WP3 Winter wheat trial in Jablje

Objectives

The aim of the experiment was to demostrate several weed management strategies and tools in winter wheat production, where two standard strategies where compared to three alternative strategies. Standard strategies included spring and autumn broadcast herbicide application, which represent common weed management practice. Two alternative strategies aimed at reduction of weed germination and establishment in the early crop development phase with delayed sowing and blind harrowing. In the third alternative strategy spring harrowing was applied to reduce weed competition in the spring.

Materials and methods

Field trial with five weed management strategies was established in autumn 2017 at AIS research station IC Jablje with winter wheat variety Vulkan. Details of the crop and weed management are presented in table 1.

Strategy	Standard 1	Standard 2	Strategy 3	Strategy 4	Strategy 5
Treatment	HER-spring	HER_autumn	HAR_autumn + HER_early spring	DEL_sow + HER_late spring	FALSE_seedbed + HER_late spring
Soil tillage	autumn ploughing	autumn ploughing	autumn ploughing	autumn ploughing	autumn ploughing
False seed bed	no	no	no	no	tine harrowing
Sowing time	optimum	optimum	delayed 14 days	delayed 14 days	optimum
Herbicide application time	early spring application EC 32	autumn application EC 12	early spring application EC 32	late spring application EC 39	late spring application EC 39
Rate	recommendet *	recommendet †	recommendet ‡	recommendet ‡	recommendet ‡
Mechanical weeding	no	no	spring tine harrowing	spring tine harrowing	autumn tine harrowing
	24 m	24 m	24 m	24 m	24 m

* iodosulfuron-methyl 50 g/L + metsulphuron-methyl 7,5 g/L - Hussar plus: 0,2 L/ha
† pendimethalin 300 g/L + chlortoluron 250 g/L + diflufenican 40 g/L - Trinity: 2 L/ha
‡ due to ineffective harrowing instead of reduced dose, recommendet dose was applied

Table 1 - Description and layout of the winter wheat experiment in Jablje

Previos crop on the experimental field was buckwheat. After harvest in August, site was ploughed and seedbed was prepared with the spring tine cultivator at the end of September 2017. Experiment was arranged in 300 m long and 24 m wide strips. Winter wheat was planted at 16.10.2017 and 30. 10. 2017 in the optimum sowing date and delayed sowing date, respectively. In the standard strategy 1, herbicide was applied early in the spring (10. 4. 2018; EC 32), while in standard strategy 2, herbicide was sprayed in the autumn (23. 11. 2017; EC 12) and recommendet doses of herbicides were used in both strategies. Due to innefective harrowing, recommendet herbicide doses were applied in strategies 3 (10. 4. 2018; EC 32), 4 (24. 4. 2018; EC 39) and 5 (24.4. 2018; EC 39), where spraying by need was proposed in the protocol.

Results

Winter wheat in the delayed sowing strategy plot was evidently behind with the development at the early autumn. Seven and five weeks after sowing (at optimum and deayed sowing time treatment), only minor differences were observed. By the early spring, no measurable effect in winter wheat development was observed (Figure 2).

Figure 2 - The difference in the winter wheat development between optimal and 14 days delayed sowing date in the autumn (left) and before winter (right)

In the strategy 5, false seedbed was established in the period of delayed sowing (Figure 3-left).
The conditions for promoting weed germination in the false seedbed technique were not favorable due to extremely warm weather for the autumn period and consequently dry soils.
Winter was cold and wet with large amount of snow laying for a long period of time. Spring harrowing was significantly delayed and soil was extremely compacted from heavy rain and snow. Consequently, the effect of harrowing was poor, since the tines did not penetrated through upper soil layer and reached the working depth and recommendet dose of herbicide had to be applied in the late spring.

Figure 3 - Harrowing in the false seedbed technique (left) and late harrowing in the spring (right)

Weed pressure was low-medium, however additional germination flush appered very late, which is probably due to sufficient moisture and delayed vegetation.

