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THE INFLUENCE OF THE CROP FARMING SYSTEM ON THE HEALTH OF SPRING TRITICALE IN THE MOUNTAIN CONDITIONS OF THE BESKID NISKI

Summary

The aim of the study was to compare the occurrence intensity of fungal diseases on leaves, ears and the stem base of spring triticale in pure and mixed sowing grown using the conventional and organic method in mountain conditions of the Beskid Niski. The research was carried out in the years 2013-2014 at the Mountain Experimental Station) located in Czyrna Niżna, located in the western part of the Beskid Niski. The research carried out showed differences in the intensity of occurrence of fungal diseases of spring triticale. Spring triticale cultivated using the organic method, in all zones of the slope, was characterised by a significant increase in the occurrence intensity of leaf and ear blight, rynchosporium disease (R. secalis) and fusarium ears blight (Fusarium spp.*). At the same time, in this management system there was a decrease in the intensity of sharp eyespot (R. cerealis) - base disease. In the existing natural conditions, the cultivation of spring triticale in a two-species mixture with oat in the lower and middle slopes with a slope of 10 and 12.6% significantly reduced the severity of ear diseases: fusarium ear blight (Fusarium* spp.*) and ear blight (S. nodorum.)*
***Key words**: spring triticale, conventional system, organic system, fungal diseases*

WPŁYW SYSTEMU GOSPODAROWANIA NA ZDROWOTNOŚĆ PSZENŻYTA JAREGO W WARUNKACH GÓRSKICH BESKIDU NISKIEGO

Streszczenie

Celem pracy było porównanie nasilenia występowania chorób grzybowych na liściach, kłosach i podstawie źdźbła pszenżyta jarego w siewie czystym i mieszanym uprawianym metodą konwencjonalną i ekologiczną w warunkach górskich Beskidu Niskiego. Badania prowadzono w latach 2013-2014 w Górskiej Stacji Doświadczalnej znajdującej się w miejscowości Czyrna Niżna, położonej w zachodniej części Beskidu Niskiego. Przeprowadzone badania wykazały zróżnicowanie nasilenia występowania chorób grzybowych pszenżyta jarego. Pszenżyto jare uprawiane metodą ekologiczną, we wszystkich strefach stoku, odznaczało się istotnym wzrostem nasilenia występowania septoriozy liści i kłosów, rynchosporiozy (R. secalis) oraz fuzariozy kłosów (Fusarium spp.*). Jednocześnie w tym systemie gospodarowania odnotowano spadek nasilenia występowania ostrej plamistości oczkowej (R. cerealis) – choroby podsuszkowej. W zaistniałych warunkach przyrodniczych, uprawa pszenżyta jarego w mieszance dwugatunkowej z owsem w dolnej i środkowej strefie stoku o nachyleniu 10.0 i 12.6% istotnie ograniczyła nasilenie chorób kłosa: fuzariozy kłosa (Fusarium* spp.*), septoriozy kłosa (S. nodorum)*
Słowa kluczowe: *pszenżyto jare, system konwencjonalny, system ekologiczny, choroby grzybowe*

1. Introduction

For years, triticale was considered as one of the more resistant cereals to fungal diseases. However, in recent years, there has been an increase in the infestation of leaves, ears and the stem base of this cereal by pathogenic fungi [1]. Common diseases of triticale include: blotches of leaves and ears (*Septoria nodorum*), fusariosis of ears blight (*Fusarium* spp.), sharp eyespot (*Rhizoctonia cerealis*), eyespot (*Pseudocercosporella herpotrichoides*) and fusarium root rot (*Fusarium* spp.) [1, 2, 5]. According to Brzozowska and Kurowski [1], the increase in the occurrence of fungal diseases depends, among others, on the weather during the growing season, selection of the forecrop, fertilisation and also the method of regulating pests in the field of the crop.

In organic farming, it is not allowed to use chemical fungicidal means (fungicides), which increases the risk of disease development and, as a consequence, it leads to a deterioration of the grain quality. Therefore, proper agrotechnics as prophylaxis, especially in this production system, plays an important role in plant protection and is the basis for obtaining grain of an appropriate quality [3, 6, 7].

