Weediness of maize in conservation tillage systems under climate change conditions

Bojana BROZOVIĆ – Irena JUG – Boris ĐURĐEVIĆ – Bojan STIPEŠEVIĆ - Marija RAVLIĆ, Danijel JUG

Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1; E-mail: bojana.brozovic@fazos.hr, ijug@fazos.hr, bdurdevic@fazos.hr, bojans@fazos.hr, marija.ravlic@fazos.hr, djug@fazos.hr

Keywords: weed occurrence, *Zea mays* L., conservation tillage, climate change

Different conservation tillage systems play an important role in mitigating the negative impacts of climate change on crop productivity and preventing soil degradation. By changing a number of soil conditions, conservation tillage affects the change in weed levels. Weeds are the dominant biotic factor that most often negatively affects the performance of maize yields during the growing season, and especially in the critical period of weediness. Fertilization can increase the competitive ability of maize which causes a reduction of weeds occurrence and change in the composition of weed flora. Weed species amount, density and biomass play a significant role in maintaining the biodiversity of agroecosystems. The aim of this study was to investigate the impact of conservation tillage and fertilization on weed infestation in maize. Field experiment was performed in year 2021 at experimental site Čačinci (Stagnosol soil type) in Croatia (17.86336 E, 45.61316 N, n.v. 111 m) as a split plot experimental design in three replicates with soil tillage as the main factor and fertilization as subfactor. The soil treatments were as follows: CT (conventional, plowing), CTD (conservation, loosening with a minimum of 30% of crop residues on the surface) and CTS (conservation, shallow tillage with a minimum 50% of crop residues on the surface). Fertilization treatments were: FR – control treatment (according to the recommendation in amount of - NPK 170: 150: 225 kg/ha), FH (50% of the recommendation), GFR (according to the recommendation + GeO2 - biophysiological soil activator, 300 kg/ha), GFH (50% of recommendation + GeO2). Weed sampling and determination of weed species were performed twice during the maize growing season (growth stages V10 and R5). The applied chemical weed protection was uniform for all soil tillage and fertilizations treatments. Individual weed species were counted within the square of 0.25 m^2 in four replicates per experimental plot to determine the weed density and cut off from the same square at ground level to determine aboveground biomass. At the same time, weed coverage was established on the same surfaces with visual assessment. The most numerous weed species were: *Calystegia sephium* (L.) R. Br., *Ambrosia artemisiifolia* L., *Setaria viridis* (L.) P. Beauv. and *Convolvulus arvensis* L. Tillage significantly affected the total number of weeds, weed aboveground biomass, number of weed species and weed cover in the first observation (V 10 – critical weed-free period for maize). All investigated indicators in average were the highest at the CTS treatment with statistical significance ($p \leq 0.05$) in relation to conventional tillage (CT). The total weed number (12.33/m^2) on CTS treatment was almost four times higher compared to CT (3.34/m^2). Fertilization did not significantly affect the level of weediness, and the average values of all studied indicators were the lowest on the treatment GFH. The impact of tillage and fertilization on the total weed number in the second sampling (growth stage R5) was statistically significant ($p \leq 0.05$). Significant interaction between tillage and fertilization was found, and the highest total number of weeds was recorded on control fertilization treatment FR for all tillage treatments. Treatment GFH in average resulted in more than 50% fewer weeds compared to FR (22.3/m^2) with statistically significant difference. The highest total weed number was recorded on CTD tillage treatment (21.25/m^2). The highest weed aboveground biomass (183.83 g/ m^2), number of weed species (2.75/ m^2) and weed cover (81,75%) in second weed observation were recorded on CTS tillage treatment with a significant statistical difference in relation to CT treatment. The results of this study indicate an increase in weediness of maize on conservation tillage systems and the positive effect of reduced fertilization with the addition of biophysiological soil activator to reduce weed levels in the later developmental stages of maize. The suitability of soil conservation systems and optimal fertilization in terms of weed management needs to be further investigated.

Acknowledgement

This work has been fully supported by Croatian Science Foundation under the project "Assessment of conservation soil tillage as advanced methods for crop production and prevention of soil degradation – ACTIVEsoil" (IP-2020-02-2647)