IMPACT OF PLANT MORPHOLOGY FOR KINETICS OF RED EAR ROT OF MAIZE CAUSED BY *FUSARIUM GRAMINEARUM* DEVELOPMENT AND DEOXYNIVALENOL FORMATION

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Red and pink ear rots caused by *Fusarium* spp. are important factors affecting the yield and its quality, mainly because of its contamination with mycotoxins produced by the fungi.

In Poland, it is commonly caused by *F. graminearum* producing deoxynivalenol (DON) and zearalenone and by *F. verticillioides* which produces fumonisins.

It was observed, that during the last years contamination of grain by these toxins increase also in Poland.

Using genetic resistance is one of the best methods for disease management. The resistance of maize to ear rots is very complex and depends on several components such as, resistance to initial infection by fungal degradation of silk tissues, resistance to fungal spreading being influenced by some traits as wax layer in grain or morphology and chemical compounds of the pericarp. The accumulation of mycotoxins can also be affected by the plant genotype.

OBJECTIVE

The main goal of this study was to determine which plant traits play important role for kinetics of red ear rot development and deoxyniwalenol formation in grain and rachis

MATERIALS AND METHODS

Plant material: seven inbreed lines (K4, K5, K6, K7, S2, S5 and S8)

Fusarium graminearum (GER) ear rot severity tests

Field experiments were conducted in three replications - Central Poland (Radzikow), in For each line eight plants were inoculated with *F. graminearum* and 8 plants were used as a control in each replication. Because of different ears morphology - kernel inoculation method was used (tooth-picks: 7 - 9 days after silking). Disease development was visually assessed every 10 days from the plants milk stage till harvesting time using 1 - 7 scale.

Mycotoxin content

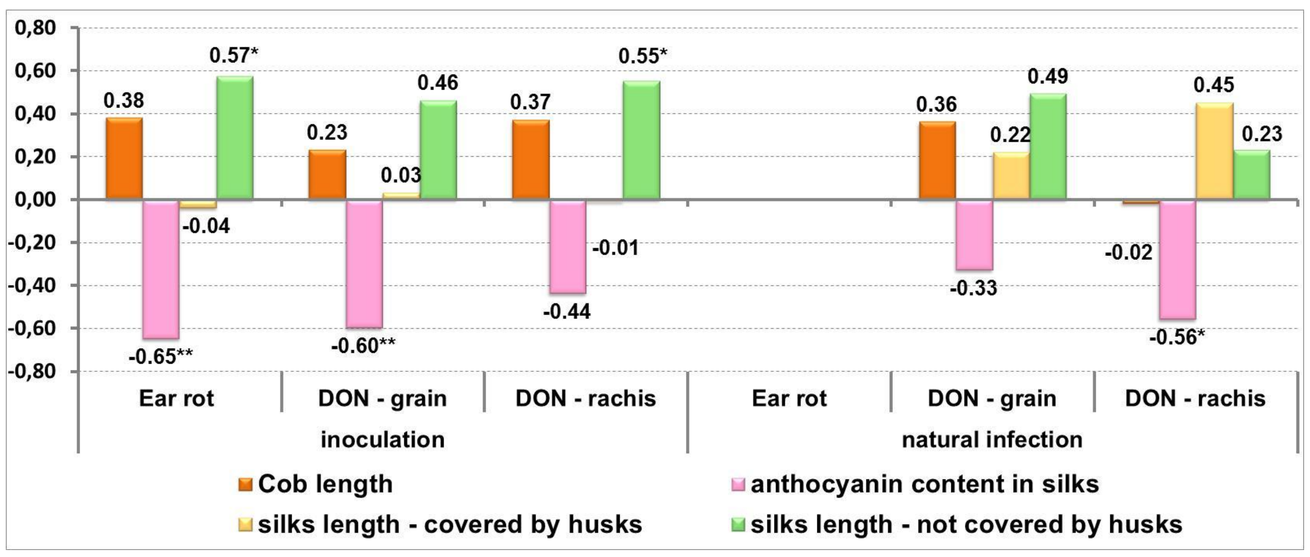
DON content was evaluated separately in grain and rachis samples with RIDA®QUICK SCAN using immunochromatographic tests.

Ears morphology

Cob and silks length (separately, covered and not covered by husks) were measured (cm).

Additionally, for each inbreed line *anthocyanin* content in silks was described.

