

## INFLUENCE OF SOWING DATE ON THE OCCURRENCE OF FUSARIUM HEAD BLIGHT ON WHEAT - A PHYTOSANITARY FOOD SAFETY PROBLEM

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### Introduction

Fusarium head blight (FHB) also known as scab is a common and worldwide disease of small grain cereals, including wheat, which has a negative impact on grain yields and quality (Parry et al. 1995). The disease occur every year and has the potential becoming the most important wheat disease in Eastern Croatia. FHB is caused by different *Fusarium* species (Wiese, 1991) and *Microdochium nivale* (Diamond and Cooke, 1997) but the principal pathogen associated with disease in Croatia is *Fusarium graminearum* Sch. (Cosic, 2001). There are several factors that directly or indirectly triggering pathogens attack: climatic conditions (Lacey et al., 1999), tolerance/sensitivity of cultivars (Snijders 1990, Bai et al. 2001) and applied agrotechniques (McMullen et al. 1997, Dill-Macky 2000). Infections of wheat heads/grains usually occur at the wheat flowering stage if environmental conditions (temperature and air humidity) are favourable to pathogens development. It is not well known how agronomic practices, such sowing date, might effect FHB occurrence. There is a little data in this matter and there is no possibility of reaching a common conclusion. Therefore is a need to research each agroclimatic area separately and each cultivar being produced within that area (Champeil et al. 2004).

### Materials

Six winter wheat cultivars (Žitarka, Srpanjka, Demetra, Barbara, Monika and Golubica) were sowing during three years (2000-2002) on 25<sup>th</sup> September, 15<sup>th</sup> October and 1<sup>st</sup> November at the location of Osijek. The experiment was carried out as randomized complete block design (RCBD) with four replications. The size of plot was 7.56 m<sup>2</sup>. Forecrop was soybean. The applied agronomic practices were usual for the wheat grown in Croatia on a large-scale production, except for protection measures against diseases, which were omitted.

The grain infection with *Fusarium* species was determined upon harvesting by the deep-freezing method. There were 4x100 grains examined for each cultivar and each replication. The obtained data were analyzed with Statistica for Windows v. 6.0. Statistical significance of the treatments was determined by ANOVA. Differences among groups were determined by using the LSD test.

### Results and Discussion

Respecting all three research years and all three sowing dates, the cv. Žitarka had the smallest number of infected grains. In 2000/2001, there were no statistically significant differences ( $P < 0.05$ ) in infected grains between cv. Žitarka and cv. Srpanjka and Monika. However, statistically highly significant differences ( $P < 0.01$ ) were determined between cv. Žitarka and cv. Demetra, Barbara and Golubica. In 2001/2002, cv. Žitarka exhibited statistically more significant tolerance ( $P < 0.05$ ) than Srpanjka, and the most significant tolerance ( $P < 0.01$ ) in

comparison to cv. Demetra, Monika and Golubica. In 2002/2003, the infection of grains was irrelevant, therefore, no statistically significant differences among cultivars were reported.

Table 1. Average number of grains infected by *Fusarium* spp., referring to years and cultivars

| Year    | Cultivar |      |       |       |       |       | LSD  |      |
|---------|----------|------|-------|-------|-------|-------|------|------|
|         | 1        | 2    | 3     | 4     | 5     | 6     | 0.01 | 0.05 |
| 2000/01 | 1.16     | 1.41 | 2.08  | 2.00  | 1.75  | 2.33  | 0.84 | 0.63 |
| 2001/02 | 24.41    | 27.5 | 28.41 | 26.75 | 28.75 | 28.33 | 3.45 | 2.59 |
| 2002/03 | 0.66     | 0.83 | 1.00  | 1.00  | 1.08  | 0.91  | 0.80 | 0.60 |

1 – Zitarka; 2 – Srpanjka; 3 – Demetra; 4 – Barbara; 5 – Monika; 6 - Golubica

If disregarding cultivars and considering sowing dates only, in all three research years the infection with *Fusarium* species was statistically weaker ( $P < 0.01$ ) on wheat sowed in the 1<sup>st</sup> sowing date than in the 2<sup>nd</sup> and 3<sup>rd</sup> dates (Table 2).

Table 2. Average number of infected grains for examined cultivars, referring to sowing date and year

| Year    | Cultivar $\bar{x}$            |                          |                          | LSD  |      |
|---------|-------------------------------|--------------------------|--------------------------|------|------|
|         | 25 <sup>th</sup><br>September | 15 <sup>th</sup> October | 5 <sup>th</sup> November | 0.01 | 0.05 |
| 2000/01 | 1.00                          | 2.08                     | 2.29                     | 0.56 | 0.45 |
| 2001/02 | 20.04                         | 24.37                    | 37.66                    | 2.43 | 1.83 |
| 2002/03 | 0.37                          | 1.00                     | 1.37                     | 0.56 | 0.42 |

In the year 2001/2002, wheat ears were strongly infected with *Fusarium* species because of climatic conditions that were in favor of disease occurrence, so statistically significant ( $P < 0.05$ ) and highly significant ( $P < 0.01$ ) differences among and within cultivars were determined, if referring to sowing dates. Within the cultivar Zitarka, Srpanjka and Demetra, there were no statistically significant differences in number of infected grains as of the 1<sup>st</sup> and 2<sup>nd</sup> sowing dates. However, statistically highly significant differences ( $P < 0.01$ ) were determined between the first two and the third sowing date. The cultivars Barbara, Monika and Golubica exhibited statistically highly significant differences ( $P < 0.01$ ) in number of grains infected with *Fusarium* spp. in all three sowing dates. The results are shown in the Table 3.

Table 3. Average number of infected grains referring to the seeding date of examined cultivars in 2001/2002

| Sowing date                | Cultivar |          |         |         |        |          |
|----------------------------|----------|----------|---------|---------|--------|----------|
|                            | Zitarka  | Srpanjka | Demetra | Barbara | Monika | Golubica |
| 25 <sup>th</sup> September | 20.00    | 22.50    | 23.25   | 18.25   | 19.25  | 17.00    |
| 15 <sup>th</sup> October   | 22.75    | 23.25    | 24.00   | 25.25   | 24.75  | 26.25    |
| 5 <sup>th</sup> November   | 30.50    | 36.75    | 38.00   | 36.75   | 42.25  | 41.75    |

LSD 0.05=4.48

LSD 0.01=5.96

### Conclusion

Based on the three-year long research, it can be concluded that the late sowing (beginning of November) causes stronger Fusarium head blight occurrence on all cultivars, especially in years when other factors were in favor of disease development. The least infection intensity was observed on all cultivars sowed at the end of September, although some cultivars (Zitarka, Srpanjka, Demetra) sowed mid October did not exhibit statistically significant differences in grain infection in comparison to those sowed at the end of September.

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