al., 2012).

In the greenhouses in exchange, a desinfection of the soil thru thermal means or chemical means is recommended, the avoidance of irrigation with very cold water right after planting, in order not to subject the plant to a thermal shock, which favors the production of the infection, the avoidance of the splashing soil particles on the leaves during the watering, the removal of attacked plants or of attacked organs of the plant (Ahonsi M. O. et al., 2010).

Regarding the prevention and the chemical control, there will be used product such as: APRON XL 350 ES - 0.35 g/kg of seed, CAPTADIN 50 PU (WP) - 2 g/ kg of seed, PREVICUR 607 SL in concentration of 0.25 %, PREVICUR ENERGY (XX) - 0.1%, MERPAN 80 WDG (WG) in concentration of 0.15%, TACHIGAREN 30 L in concentration of 0.1% (Ulea E., 2003).

CONCLUSIONS

In the climatic conditions of the year 2014, in the Moldavian area, the fungus *Phytophthora parasitica* Dast. has produced significant damages to the crops of *Petunia hybrida* Hort.

Both the petunias attacked in a seedling phase and the ones attacked in a period farther along in the vegetation presented at the ground level or in its proximity browned areas with soft tissues.

The observations realized on the binocular magnifying glass have shown the presence of the mycelium and of the sifonoplast of the fungal, with dimensions between 100-300 μm

The measurement made at the microscope have proven that the dimensions of the papilla zoosporangia with a spherical or a ovoidal form, (25-35 μm x 30-45 μm), is within the range of those specified in the micological literature.

Regarding the avoidance of the attack of the pathogen agent *Phytophthora parasitica* Dast the use of seedling free of pathogens is recommended, obtained in greenhouses with a soil desinfected thru thermal means or chemical means and most importantly from desinfected seed using one of the following products or several combinations APRON XL 350 ES, CAPTADIN 50 PU (WP) sau cu PREVICUR 607 SL.

Just in case the crops will be sprinkled with one of the following products: PREVICUR ENERGY (XX) - 0.1%, MERPAN 80 WDG (WG)

in concentration of 0.15%, TACHIGAREN 30 L in concentration of 0.1%.

The location of the *Petunia hybrida* Hort. crops will be chosen considering the rotation of the cultures for three to four years in a row.

REFERENCES

- Ahonsi M.O., Banko T.J., Doane S.R., Demuren A.O., Copes W.E., Hong C., 2010** - *Effects of hydrostatic pressure, agitation and CO₂ stress on Phytophthora nicotianae zoospore survival*, Pest Management Science, vol. 66, nr. 7, pg. 696-704, Virginia.
- Becktell M.C., Smart C.D., Haney C.H., Fry W.E., 2006** - *Host-Pathogen Interactions Between Phytophthora infestans and the Solanaceous Hosts Calibrachoa × hybridus, Petunia × hybrida, and Nicotiana benthamiana*, Plant Disease vol. 90, nr. 1, pg. 24-32, New York.
- Hao W., Ahonsi M.O., Vinatzer B.A., Hong C., 2012** - *Inactivation of Phytophthora and bacterial species in water by a potential energy-saving heat treatment*, European Journal Plant Pathology, nr. 134, pg. 357-365, Virginia.
- Hu J. and Li Y., 2014** - *Inheritance of mefenoxam resistance in Phytophthora nicotianae populations from a plant nursery*, European Journal Plant Pathology, nr. 139, pg. 554-555, China.
- Lamour K., 2013** - *Phytophthora: a global perspective*, Editura CABI, Cambridge.
- Olson H.A., Jeffers S.N., Ivors K.L., Steddom K.C., Williams-Woodward J.L., Mmbaga M.T., Benson D.M., Hong C.X., 2013** - *Diversity and Mefenoxam Sensitivity of Phytophthora spp. Associated with the Ornamental Horticulture Industry in the Southeastern United States*, Plant Disease, vol 97, nr. 1, pg. 86-92, Virginia.
- Philips D.J., Baker R., 1962** - *Phytophthora crown rot of petunia*, Plant Disease nr. 46, pg. 506-508, Colorado.
- Ulea E., 2003** - *Fitopatologie*, Editura Ion Ionescu de la Brad, Iași.