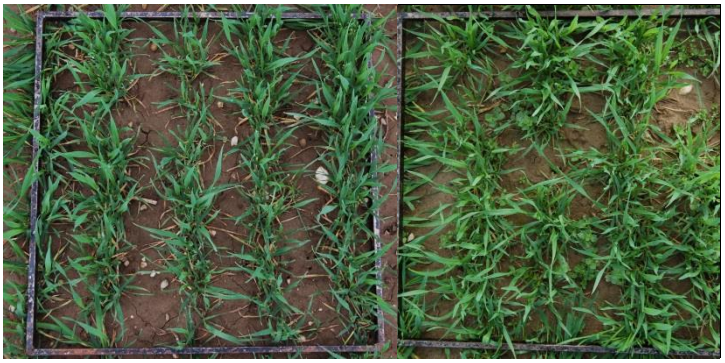

Figure 4 - Autumn sprayed standard strategy (left) and false seedbed plot before spraying at the beginning of April (right)

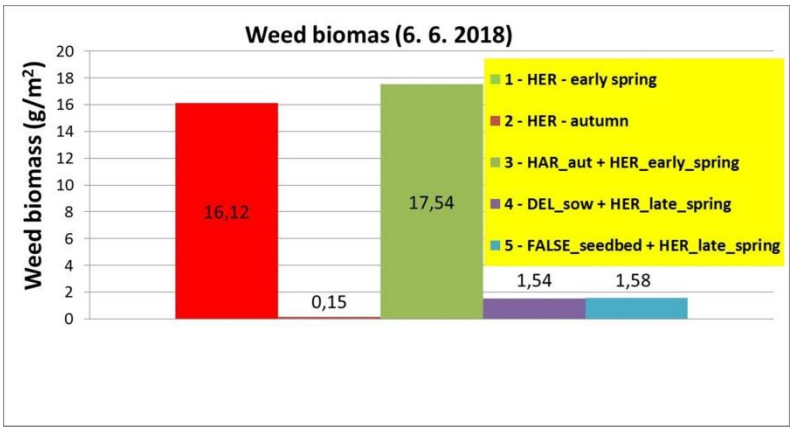

Figure 5 - Weed biomass in winter wheat at the end of flowering stage

Due to extended weed germination, late spring applications performed better (strategy 4 and 5) compared to early spring application (strategy 1 and 3). Autumn herbicide application (strategy 2) was by far the best with good residual efficacy, which was visible until the harvest (Figure 5).
The highest dry grain yields (14 % moisture) was measured in autumn standard herbicide application (strategy 2; 6,18 t/ha), followed by strategy 5 (6,09 t/ha), while other tretaments (strategy 1, 3 and 4) were similar in dry grain yields (5,7 t/ha) (Figure 6).

