

ABSTRACT OF DOCTOR DISSERTATION

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ASSESSMENT OF OCCURRENCE OF *FUSARIUM* SPP. FUNGI ON GARDEN ASPARAGUS (*ASPARAGUS OFFICINALIS* L.)

OCENA WYSTĘPOWANIA GRZYBÓW RODZAJU *FUSARIUM*
W WYPUSTKACH SZPARAGA LEKARSKIEGO (*ASPARAGUS OFFICINALIS* L.)

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Key words: *Asparagus officinalis*, *Fusarium*, fungi, pathogenicity, white spears, green spears

Fungi exhibiting pathogenic action against garden asparagus (*Asparagus officinalis* L.) are major factors reducing yields and quality of spears. *Puccinia asparagii*, *Botrytis cinerea* or *Stemphylium botryosum* damage shoots and cladophylls. Much greater losses are caused by different species from the genus *Fusarium*, which may cause stem and root rot leading to wilting and die-back of plants. Apart from *F. oxysporum* the species isolated most frequently from asparagus spears and crowns include *F. culmorum* (W.G. Smith) Saccardo, *F. proliferatum* (Matsushima) Nirenberg and *F. verticillioides* (Saccardo) Nirenberg. These fungi may also contribute to the formation of discolourations and rusting on spears, which as a consequence leads to a deterioration of yield quality. Certain species from the genus *Fusarium* produce secondary metabolites, which are toxic to humans. Changing climate conditions and the variety of cultivated crops require an evaluation of their suitability for growing in Poland, as well as a determination of the species composition of fungi from the genus *Fusarium* presently found in asparagus cultures.

The aim of the investigations was to determine the species composition of fungi found in white and green spears of garden asparagus with disease symptoms (brown irregular spots and rusting), as well as those with no disease symptoms, depending on the date of harvest, cultivar, site from which a fragment for analysis was collected, as well as the age of the plot on which the asparagus plants were grown. Moreover, pathogenicity of collected isolates in relation to garden asparagus plants was also assessed, together with the effect of temperature on *in vitro* mycelial growth of different species from the genus *Fusarium*, which were obtained as a result of isolation from spears.

Observations were conducted on a commercial plantation in Świdwowiec (the Lubuskie province). Asparagus plants on that plantation were grown to produce white spears and the German cultivar 'Eposs' was analysed in this study. Spears for analyses were collected from two plots, i.e. an older one in the 7th, 8th and 9th years of culture, and a younger one in the 4th, 5th and 6th year of culture. Green spears were collected from asparagus plants of different cultivars at the experimental plantation of the Department of Vegetable Crops, located at the Experimental Stations of the Departments of the Faculty of Horticulture and Landscape Architecture, Poznań University of Life Sciences. Spears of cv. 'Gynlim' were collected for analyses from two plots, an older one in the 6th, 7th and 8th year of culture and a younger one in the 4th, 5th and 6th year. Moreover, the incidence of fungi from the genus *Fusarium* was also assessed on green spears of garden asparagus of seven cultivars, i.e. 'Andreas', 'Ariane', 'Cipres', 'Eposs', 'Grolim', 'Gynlim' and 'Hannibal'. These spears were harvested in the 4th, 5th and 6th year of culture. In each group a half of the material for analyses was collected from spears with disease symptoms (spots or rusting), while the other half was collected from spears with no disease symptoms. In each case 10 spears were selected at random. Approximately 20,000 fragments for mycological analyses were collected in the course of 3-year-long observations from white and green asparagus spears.

Among the obtained isolates the most numerous were those from the genus *Fusarium*, from spears with no disease symptoms it was at 80% (white spears) and 87.6% (green spears), respectively, while on symptomatic spears it was at 78% and 87.4%, respectively. The other isolated species belonged to the genera *Alternaria*, *Botrytis*, *Cladosporium*, *Penicillium* and *Stemphyllium*.

The obtained fungi from the genus *Fusarium* belonged to six species: *F. culmorum*, *F. equiseti*, *F. oxysporum*, *F. proliferatum*, *F. solani* and *F. verticillioides*. *Fusarium oxysporum* and *F. proliferatum* were most numerous. Moreover, higher fungal infestation rates were found on spears harvested from the older plots. The assessment of fungal infestation of fragments collected from the skin and deeper located tissues showed that fungi from the genus *Fusarium* colonised the skin and the parenchyma not only in the spears with disease symptoms, but also those asymptomatic. *Fusarium oxysporum* was always isolated from the internal tissues. Isolates of the other species from the genus *Fusarium* might not be found in that population. It was stated that spears from the last harvest date (3rd decade of June) were infested to the greatest extent by fungi and in that period the greatest number of *Fusarium* species was identified in the fungal population. In turn, at the first date of harvest (1st decade of May) *F. proliferatum* or *F. verticillioides* were not isolated. The presence, except for *F. oxysporum*, and the population sizes of isolates of individual species varied not only for individual dates, but also the years taken into consideration.

In infection tests it was shown that fungi from the genus *Fusarium* infesting asparagus spears were pathogenic in relation to asparagus plants. Pathogenicity of isolates within one species, as well as between species, was varied.

When evaluating *in vitro* mycelial growth at different temperatures it was found that the optimum temperature for growth for all the analyzed species was 24°C.

The evaluated species from the genus *Fusarium* differed in terms of the minimum temperature for *in vitro* mycelial growth, as in case of *F. culmorum* it was 4°C, for *F. equiseti*, *F. oxysporum* and *F. solani* it was 8°C, while for *F. proliferatum* and *F. verticillioides* it was 12°C.

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