The use of mixtures is one of the agrotechnical methods that limits the development of diseases in cereal fields. The introduction of species biodiversity in the form of mixed sowing does not disturb biological balance [11]. Mixed crops are mixtures of cereals of various species, cereal-legumes and varieties of one species. Plants cultivated in mixtures have better habitat conditions, better adapt to changing condition and thus yield better than with pure sowing. In various studies, it was found that double-species and three-species cereal mixtures are more competitive with regard to weeds, are less susceptible to pathogens and pests, and unfavourable habitat conditions than species grown in pure sowing [3, 4, 7].

The effectiveness of interspecific mixtures and their usefulness in limiting the infection of spring cereals by pathogenic fungi was also tested by Tratwal and Nadziak [10] as well as Tobiasz-Salach et al. [9]. According to Kurowski et al. [6], the health condition of spring triticale improves sowing mixed with oat and spring barley. However, research in the subject matter conducted in mountain conditions is missing.

The aim of the study was to compare the intensity of fungal diseases on leaves, ears and the stem base of spring triticale in pure and mixed sowing grown using the conventional and organic method in mountain conditions of the Beskid Niski.

2. Materials and methods

Field research was carried out in the years 2013-2014 at the Mountain Experimental Station located in Czyrna Niżna, near Krynica, located in the western part of the Beskid Niski. The experiments were carried out on the soil of the 12th oat-potato mountain complex. This were two-factor experiments, founded by a randomised block method in triplicates. The first factor of experiment was related to the farming system (conventional, organic), and the second- to the method of sowing (pure sowing - spring triticale, double-species mixed sowing - spring triticale + oats, and spring triticale + spring barley, three - species mixed sowing - spring triticale + oats + spring barley). The tests were carried out on a slope with an inclination of: 10.0% (lower zone of the slope), 12.6% (middle zone of the slope) and 16.6% (upper zone of the slope).

Potato was the forecrop for spring triticale and cereal mixtures, in both farming systems (conventional, organic). Tillage was typical and consistent with the agrotechnical requirements of these cereals. In the experiment with conventional cultivation, the following mineral fertilisation was applied for cereals: K_2O 92 kg·ha^{-1}, P_2O_5 104 kg·ha^{-1} and N 90 kg·ha^{-1} (30 kg before sowing and 60 kg·ha^{-1} before heading). Prior to sowing, the cereal grain was treated with Vitavax 200 FS (active substance - carboxin, thiuram) at a dose of 300 ml per 100 kg of grains. During the vegetation period, the triticale was protected against weeds using the Chwastox Turbo herbicide (active substance – MCPA and dikamba) at a dose of 2 l·ha^{-1}. In turn, the organic farming system included sowing primed seed. In this system, there were used neither synthetic fertilisation nor treatments to protect spring triticale against pests.

Grain sowing in both cultivation systems was carried out in the second decade of April with an interval between rows of 11 cm. The doses of the spring triticale (Milewo cultivars) in pure sowing were 200 kg·ha^{-1} (568 pcs·m^2). In double-species mixtures, 100 kg·ha^{-1} (284 units·m^{-2}) of spring triticale and 110 kg·ha^{-1} (325 pcs m^{-2}) of unscoured oat (Borowiak variety) and 100 kg·ha^{-1} (284 pcs·m^{-2}) of spring triticale and 85 kg·ha^{-1} (205 pcs·m^{-2}) of spring barley (Boss variety) were sown. The three-species mixture consisted of: 61 kg·ha^{-1} (173 pcs·m^{-2}) of spring triticale grains, 67 kg·ha^{-1} (198 units·m^{-2}) of oats and 52 kg·ha^{-1} (125 pcs·m^{-2}) of spring triticale.

In the initial milk maturity stage of the spring triticale (BBCH 73), the health condition of the leaves, ear and stem base was evaluated on 25 randomly harvested plants from each plot. The assessment of the severity of diseases on the leaves and ears was done with a 9-point scale, where grade 1 means total immunity, and grade 9 – full susceptibility. However, the stem base was evaluated on a 6-point scale, where 0 means healthy stalks (without symptoms), while 5 – the base of the stalk completely controlled by the disease [8].

The results of the study were presented in the form of an infection index by Towsend-Heuberger [12], which was analysed by variance.

$$I_p = \frac{\sum(a \cdot b) \cdot 100}{N \cdot n}$$

I_p – Infection index,
a – number of plants tested,
b – degree of scale,
N – total number of studied plants,
n – the highest degree of scale.

The significance of the differences between the mean values was compared with Tukey's test at $\alpha = 0.05$.

