Efficiency of pesticides in spring barley sowing

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Trials have been conducted in Vokė Branch of the Lithuanian Institute of Agriculture over 1998–2000 on the soddy-podzolic sandy loam soil with the purpose to investigate the effect of the herbicide MCPA (1.5 l/ha) and its mixtures with fungicides (Tango and Archer, 0.8 l/ha) on the development of fungal diseases of spring barley 'Auksiniai 3'. The results showed that when spring barley crops were treated with MCPA 1.5 l/ha, MCPA 1.5 l/ha + fungicide (Tango or Archer, 0.8 l/ha) after sowing, the number of weeds decreased by 27.5–51.6% and their mass by 23.0–38.4%. MCPA 1.5 l/ha + tango 0.8 l/ha (DC 25–29) and Archer 0.8 l/ha (DC 47–51) were best to supress the pathogenes of net blotch (*Drechslera teres*) by 61.6%, and in those treatments grain yield increment was the highest as well (0.88 t/ha).

Key words: spring barley, pesticides, weeds, leaf diseases, grain yield

INTRODUCTION

The most important for breeding spring barley 'Auksiniai 3' (*Hordeum vulgare* L.*)* in Lithuania is the problem of diseases such as net blotch *(Drechslera teres*) and powdery mildew *(Erysiphe graminis*). To prevent losses of spring barley yield from fungal diseases, it is necessary to apply effective fungicides, which render an appreciable positive influence on the phytosanitary condition of crops. When the level of productivity is higher than 3.0 t/ha, the application of fungicides against a high level on the development of fungal diseases [1] is considered proved. Net blotch occures wherever spring barley is grown, and this disease is most severe in temperate regions of high rain fall and hymidity. One of the most important factors securing stable agricultural crop yields is disease control [1–3]. It has been established, that the spread of foliar diseases of spring barley is very much dependent on plant species, variety, crop manegement level and meteorological conditions [1–3]. The earlier the fungal diseases appear on the leaves of spring barley, the bigger losses of the yield occur. The basic purpose of our field trials was to establish the efficiency of pesticides against a complex of fungal diseases on the variety of spring barley 'Auksiniai 3' in the conditions of South-eastern Lithuania.

MATERIALS AND METHODS

In 1998–2000 in Vokė Branch of the Lithuanian Institute of Agriculture on the soddy podzolic sandy loam soil field trials have been carried out with the aim to investigate the influence of various pesticides on spring barley leaf diseases, weediness and the yield of grains. The efficiency of all pesticides was studied on the variety of spring barley 'Auksiniai 3'. A pure herbicide (MCPA, 1.5 l/ha) and its mixtures (MCPA 1.5 l/ha + tango 0.8 l/ha, MCPA 1.5 l/ha + archer 0.8 l/ha) was used against weeds at the spring barley stage DC 25–29, pure fungicides (Tango and Archer, 0.8 l/ha) against diseases at the stage DC 47–51. The preceding crop in 1998–1999 was potato and in 2000 winter rye. The experimental design consisted of 7 treatments: 1 – control, untreated, 2 – MCPA 1.5 l/ha, DC 25–29, 3 – MCPA 1.5 l/ha, DC 25–29, Tango 0.8 l/ha, DC 47–51, 4 – MCPA 1.5 l/ha, DC 25–29 + Tango 0.8 l/ha, DC 25–29, 5 – MCPA 1.5 l/ha + Tango 0.8 l/ha, DC 25–29, Archer 0.8 l/ha, DC 47–51, 6 – MCPA 1.5 l/ha + archer 0.8 l/ha, DC 25–29, 7 – MCPA 1.5 l/ha, DC 25–29, Archer 0.8 l/ha, DC 47–51. The plant variety recognized in Lithuania was grown on experimental plots in accordance with agronomical recomendations set for South-eastern Lithuania [4]. When recording foliar leaf diseases, the percentage of affected leaves was established and the visual assesment of the development of these diseases was perfomed (the affected leaf area was expressed in per cent) [5–6]. The data were processed by a dispersion and correlation-regression methods [7].

