Occurrence and Intensity of More Important Fungal Diseases on Soybean (*Glycine max* (L.) Merrill) Cultivars

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Abstract

The main objective of this study was to determinate the occurrence and intensity of attack by the more important fungal diseases on soybean in Eastern Croatia. Four-year investigation (1998–2001) was undertaken on 10 domestic soybean cultivars with different level of disease resistance. The investigation was set in two planting date (optimal and delayed) on experimental fields of the Agricultural Institute Osijek. Following more important diseases were established: Downy mildew, Pod and stem blight and Stem canker. Significant differences in disease incidence were caused by genetic diversity of tested materials as well as different climatic conditions among growing seasons. According to planting date, significantly higher incidence of Downy mildew and Pod and stem blight was in optimal planting date.

Keywords: soybean; fungal diseases; occurrence; intensity; cultivar; planting date

INTRODUCTION

In wide range of agroecological conditions, soybean (*Glycine max* (L.) Merrill) is atacked by numerous pathogens. According to HARTMAN *et al*. (1999), more than 100 pathogens are known to affect soybean but only 35 of them are important economically. In large-scale production in Croatia several diseases regularly occur, but serious losses are not recorded yet. The most important fungal pathogens of soybean in Croatia are *Peronospora manshurica* (NAOUM.) Syd. ex GAUM. – cause Downy mildew (Pm), *Diaporthe phaseolorum* var. *sojae* (*Phomopsis sojae*) – cause Pod and stem blight (Dps), *Diaporthe phaseolorum* (CKE. & ELL.) Sacc. var. *caulivora* (Athow & Caldwell) – cause Stem canker (Dpc) and *Sclerotinia sclerotiorum* (LIB.) De BARY – cause Sclerotinia stem rot (Ss). Occurrence and intensity of disease vary depending on climatic conditions during the growing period, the aggressiveness of pathogens and the susceptibility of cultivars (JURKOVIC & VRATARIC 1986; VRATARIĆ *et al*. 2002).

The main objective of this study was to determinate the occurrence and intensity of attack by the more important fungal diseases in soybean in our area.

MATERIAL AND METHODS

The study was conducted over four years (1998–2001) on experimental field of Agricultural Institute Osijek using 10 domestic soybean cultivars maturity group 0-II with different level of disease resistance. The experiment was set in two planting date (optimal and delayed) as Randomised Complete Block Design with 4 replicates. Basic plot size was 10 m^2. Plots were machine sown in last decade of April (optimal planting date-I) and two weeks later (delayed planting date-II). Conventional agronomic practices for soybean were carried out. Occurrence and intensity of diseases was evaluated twice: at R_2 and R_6–R_7 stages (FEHR & CAVINESS 1977). The first evaluation was done for Downy mildew. Second evaluation was done for late-occurring soybean diseases such as Pod and stem blight, Stem canker and Sclerotinia stem rot. Diseases severity was evaluated by scale 0–9. Plots were machine harvested and grain yield was weighted and converted to t/ha with 13% moisture. Data were statistically processed using SAS System 8.2. Climatic conditions for investigated years were shown in Table 1.

Table 1. Meteorological data for investigated period (1998–2001) and 30-years average (1961–1990), Osijek, Croatia

Month	1998	1999	2000	2001	1961–1990
Precipitation (mm)					
I	90.7	35.7	17.5	72.9	46.9
II	0.7	59.9	14.8	21.5	40.2
III	21.2	28.7	41.0	82.5	44.8
IV	53.2	44.9	27.4	71.5	53.8
V	48.6	88.8	26.1	59.5	58.5
VI	26.1	149.6	9.6	238.9	88.0
VII	83.7	95.3	62.3	77.1	64.8
VIII	99.4	73.5	5.3	7.1	58.5
IX	64.4	50.8	15.0	195.2	44.8
X	96.5	22.1	10.2	5.1	41.3
XI	68.7	122.2	42.4	74.0	57.3
XII	29.7	96.5	36.6	33.9	51.6
Total	682.9	868.0	308.2	939.2	650.5
Air temperature (°C)					
I	2.7	0.4	–1.7	2.7	–1.2
II	5.0	1.1	4.2	4.2	1.6
III	4.8	8.2	7.0	9.9	6.1
IV	12.6	12.6	14.9	10.8	11.3
V	16.2	17.3	18.4	18.4	16.5
VI	21.4	20.3	22.5	18.1	19.4
VII	22.2	21.9	21.7	21.8	21.1
VIII	21.8	21.3	23.7	22.7	20.3
IX	15.9	18.8	16.1	14.9	16.6
X	12.3	11.7	14.1	13.9	11.2
XI	3.9	4.0	10.0	3.5	5.4
XII	–3.3	0.7	3.0	–3.8	0.9

Table 2. The range of mean values of investigated fungal diseases (0–9) and grain yield (t/ha) for tested soybean cultivars in two planting date (1998–2001, Osijek, Croatia)

	Cultivars		Years		Planting date	
	Range	$LSD_{0.05}$	Range	$LSD_{0.05}$	Range	$LSD_{0.05}$
Downy mildew	1.03–2.50	0.24	1.24–2.72	0.15	1.68–2.40	0.11
Stem canker	1.30–2.82	0.47	1.54–2.80	0.30	2.30–2.38	n.s.
Pod and stem blight	1.70–2.91	0.29	1.56–3.64	0.19	2.06–2.62	0.13
Sclerotinia stem rot	0.00–0.50	n.s.	0.00–0.10	n.s.	0.00–0.20	n.s.
Grain yield	3.39–4.19	0.23	2.99–4.21	0.15	3.61–3.87	0.10

RESULTS AND DISCUSSION

Results are generally overviewed in Table 2.

During the investigation following more important fungal diseases were established: Downy mildew, Pod and stem blight and Stem canker. Sclerotinia stem rot was recorded only sporadically according to good crop rotation, inoculum absence as well as unfavourable climatic conditions for disease development. The obtained results indicated statistical significant differences among tested cultivars in tolerance on Pm, Dps, and Dpc, implaying genetic diversity of tested materials. Variability in intensity of attack by detected diseases, except Ss, among investigated years was statistical significant as well as interaction cultivar × year. The differences in intensity of disease infection according to planting date were statistical significant only for Downy mildew and Pod and stem blight.

Variability of expression grain yield significantly was caused by genotypic variability (cultivar) and environmental variability (year and planting date).

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