3. Results and discussion

The weather conditions during the study period varied (Table 1). The growing season of 2013 was marked by a shortage of moisture and higher average air temperature compared to 2014 and to multi-years (1961-1990). This moisture deficiency has accompanied the plants throughout the entire growing season except in May and June. In contrast, in 2014, the sum of atmospheric precipitation from April to August was close to multi-years. However, a moisture deficiency was recorded in April and June. Although, in both years, the distribution of atmospheric precipitation was uneven, in general, it can be concluded that the growing season of 2013 was drier and warmer, and 2014 was more humid and slightly cooler. Weather conditions in the Beskid Niski region in 2013-2014 significantly differentiated the occurrence intensity of fungal diseases on spring wheat (Table 2). In own research, in 2014, a significant increase in the occurrence intensity of leaf and ear blight (*S. nodorum*) and sharp eyespot – black scurf (*Rhizoctonia cerealis*) was found. On the other hand, the weather conditions in 2013 significantly reduced the development of *R. cerealis* (sharp eyespot - take-all disease).

Table 1. Weather conditions in the research period at the Czyrna Niżna weather station, against the long-term values
Tab. 1. Warunki pogodowe w okresie prowadzonych badań w Stacji Czyrna Niżna na tle wielolecia

Years	Months					Total
	IV	V	VI	VII	VIII	
	Precipitation (mm)					
2013	24.70	118.0	202.40	33.10	32.90	411.10
2014	51.10	137.80	58.30	134.40	113.60	495.20
1961–1990 (multi-years)	62.00	99.60	118.60	111.20	91.00	482.40
	Mean temperatures (°C)					Average
2013	7.20	13.10	15.50	18.10	17.70	14.32
2014	8.50	12.60	14.40	18.70	16.20	14.08
1961 – 1990 (multi-years)	6.20	11.50	14.20	16.00	14.80	12.54

Source: own work / Źródło: opracowanie własne

Table 2. Mean infection index (ip %) for spring triticale by fungal disease in the years 2013-2014
Tab. 2. Średni indeks porażenia (ip %) pszenżyta jarego przez choroby grzybowe w latach 2013-2014

Diseases name	Years		$LSD_{0.05}$
	2013	2014	
Leaf septoriosis (*Septoria nodorum)*	38.33	47.48	3.07
Leaf rhynchosporiosis *(Rhynchosporium secalis)*	35.00	38.42	n. s.
Septoria ear blight (*Septoria nodorum)*	21.14	26.38	2.63
Fusarium ear blight (*Fusarium* spp.*)*	15.62	19.42	n. s.
Sharp eyespot *(Rhizoctonia cerealis*)	14.45	20.46	4.12

Source: own work / Źródło: opracowanie własne

In mountainous conditions of the Beskid Niski, on the leaves of spring triticale, an increased intensity of leaf septoriosis (*S. nodorum*) was noted (Table 3). According to many authors [1, 5, 13], blotches attack this type of grain every year with a varying intensity. In their opinion, the occurrence of *S. nodorum* on the leaves is favoured by high humidity, which is confirmed by the results of own research. In our research, it was found that the management system significantly differentiated the index of leaf infestation by *S. nodorum* in the middle (with an inclination of 12.6%) and the upper zone of the slope (with an inclination of 16.6%). The obtained results indicate that the higher slope inclination contributes to a significant increase in the blotches of triticale leaves cultivated using the organic method. Such relationships were not observed in the lower zone of the slope, with an inclination of 10.0%. In turn, the sowing method significantly differentiated the severity of this disease only in the lower zone of the slope. The cultivation of spring triticale with a slope inclination of 10.0% in a two-species mixture with oats significantly limited the development of leaf septoriosis (*S. nodorum*). Similar effects were obtained by Michalski et al. [7], or Kurowski et al. [6]. In the other zones of the slope (middle and upper), the sowing method did not significantly differentiate the severity of this disease. The index of leaf infestation by *S. nodorum* in these slope zones in both pure and mixed sowing was at a comparable level. There was also a significant interaction between the farming systems and the sowing method. This interaction indicates that the leaves of triticale cultivated with oats (in a two-species mixture) by the conventional method in all slope zones are characterised by a significantly lower infestation index by *S. nodorum*.