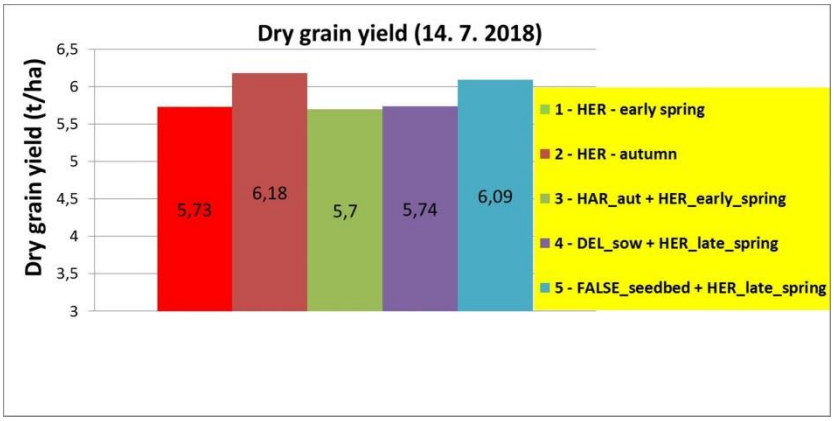

Figure 6 - Winter wheat dry grain yield at different weed management strategies

Conclusions

In the 2017/2018 season average winter wheat grain yields were recorded in central Slovenia. Our results showed that the highest yields were measured in treatments with the lowest weed biomass (strategy 1 and 5). However, there were moderate yield differences between treatments. Dry grain yields (14 % moisture) ranged from 5,7 t/ha in strategies 1, 3 and 4 up to 6,1 t/ha in strategies 2 and 5, respectively. All of the tested strategies will be repeated in 2018/19 season.

WP3 Winter wheat trial at BSR Rakičan

Objectives

The purpose of the demonstration trial was to test alternative weed management approaches where mechanical tools where incorporated in weed control strategies aiming at reduction of herbicide use in winter wheat production. Beside mechanical weeding, measures to prevent weed germination and reduce weed establishment in the early crop development phase were implemented.

Materials and methods

Field trial at the Biotechnical School Rakičan was established in autumn 2017 where two alternative strategies and one standard weed management practice were compared in winter wheat production. Experiment was arranged in long and 15 m wide strips. In the two standard weed control strategies, broadcast herbicide were applied in the autumn and spring. In one of the alternative strategy, autumn and spring tine harrowing was combined with reduced herbicide use in the spring. In the second alternative approach, delayed sowing and spring tine harowing was utilized and herbicide were used in the spring by need.

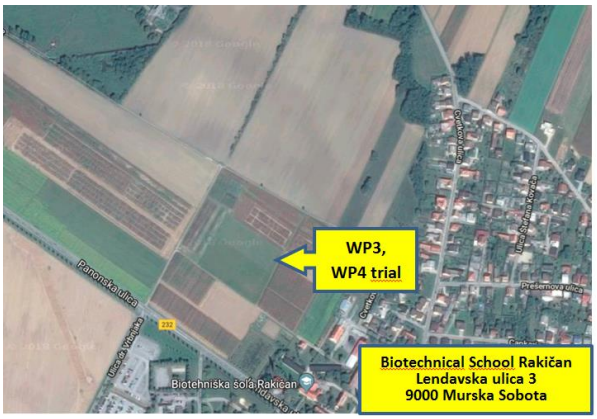

Figure 7 - Location of the WP3-winter barley and WP4- maize trial in Rakičan in 2018

Strategy	Standard 1	Strategy 4	Strategy 3	Standard 2
Treatment	HER-spring	HAR_aut + HER_ spring-reduced 50 %	DEL_sow + HAR_late spring	HER-autumn
Soil tillage	autumn ploughing	autumn ploughing	autumn ploughing	autumn ploughing
False seed bed	no	no	no	no
Sowing time	optimum	delayed 14 days	optimum	optimum
Herbicide application time	early spring application *	early spring application *	/	autumn application †
Rate	recommendet	50 % reduced	/	recommendet
Mechanical weeding	/	spring tine harrowing	autumn and spring tine harrowing	/
	15 m	15 m	15 m	15 m

* iodosulfuron-methyl 50 g/L + metsulfuron-methyl 7,5 g/L - Hussar plus: 0,2 L/ha
† iodosulfuron-methyl-sodium 7,5 g/L + mesosulfuron-methyl 9 g/L + diflufenican120 g/L +mefenpyr-diethyl 27 g/L) - Alister new: 1 L/ha

Table 2 - Description and layout of the winter wheat experiment at BSR Rakičan.

The soil conditions in the period of optimal sowing date were favorable with warm weather and adequate water supply. Winter wheat in optimum sowing date was drilled on the 16. 10. 2017 (strategies 1,2 and 3). Plot with strategy 4 was sown 14 days later on the 30. 10. 2017. Winter wheat in the delayed sowing plot needed 12 days to emerge, compared to just 6 days in the optimum sowing date. Unusally warm weather continued in the late autumn which enabled the implementation of weed management measures in optimum conditions.