RESULTS AND DISCUSSION

The development of fungal diseases on leaves, the amount of weeds on sowings and grain yield of

spring barley stands considerably depend on meteorological conditions and the efficiency of pesticides (Figs. 1, 2).

In 1998–2000, spring barley leaves vere more intensively affected by net blotch (*Drechslera teres*) and powdery mildew (*Erysiphe graminis*). The development of these diseases, the grain yield of spring barley in different years differed greatly. Net blotch occurred on spring barley every year. The incidence and severity of disease depended on the agroclimatic conditions. The cool and rainy weather of 1998 was most favourable for net blotch *s*pread and development. That year an average incidence of this disease in the plots not treated with pesticides made up 44.45% of the leaf area. The grain yield was 2.14 t/ha. The total number of weeds in spring barley stands was 731 N_o/m^2, weed air-dry mass was 194 g/m^2. In 1999, as a result of a deficiency of moisture in the period of drought (June–July) during the ripening of grain (DC 69–71) leaves of spring barley completely perished. That year, at the stage of heading (DC 51–59) the development of net blotch reached 16.57%. The warm and rainy weather of 2000 was most favourable for powdery mildew *s*pread and development, of affected leaves made 94.7%, the disease severity was 25.98%. A strong development of powdery mildew prevent the development of net blotch (2.44%). Powdery mildew on leaves of spring barley was visible to develop in a stage of heading (DC 47–51). Already in the grain ripening stage (DC 69–71) the upper leaves of the plants were damaged. It resulted in a drop of productivity. In 2000 the grain yield of spring barley was higher than in 1999 (1.47 t/ha). That year the total number of weeds reached 257 N_o/m^2, their air-dry mass was 115 g/m^2.

The average data of the experimental years (1998–2000) have shown that the herbicide MCPA 1.5 (l/ha) and the fungicides Tango and Archer (0.8 l/ha), both alone and in a mixture, reliably reduced the development of net blotch (from 21.15 to 18.56–8.13%), the total weedinees by 27.5–51.6%, air-dry mass of weeds by 23.0–38.4% and increased grain yield by 1.44 to 1.92–2.32 t/ha (LSD_{05} at 0.17). Against net blotch (with 21.15 up to 8.13%) most effective in all years of the trial was a mixture of herbicide + fungicide (MCPA 1.5 l/ha + tango 0.8 l/ha) at the 25–29 stage of organofaction on Zodaks (DC) and Archer 0.8 l/ha in a phase began headings stage (DC 47–51). In this variant the highest spring barley grain yield was obtained (2.32 t/ha or by 61.1%) higher than control – 1.44 t/ha, LSD_{05} 0.17). In the years favourable for the disease occurrence (1998, 2000) a strong correlation was obtained between grain yield and the development of leaf diseases; the correlation coefficient was r = 0.71–0.80.

Seeds treated with pesticides were less injured by different kinds of fungi. Application of pesticides had no negative effect on the seed quality and biometric indices of spring barley.