In the own studies on the leaves of spring triticale, the presence of rynchosporium disease (*Rhynchosporium secalis*) was also found. The *R. secalis* leaf infestation index in all analysed slope zones depended significantly on the farming system (Table 4). Spring triticale cultivated using the organic method was characterized by a significantly higher leaf infestation index than spring triticale cultivated using the conventional method. Different results regarding this disease, but in spring barley, were obtained by Korbas et al. [3] and Kurowski et al. [6]. In the own research, a good effect of the protection of triticale against rynchosporium disease (*R. secalis*) was provided by mixed sowing, which significantly limited the development of *R. secalis* only in the upper zone of the slope with inclination of 16.6%. It was found that the best protective effect in this zone of the slope is ensured by the cultivation of spring triticale with oat (a two-species mixture) or oat in combination with spring barley (a three-species mixture).

Table 3. Infection index (ip %) of spring triticale leaves by *S. nodorum* (leaf septoriosis) in the conventional and organic farming systems
Tab. 3. Indeks porażenia (ip %) liści pszenżyta jarego przez S. nodorum (septorioza liści) w systemie konwencjonalnym i ekologicznym

Hillside zones	Mode of sowing	Farming system		Mean	$LSD_{0.05}$
		conventional	organic		
Lower	Spring triticale	69.63	42.60	56.12	19.67
	Spring triticale + oat	16.47	37.05	26.76	
	Spring triticale + spring barley	50.70	43.33	47.02	
	Spring triticale + oat + spring barley	28.87	55.93	42.40	
Mean		41.42	44.73	-	
$LSD_{0.05}$		n.s.		-	
$LSD_{0.05}$: farming system x mode of sowing = 20.88				-	
Middle	Spring triticale	47.00	43.33	45.17	n.s.
	Spring triticale + oat	23.12	78.13	50.62	
	Spring triticale + spring barley	44.10	44.07	44.09	
	Spring triticale + oat + spring barley	39.42	51.47	45.33	
Mean		38.41	54.25	-	
$LSD_{0.05}$		11.01		-	
$LSD_{0.05}$: farming system x mode of sowing = 22.03				-	
Upper	Spring triticale	58.47	41.50	49.98	n.s.
	Spring triticale + oat	18.70	52.97	35.83	
	Spring triticale + spring barley	33.68	43.33	38.51	
	Spring triticale + oat + spring barley	27.38	38.50	32.94	
Mean		34.56	44.08	-	
$LSD_{0.05}$		9.21		-	
$LSD_{0.05}$: farming system x mode of sowing = 18.42				-	

n.s. – not significant difference *Source: own work / Źródło: opracowanie własne*

Table. 4. Infection index (ip %) of spring triticale leaves by *R. secalis* (leaf rhynchosporiosis) in the conventional and organic farming systems

Tab. 4. Indeks porażenia (ip %) liści pszenżyta jarego przez R. secalis (rynchosporioza liści) w systemie konwencjonalnym i ekologicznym

Hillside zones	Mode of sowing	Farming system		Mean	$LSD_{0.05}$
		conventional	organic		
Lower	Spring triticale	55.53	36.35	45.94	n. s.
	Spring triticale + oat	9.05	44.82	26.93	
	Spring triticale + spring barley	41.47	38.87	40.17	
	Spring triticale + oat + spring barley	22.22	52.60	37.41	
Mean		32.07	43.16	-	
$LSD_{0.05}$		9.98		-	
$LSD_{0.05}$: farming system x mode of sowing = 20.01					
Midlle	Spring triticale	58.50	28.50	43.50	n. s.
	Spring triticale + oat	14.98	75.93	45.46	
	Spring triticale + spring barley	30.92	41.10	36.01	
	Spring triticale + oat + spring barley	24.42	50.37	37.39	
Mean		32.20	48.98	-	
$LSD_{0.05}$		10.32		-	
$LSD_{0.05}$: farming system x mode of sowing = 20.63				-	
Upper	Spring triticale	55.17	31.47	43.32	16.93
	Spring triticale + oat	5.18	47.77	26.47	
	Spring triticale + spring barley	20.36	37.40	28.88	
	Spring triticale + oat + spring barley	16.47	30.73	23.60	
Mean		24.49	36.84	-	
$LSD_{0.05}$		8.98		-	
$LSD_{0.05}$: farming system x mode of sowing = 17. 99				-	

n.s. – not significant difference *Source: own work / Źródło: opracowanie własne*

Table 5. Infection index (ip %) of spring triticale ears by *S. nodorum* (ear blight septoriosis) in the conventional and organic farming systems