Relationships between disease severity, DON contamination, anthocyanin content and ear morphology were calculated using Pearson correlations.



Inbreed line	Cob length (cm)	Silks length (cm)		Anthocyanin content in silks
		covered by husks	not covered by husks	
K4	19.9	5,0	14.1	2,0
K5	14.3	5.9	7.1	1.2
K6	15,0	10.2	6.9	2,0
K7	17.5	4.7	8.4	2.6
S2	15.6	3,0	5.9	4,0
S5	22.1	0.4	15.7	2.6
S8	15,0	4.8	5.6	5,0
mean	17.1	4.8	9.1	2.8
LSD (Fisher)	0.94667	0.89887	1.09385	0.46088

CONCLUSIONS

There were significant differences in the level of ear rot resistance and the DON contamination in grain and rachis sampled in different time.

After inoculation severity of the disease was on average about 3 degrees higher than under natural infection and it increased over time.

It was possible to observe that the first symptoms of the disease occurred 20 days after flowering time. In rachis DON contamination was significantly higher than in grain samples even under natural infection.

On average, after inoculation the differences in grain sample contamination with DON ranged from 6.7 mg/kg (milk stage) to 56.4 mg/kg (maturity time). As the same, the differences in rachis sample contamination with DON ranged from 79.7 to 325.6 mg/kg.

Under natural infection DON contamination in grain samples ranged from 0.0 to 0.4 mg/kg and in rachis samples from 0.0 to 35.7 mg/kg.

Disease severity and DON contamination, both in grain and rachis samples, negatively correlated with *anthocyanin* content in silks and positively correlated with the length of silks which were not covered by husks. DON content in samples collected from the most resistant inbreed line was low under natural infection and also after inoculation.

Infection type	Scoring and sampling time (Days numer from flowering time)	K4 (Lancaster)			K5 (SSS)			K6 (Flint)			K7 (IDT)			S2 (Dent)			S5 (Dent)			S8 (Flint)		
		Ear rot	DON (mg/kg)		Ear rot	DON (mg/kg)		Ear rot	DON (mg/kg)		Ear rot	DON (mg/kg)		Ear rot	DON (mg/kg)		Ear rot	DON (mg/kg)		Ear rot	DON (mg/kg)	
			grain	rachis		grain	rachis		grain	rachis		grain	rachis		grain	rachis		grain	rachis		grain	rachis
Natural infection	40	0.8	0	0	0.8	0	0	0.9	0	0	1.1	0	0	0.9	0	0	1.2	0	0	1.1	0	0
	50	0.8	0	0	0.8	0	0	0.8	0	0	0.8	0	0	0.8	0	0	0.8	0	0	0.8	0	0
	60	0.8	0	17.2	0.8	0	0	0.8	0	0	0.8	0	23.9	0.8	0	23.4	0.9	0	0	0.8	0	10.2
	70	0.8	2.1	113.3	0.8	0	71.5	0.8	0.5	53.9	0.8	0	4.8	0.8	0	14.4	0.8	0	6.4	0.8	0	21.1
mean		0.8	0.5	32.6	0.8	0	17.9	0.8	0.1	13.5	0.9	0	7.2	0.8	0	9.4	0.9	0	1.6	0.9	0	7.8
Inoculation *F. graminearum*	40	4.2	23.2	304.8	4.6	24.5	142.4	2.1	1.9	8.8	2.2	1.3	33.6	1.9	0	3.4	3.3	13.1	112	2.7	0.7	15.5
	50	5.2	87.0	377.6	5.2	42.0	156.7	2.8	4.3	22.6	3.6	14	93.5	1.9	0	4.1	4.4	35.1	236.9	3.1	4.2	97.5
	60	5.4	91.2	374.4	5.3	79.1	392.0	3.5	3.4	6.7	4.3	10.4	214.5	2.0	0	27.2	4.5	25.7	182.4	3.3	3.1	30.0
	70	5.5	252.5	1522.8	5.4	185.0	569.6	3.3	6.3	12.6	4.3	20.5	80	2.1	0	49.8	4.5	46.4	208	3.6	12.8	80.6
mean		5.1	113.5	644.9	5.1	82.6	315.2	2.9	4.0	12.7	3.6	11.5	105.4	2.0	0	21.1	4.2	30.1	184.8	3.2	5.2	55.9