WP4 Maize trial in Jablje

Objectives

The objective of the trial was to test various integrated weed management strategies in maize production with aim to reduce reliance on herbicides. To achieve this goal, herbicide use was partially replaced with implementation of mechanical tools and band spraying.

Materials and methods

Field experiment in maize was established at the end of april 2018 at AIS research station IC Jablje. Trial was arranged in 200 m long and 12 wide strips and consisted out of three alternative weed management strategies which were compared to standard early post broadcast herbicide application. In the two alternative strategies, reduced herbicide dose and band application were combined with precise camera guided finger weeder, while in the third strategy only mechanical tools were used to control weeds.

Strategy	Strategy 4	Strategy 3	Strategy 2	Strategy 1 Standard
Treatment	ORG	HER_row	HER_red	CON
Soil tillage	Spring ploughing	Spring ploughing	Spring ploughing	Spring ploughing
Herbicide application time	/	early post EC 13	early post EC 13	early post EC 13
Rate	/	recommendet dose *	reduced dose 60 % *	recommendet dose *
Mechanical weeding	Finger weeder EC 14 †	Finger weeder EC 16 †	/	/
	Finger weeder EC 18	Finger weeder EC 18	Finger weeder EC 18	/
	12 m	12 m	24 m	12 m

* isoxaflutole 225 g/L + thiencarbazone-methyl 90 g/L + cyprosulfamide safener 150 g/L - Adengo: 0,44 L/ha

† due to unfavorable weather conditions mechanical weeding was not performed

Table 1 - Description and layout of the maize experiment in Jablje

The trial was planted in warm conditions 30th of April 2018 with the variety Phyton. Maize germinated fast (in 7 days) and first early post herbicide applications were performed 18. 5. 2018 (EC 13). The growing season was extremely humid and warm, which facilitated excellent efficacy of applied herbicides.
In treatment 3 with band spraying and strategy 4 (only mechanical weed control), mechanical weeding was planned to be performed at two growth stages of maize. Extreme rain events and soil conditions in May and June did not allowed hoeing at 6 leaf stage, therefore only one pass at 8-leaf stage of maize was executed in strategy 3 and 4 (Figure 2).

Results

Figure 2 - Heavy weed infestation in the organic plot (left) before hoeing with finger weeder (right)

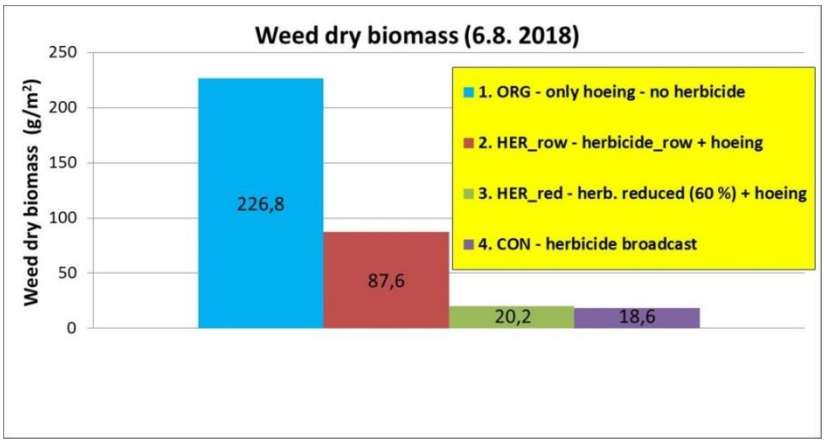

Figure 3 - Weed biomass in maize at the grain filling stage

Substantial dry weed biomass was measured at the end of August (226 g/m^2) in treatment with only mechanical weed control (strategy 1). Finger weeder was effective in the interrow space, however most of the weed infestation was recorded along the maize rows and had significant impact on competition with maize. In the strategy with band spraying (treatment 2), maize rows were adequatelly controlled, however late application of hoeing was less efficient in the interrow space. Reduced dose of herbicide (60 %) in strategy 3 did not show any reduction in weed control compared to recommnedet dose (Figure 3).
The highest yield was measured in the standard strategy 4 (14,64 t/ha), followed by 12,41 t/ha and 13,03 t/ha in the strategy 2 and 3, respectively. The lowest yield was achiewed in the strategy 4 with only one hoeing (10,56 t/ha), where considerable higher weed infestation was observed (Figure 4).