Tab. 5. Indeks porażenia (ip %) kłosów pszenżyta jarego przez S. nodorum (septorioza plew kłosów) w systemie konwencjonalnym i ekologicznym

Hillside zones	Mode of sowing	Farming system		Mean	$LSD_{0.05}$
		conventional	organic		
Lower	Spring triticale	28.17	28.53	28.35	11.04
	Spring triticale + oat	6.65	32.97	19.81	
	Spring triticale + spring barley	35.00	26.67	30.83	
	Spring triticale + oat + spring barley	18.68	25.93	22.31	
Mean		22.13	28.53	-	
$LSD_{0.05}$		5.86		-	
$LSD_{0.05}$: farming system x mode of sowing = 11.72				-	
Midlle	Spring triticale	23.30	24.07	23.68	10.04
	Spring triticale + oat	8.68	30.37	19.53	
	Spring triticale + spring barley	41.47	27.03	34. 25	
	Spring triticale + oat + spring barley	22.60	27.80	25.20	
Mean		24.00	27.32	-	
$LSD_{0.05}$		n. s.		-	
$LSD_{0.05}$: farming system x mode of sowing = 10.67				-	
Upper	Spring triticale	20.63	25.57	23.10	n.s.
	Spring triticale + oat	13.13	27.40	20.27	
	Spring triticale + spring barley	19.42	21.87	20.64	
	Spring triticale + oat + spring barley	8.87	25.20	17.03	
Mean		15.51	25.01	-	
$LSD_{0.05}$		3.63		-	
$LSD_{0.05}$: farming system x mode of sowing = 7.26				-	

n.s. – not significant difference *Source: own work / Źródło: opracowanie własne*

Kurowski et al. [6] believe that mixed sowing limits the development of this disease in cereals. In own studies, the highest intensification of leaf rynchosporium disease (*R. secalis*) was observed in pure triticale sowing. There was also a significant interaction: farming systems x sowing method. This interaction indicates that the leaves of spring triticale cultivated with oat (in a two-species mixture) by the conventional method, and in all slope zones, they are characterised by a significantly lower infection index by *R. secalis.*

In own studies on the ears of triticale, the presence of ear blight (*S. nodorum*) and fusarium ear blight (*Fusarium* spp.) were noted.

In the conducted experiments, it was found that the farming system significantly modified the severity of ear blight of triticale (*S. nodorum*) in the lower and upper zone of the slope (Table 5). The ear infection by *S. nodorum* was higher in the organic system. The method of sowing also differentiated the intensity of the occurrence of the triticale ear blight (*S. nodorum*). Significant differences in the ear blight infestation by this pathogen were found in the lower and middle slopes with an inclination of 10% and 12.6%. In these slope zones, cultivation of triticale mixed with oats best protected the ears against *S. nodorum*. The results obtained confirm the research of other authors [6, 7]. The interaction that was found - farming systems x sowing method - indicates that ears of triticale grown using the conventional method in a two-species mixture with oats were characterised by a significantly lower infection index by *S. nodorum* than in the ecological system.

The obtained results showed a significant effect of the farming system on the ear infection index by *Fusarium* spp. In all slope zones (Table 6), a significant increase in the analysed disease was found on the ears of triticale grown using the organic method. Similar effects, but with other grain species, were obtained by Korbas et al. [3].

Table. 6. Infection index (ip %) of spring triticale ears by *Fusarium* spp. (fusarium ear blight) in the conventional and organic farming systems

Tab. 6. Indeks porażenia (ip %) kłosa pszenżyta jarego przez Fusarium spp. *(fuzarioza kłosa) w systemie konwencjonalnym i ekologicznym*

Hillside zones	Mode of sowing	Farming system		Mean	LSD $_{0.05}$
		conventional	organic		
Lower	Spring triticale	18.87	16.67	17.77	8.69
	Spring triticale + oat	8.88	17.80	13.34	
	Spring triticale + spring barley	21.10	31.10	26.10	
	Spring triticale + oat + spring barley	12.22	18.90	15.56	
Mean		15.27	21.12	-	
LSD $_{0.05}$		4.62		-	
LSD $_{0.05}$: farming system x mode of sowing = n.s.					
Midlle	Spring triticale	14.07	11.50	12.78	6.69
	Spring triticale + oat	7.02	21.10	14.06	
	Spring triticale + spring barley	24.40	34.83	29.62	
	Spring triticale + oat + spring barley	11.50	25.53	18.52	
Mean		14.25	23.24	-	
LSD $_{0.05}$		3.55		-	
LSD $_{0.05}$: farming system x mode of sowing = 7.10					
Upper	Spring triticale	7.77	15.53	11.65	n.s.
	Spring triticale + oat	11.10	21.50	16.30	
	Spring triticale + spring barley	16.47	22.97	16.48	
	Spring triticale + oat + spring barley	9.98	19.67	18.07	
Mean		11.33	19.92	-	
LSD $_{0.05}$		7.23		-	
LSD $_{0.05}$: farming system x mode of sowing = n.s.					

