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THE EFFECT OF THE BIOPRODUCTS ON THE INCIDENCE OF SEPTORIA LEAF BLOTCH IN WINTER WHEAT CROPS

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Diseases in organically grown winter wheat crops are becoming an increasingly pressing problem. A very limited choice of biological plant protection products is one of the reasons restricting effective control of harmful organisms in organic farms. Septoria leaf blotch (*Mycosphaerella graminicola* (Fuckel) J. Schröt. (anamorpha *Zymoseptoria tritici* (Desm.) is difficult to control winter wheat disease. The relevance of the problem prompts a search for alternative means intended for this disease control.
For this reason, investigations were carried out at the organic farm of the Experimental Station in Kazliškiai village in 2018-2019. The aim was to investigate the effects of the bioproducts Biokal 1 and Fitokondi on occurrence of Septoria leaf blotch during the growing seasons.
The experiment included the following treatments: 1) control (not sprayed), 2) Biokal 1 sprayed at a rate of 10 l ha^{-1}, 3) Fitokondi sprayed at a rate of 6 l ha^{-1}. Winter wheat was sprayed at tillering (BBCH 20), booting (BBCH 35-38) and heading (BBCH 55-58). Disease incidence and severity were estimated on three upper fully expanded leaves.
During winter wheat tillering stage (BBCH 25-30) Fitokondi and Biokal 1 have reduced the intensity of the disease very slightly (2018-0.1% and 2019-0,7%), compared to control – non-essential. During BBCH 40-45 in 2018 wheat sprayed with Biokal 1 disease intensity increased by 0.3%. Only Fitokondi has a 0.7% reduction in intensity, but it did not differ significantly from the control. In 2019 Fitokondi has a 1.4% reduction in intensity, compared to control – non-essential. During BBCH 60-65 stage in 2018 wheat sprayed with Biokal 1 and Fitokondi disease intensity slightly increased compared to control, 0.8% and 0.5%, accordingly. In 2019 only Fitokondi had a 0.6% reduction in intensity, compared to control – non-essential.
In the field conditions the tested bioproducts did not have significant effect on the incidence of Septoria leaf blotch during the growing seasons.

Keywords: bioproducts, fungi, organic farming, wheat

Diseases in organically grown winter wheat crops are becoming an increasingly pressing problem. Various foliar diseases occur in winter wheat crops annually; however, their severity differs between years. Septoria leaf blotch (*Mycosphaerella graminicola* (Fuckel) J. Schröt. (anamorpha *Zymoseptoria tritici* (Desm.) caused by necrotrophic pathogens, are important, difficult to control winter wheat diseases, inflicting severe damage to crops (Bhathal et al., 2002).

Septoria leaf blotch (*Mycosphaerella graminicola* (Fuckel) J. Schröt. (anamorpha *Zymoseptoria tritici* (Desm.)

The soil of the experimental site is *Eutric Planosol – PLe-gln – w*, with a pH close to neutral (6.6 -6.9), moderate in humus (2.3%), phosphorus (145.5 $P_2 0_5$ mg kg^{-1}) and potassium (126.3 $K_2 0$ mg kg^{-1}), total N - 0,2%.

- **The field experiments involved four replications on winter wheat cultivar 'Širvinta 1'. The total area of the experimental plot was 21 m^2 and that of the harvested plot 11.0 m^2. The plots were laid out in a randomised order. The pre-crop of winter wheat in 2014 - 2015 was oat-pea mixture for seed.**
- **The experiment included the following treatments: 1) control (not sprayed with the bioproducts), 2) Biokal 1 treated seeds and sprayed at a rate of 10 l ha^{-1}, 3) Fitokondi treated seeds and sprayed at a rate of 6 l ha^{-1}.**
- **Winter wheat was sprayed at tillering (BBCH 20), booting (BBCH 35-38) and heading (BBCH 55-58) stages according Meier, 2001. A knapsack sprayer "Garden 15" (Germany) was used for the spray application. Assessments of disease severity and incidence were carried out before the spray application of the bioproducts and 2 – 3 weeks after application. A total of 25 randomly selected plants per each plot were assessed. Disease incidence and severity were estimated on three upper fully expanded leaves, later assessments were done on the remaining vegetating upper leaves according to the disease-affected leaf area in percentage, following the methodology approved by the EPPO standards (PP1/26(4)), 2012).**
- **The biological efficacy of the tested products was calculated according to Abbot's formula (Korol A. L., Preigerzon V. A., 1990): X = a-b/a x 100; where - X– biological efficacy of the tested product %; a – disease incidence or severity in the control %; b – disease incidence or severity in the treatment where the test products had been used %.**
- ***Analysis of yield.* For the determination of winter wheat biometric indicators, plant samples were uprooted before harvesting at complete maturity stage (BBCH 89) from individual treatments' three replications from four different spots 0.25 m^2 in size and were analysed.**
- **The research results were analysed by the ANOVA technique, the least significant difference (P≤ 0.05.) was estimated (Raudonius, 2017).**

In the years of research during the winter wheat tillering stage (BBCH 25-30) began to spread Septoria leaf blotch. The prevalence of Septoria leaf blotch in control fields was low at 2.2%, intensity at 1.3%. The first symptoms of the disease are markedly influenced by the weather conditions – air temperature, moisture and light (Ponomarenko, 2011). Bioproducts Fitokondi and Biokal 1 have reduced the intensity of the disease very slightly – 0.1%, compared to control – non-essential.

During the wheat booting stage (BBCH 40-45), the intensity of the Septoria leaf blotch was 6.6%. Biokal 1 Septoria leaf blotch intensity did not decrease, compared to control, bioproducts in sprayed fields, it increased by 0.3%, respectively. Only Fitokondi wheat has a 0.4% reduction in intensity, but it did not differ significantly from the control.