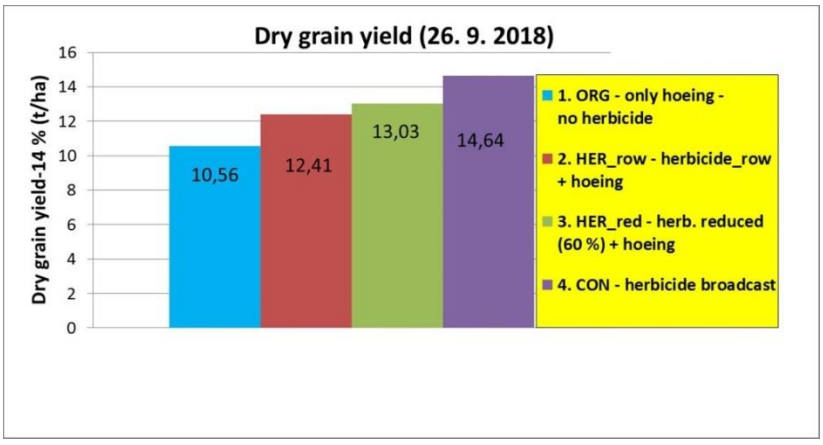

Figure 4: Maize dry grain yield at different weed management strategies

Conclusions

Overall environmental conditions in the 2018 were favorable with high temparatures and sufficient rainfall. Maize did not suffer any water shortage, therefore relativelly high yields were achieved this season. In strategies 2 and 3 weed infestation did not had any significant effect on yield loss, lower yields were in our opinion consequence of maize stand loss due to very agressive hoeing with finger weeder.

WP4 maize trial at BSR Rakičan

Objectives

The objective of the demonstration trial was to include mechanical measures into weed management strategies in maize production where only herbicdes are used for weed control in the standard practice. Strategies were demostrated in real field conditions and designed with aim to reduce reliance on herbicides. To achieve this goal, herbicide use was partially replaced with use of mechanical tools and band spraying.

Materials and methods

Field experiment in maize was established at the beginning of april 2018 at Biotechnical School Rakičan. The demonstration trial was arranged in long and 12 wide strips and consisted out of three alternative weed management strategies which were compared to standard early post broadcast herbicide application. In alternative strategy 2 interrow weeder was adapated for band application of herbicides in the row, combined with hoeing. In the second alternative strategy 3, reduced herbicide dose was applied.

Strategy	Strategy 1 Standard	Strategy 2	Strategy 3	Strategy 4
Treatment	CON	Her_row	Her_red	ORG
Soil tillage	Autumn ploughing	Autumn ploughing	Autumn ploughing	Autumn ploughing
Herbicide application	Broadcast	Band spraying combined with hoeing	Broadcast	No herbicide
Herbicide application time	early post EC 12	early post EC 13	early post EC 12	/
Rate	recommendet dose *	recommendet dose **	recommendet dose *	/
Mechanical weeding	/	Hoeing EC 16	Hoeing EC 16	Harrow: EC 12 Harrow: EC 14 Hoeing EC 17
	12 m	12 m	12 m	12 m

* isoxaflutole 225 g/L + thiencarbazone-methyl 90 g/L + cyprosulfamide safener 150 g/L - Adengo: 0,44 L/ha

** recommendet dose was applied in the 30 cm band along the row

Table 2 - Description and layout of the maize experiment at BSR Rakičan

Conditions after planting were favorable. Maize germinated in 7 days and with optimum water supply it was rapidly developing. Afterwards heavy rain caused compaction of the soil and delay in executing weed management operations. Additionaly , a standing water on a part of the field postoned harrowing operation in the strategy 1. Furthermore, weeds overgrow optimum development stage, therefore harrowing was less efective than expected, with mostly grass weeds survived in the area with compacted soil. Even after two passes with harrow and one hoeing weeds were not sufficiently controlled. In the strategy 3, soil conditions for herbicides were favorable and enabled effective weed control in the early season. Later emerged weeds were controlled with hoeing at 6 leaves growth stage of maize and did not represent any relevant competition to maize in the early growth period. Our prototype, which was developed for band spraying and interrow hoeing showed some deficiencis. The nozzles were placed infront of the hoes, therefore the spray did not cover the weed plants adequately. Especially perennial weeds like bindweed were not sufficiently controlled. In strategy 4, only mechanical measures were implemented and overall this strategy was less effective.