n.s. – not significant difference *Source: own work / Źródło: opracowanie własne*

Table 7. Infection index (ip %) of spring triticale culm base by *R. cerealis*. (sharp eyespot) in the conventional and organic farming systems

Tab. 7. Indeks porażenia (ip %) podstawy źdźbła pszenżyta a jarego przez R. cerealis (ostra plamistość oczkowa) w systemie konwencjonalnym i ekologicznym

Hillside zones	Mode of sowing	Farming system		Mean	LSD $_{0.05}$
		conventional	organic		
Lower	Spring triticale	34.00	17.33	25.67	n.s.
	Spring triticale + oat	1.33	20.67	11.00	
	Spring triticale + spring barley	25.33	20.00	22.67	
	Spring triticale + oat + spring barley	22.00	8.00	15.00	
Mean		20.67	16.50	-	
LSD $_{0.05}$		n.s.		-	
LSD $_{0.05}$: farming system x mode of sowing = 16.22					
Midlle	Spring triticale	15.33	22.00	18.67	8.86
	Spring triticale + oat	9.33	10.67	10.00	
	Spring triticale + spring barley	34.00	20.67	27.33	
	Spring triticale + oat + spring barley	17.67	15.33	16.50	
Mean		19.08	17.17	-	
LSD $_{0.05}$		n.s.		-	
LSD $_{0.05}$: farming system x mode of sowing = 9.41				-	
Upper	Spring triticale	11.83	13.00	12.42	n.s.
	Spring triticale + oat	7.00	20.00	13.50	
	Spring triticale + spring barley	29.00	17.33	23.17	
	Spring triticale + oat + spring barley	14.33	12.67	13.50	
Średnia		15.54	15.75	-	
NIR $_{0.05}$		n.s.		-	
LSD $_{0.05}$: farming system x mode of sowing = n.s.					

n.s. – not significant difference *Source: own work / Źródło: opracowanie własne*

In own research, a significant effect of the sowing method on the occurrence of fusarium ears blight (*Fusarium* spp.) was found. The lowest infection index of ears of spring triticale by *Fusarium* spp. occurred in a two-species mixture with oats. This reaction was recorded in the lower and middle zone of the slope.

In the mountain conditions of the Beskid Niski, on a stem blade of spring triticale, sharp eyespot, which is caused by *Rhizoctonia cerealis*, predominated. There was no significant dependence of the occurrence of this disease on the management system (Table 7). However, a tendency of lower infestation of the stem base of this cereal by *R. cerealis* originating from organic farming was observed. The convergent results were obtained by Korbas et al. [3]. In own research, the method of sowing significantly limited the development of sharp eyespot only in the midlle zone of the slope with an inclination of 12.6%. Also, in the case of this disease, the inhibitory effect of the two-species mixture with oats on the index of infection of the triticale stalk base by *R. cerealis* was revealed. The obtained results are consistent with reports by Kurowski et al. [6] who claim that the cultivation of triticale in a mixture, especially with oats, is an agrotechnical factor that improves the phytosanitary status of cereals.

4. Conclusions

The research carried out in the mountain conditions of the Beskid Niski showed a differentiation in the intensity of fungal diseases of spring triticale. Spring triticale cultivated using the organic method, in all zones of the slope, was characterised by a significant increase in the occurrence intensity of blotches of leaves and ears, rynchosporium disease (*R. secalis*) and fusariosis of ear blight (*Fusarium* spp.). At the same time, in this management system, there was noted a decrease in the severity of sharp eyespot (*R. cerealis*) – base disease.

Under the existing natural conditions, the cultivation of spring triticale in a two-species mixture with oat in the lower and middle slopes with inclination of 10 and 12.6%, significantly reduced the severity of ear diseases: fusarium ear blight (*Fusarium* spp.), ear blight (*S. nodorum*).

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