During cereal flowering stage (BBCH 60-65), the intensity of Septoria leaf blotch on the two upper wheat leaves reached 13.3%. Bioproducts studied had no effect on limiting the development Septoria leaf blotch. In Biokal 1 and Fitokondi-sprayed wheat, the intensity of disease was slightly increased compared to control, 0.8 and 0.5%, respectively.

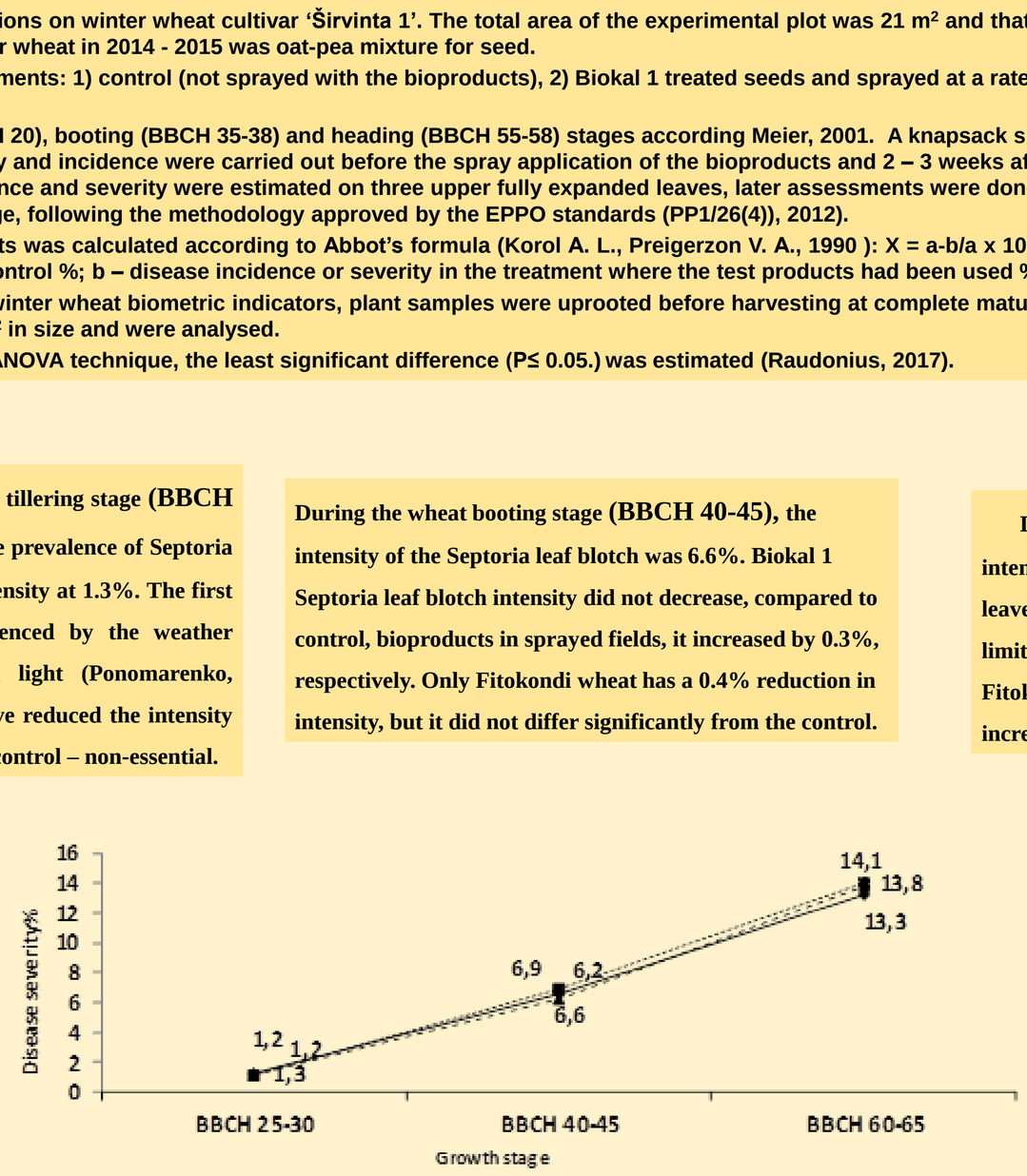

Fig. 1. Septoria leaf blotch severity in unsprayed (-), sprayed with Biokal 1 (⋯) and with Fitokondi (---) winter wheat treatments

Table 4. **The effect of biological products on winter wheat grain yield and chemical composition, 2014-2015**

Bioproducts	Yield t ha^{-1}	Protein %	Wet gluten%	Dry gluten%	Sedimen-tation ml	Falling numbers
Unsprayed	3.5	10.0	19.0	6.0	28.4	231.8
Biokal 1 10 l ha^{-1}	4.33	10.7	20.3	6.6	30.9	227.8
Fitokondi 6 l ha^{-1}	4.20	10.5	19.9	6.4	29.8	226.0

Note: no differences, P ≤ 0.05.

Under the effect of the bioproducts, the grain yield increased by on average 0.7-0.8 t ha^{-1} or 18.6-22.3%. Biokal 1 gave a greater grain yield increase than Fitokondi; however, the difference was not significant. The tested bioproducts contain different amounts of aqueous extract of biohumus. As a result, due to a greater nutrient content, Biokal 1 tended to increase grain yield more than Fitokondi. Previous research has proved the efficacy of Biokal 1 for organically grown agricultural crops

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