Results

Figure 5 - Heavy rainfall created compacted soil and harrowing was performed in difficult conditions

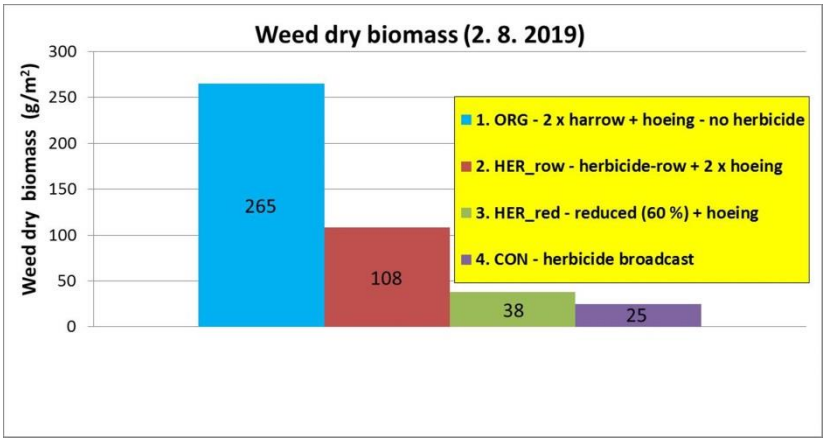

Figure 6 - Weed biomass in maize at the grain filling stage

Substantial dry weed biomass was measured at the end of August (265 g/m^2) in treatment with only mechanical weed control (strategy 1). Band spraying in the strategy 2 was less effective due to improper nozzle placement and significant weed infestation was recorded along the maize rows. Reduced dose of herbicide (60 %) in strategy 3 did not show considerable reduction in weed control compared to recommendet dose (Figure 6).

Dry grain yields of maize were correlated to weed infestation. The highest yield was measured in standard strategy 4 (8,95 t/ha), followed by 8,84 t/ha and 8,52 t/ha in the strategy 3 and 2, respectively. The lowest yield was achiewed in strategy 1 with only mechanical weed control (7,89 t/ha), where substantially higher weed infestation was observed (Figure 7).

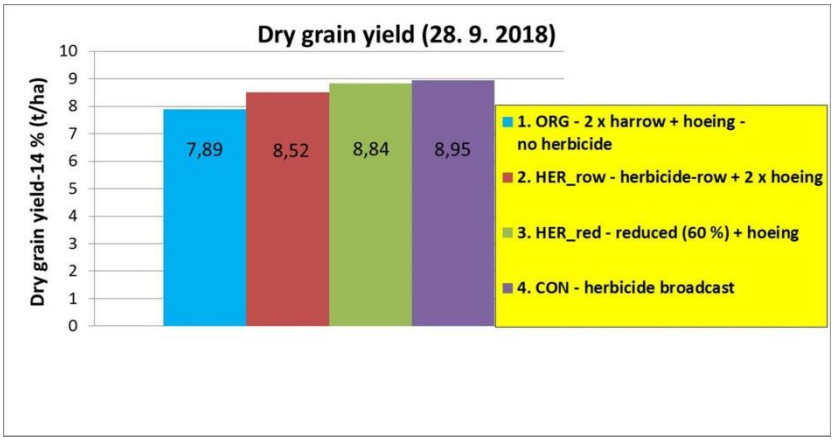

Figure 7 - Maize dry grain yield at different weed management strategies

Conclusions

Overall environmental conditions in the 2018 were not favorable in this region. Excessive water supply after planting and high temparatures in the late summer greatly reduced maize yield potential. Minor yield losses in strategies 1 and 2 were related to difficult soil conditions and at the time of mechanical weeding and consequently decreased efficacy of harrowing and hoeing.