Grain yield

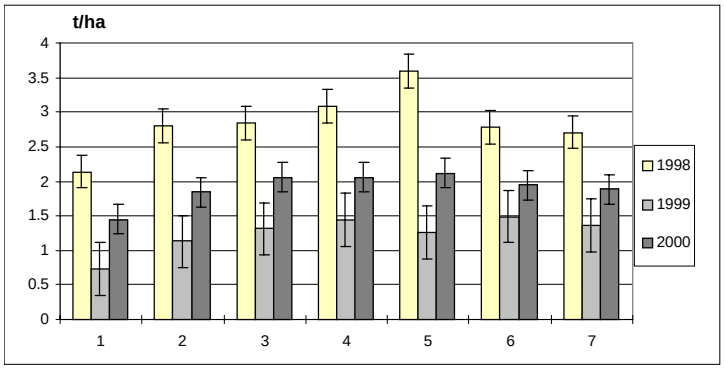

Fig. 1. The influence of pesticides on spring barley grain yield

Disease severity %

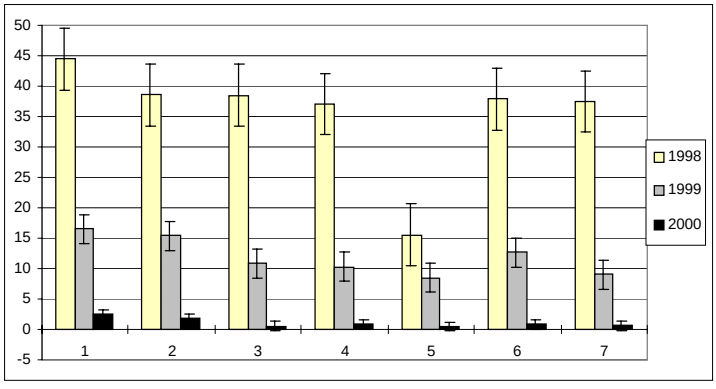

Fig. 2. The effect of pesticides on the occurrence of net blotch (*Drechslera teres)* in spring barley stands

CONCLUSIONS

1. In 1998 spring barley was mostly affected by net blotch (*Drechslera teres).*The disease severity was 44.45%, affected leaves made 100.0%. In 2000 spring barley was mostly affected by powdery mildew (*Erysiphe graminis*); affected leaves made 94.7%, disease severity was 25.98%.

2. When spring barley crops were treated with MCPA 1.5 l/ha, MCPA 1.5 l/ha + tango or Archer 0.8 l/ha after sowing, the number of weeds decreased by 27.5–51.6% and their mass by 23.0–38.4%.

3. MCPA 1.5 l/ha + Tango 0.8 l/ha (DC 25–29) and Archer 0.8 l/ha (DC 47–51) we-

re best to suppress the pathogenes of net spotch (61.6%), and in those trials grain yield increment was highest as well (0.88 t/ha).

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PESTICIDŲ ĮTAKA VASARINIAMS MIEŽIAMS

S a n t r a u k a

1998–2000 m. LŽI Vokės filiale, velėniniame jauriniame priesmėlio dirvožemyje, buvo atlikti lauko bandymai, kurių tikslas – ištirti pesticidų įtaką vasarinių miežių lapų grybinėms ligoms, piktžolėtumui ir grūdų derliui.

Nustatyta, kad visi panaudoti pesticidai tiek atskirai (MCPA 1,5 l/ha DC 25–29, tango ir arčeris po 0,8 l/ha DC 47–51), tiek mišinyje (MCPA 1,5 l/ha + tango 0,8 l/ha DC 25–29 ir MCPA 1,5 l/ha + arčeris 0,8 l/ha DC 25–29) mažino tinkliškosios dryžligės *(Drechslera teres)* išsivystymą (nuo 21,15 iki 16,08–8,13%), piktžolėtumą (iki 27,5–51,6%), patikimai padidino vasarinių miežių grūdų derlių nuo 1,44 iki 1,92–2,32 t/ha (R_{05} 0,17). Tinkliškosios dryžligės išsivystymas ir paplitimas buvo mažiausias tuose laukeliuose, kur vasarinių miežių pasėlis buvo nupurkštas mišiniu MCPA 1,5 l/ha + tango 0,8 l/ha krūmijimosi (DC 25–29) ir arčeriu 0,8 l/ha plaukėjimo (DC 47–51) tarpsniuose: biologinis efektyvumas buvo 61,6%. Šiuose laukeliuose buvo gautas ir didžiausias derlius: 2,32 t/ha, arba 61,1% (kontrolė 1,44, R_{05} 0,17).

Raktažodžiai: Vasariniai miežiai, pesticidai, piktžolės, lapų ligos, grūdų derlius