Autumn spraying in the strategy 2 was performed 22. 11. 2017, while autumn harrowing in the strategy 3 was executed two days later , i.e. 24. 11. 2018. The overwintering of the crop was adequate despite of harsh winter temperatures and long snow cover which caused significant delay in the vegetation developement and crop management.

Results

Although the crop on the delayed sowing plots was thinner in the spring, at the time of the harvest approx. 600 heads was counted on average in all the treatments. Only minor delay in the development was recoreded, heading on the later drilled plots was only 2 days later compared to optimal sowing date strategies.

Figure 8 - Two weeks later drilled winter wheat (left) and optimal sowing date (right) and at the end of March 2018

After fertilisation at the end of March, tine harrow was used in strategies 2 and 3. Both, autumn and spring harrowing performed well, mainly becuase of adequate soil conditions and optimal crop development. Weed infestation was generally low across all the plots, only Cirsium arvense appeared on some spots.

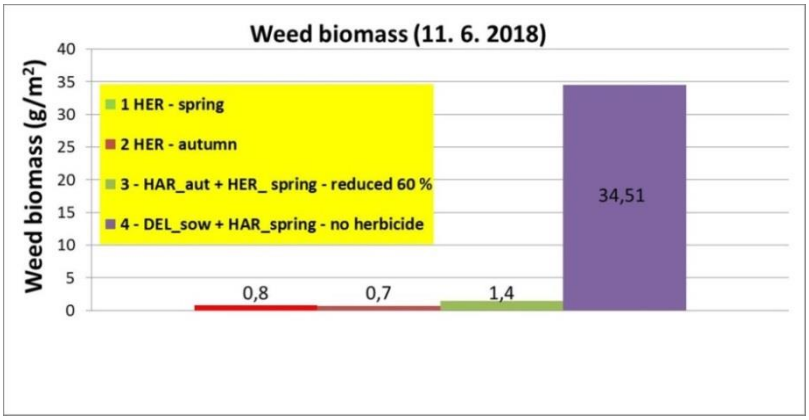

Figure 9 - Weed biomass in winter wheat at the end of flowering stage

The highest weed biomass was recorded in strategy 4, where only autumn and spring harrowing was conducted. Although weed biomass was considerable greater in strategy 4 (only mechanical tools without herbicide) compared to other treatments (Figure 9), the level of weed infestation did not had any effect on the yield performance (Figure 10).

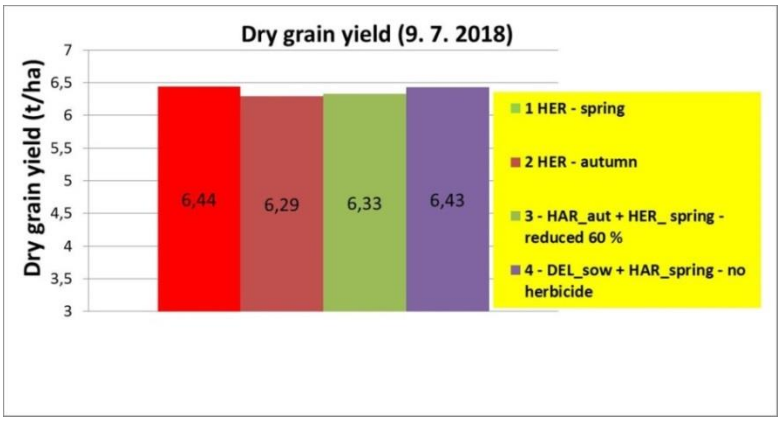

Figure 10 - Winter wheat dry grain yield at different weed management strategies

Conclusions

The environmental conditions in the 2018 were not favorable, high temparatures and water shoratge in the spring greatly reduced winter wheat yields. In all of the strategies remarkably similar yields were recorded, ranging from 6,3 t/ha to 6,4 t/ha. All of the tested strategies will be repeated in 2018/19 season.