HRZZ
Croatian Science Foundation

1st international scientific conference
„Agricultural Challenges to Climate Change"

A3C
Agricultural Challenges to Climate Change

Soybean weediness in conservation tillage systems

Brozović Bojana, Irena Jug, Boris Đurđević, Iva Rojnica, Marija Ravlić, Vesna Vukadinović, Danijel Jug
(bojana.brozovic@fazos.hr)

ACTIVEsoil

Assessment of conservation soil tillage as advanced methods for crop production and prevention of soil degradation

http://www.activesoil.eu/index.php/hr/

Josip Juraj Strossmayer University of Osijek
Faculty of Agrobiotechnical Sciences Osijek

Introduction

- adaptation
- mitigation

- one of the most effective ways to adapt crop production to the present shifting and seasonal changes in average temperatures and precipitation amount in various agroecological conditions, with conservation tillage as the main tool

- The sustainability of implementation and wide general integration of conservation tillage in agriculture production depend mainly on the extent of expected changes in the weed community, the use of herbicides, and the development of effective weed management

- Weeds - common and widely present segments of crop fields

- Presence - interactions of agricultural production measures and environmental and ecological elements

- Weed abundance - conditioned by different management strategies (soil tillage, crop rotation, liming and fertilization, herbicide use, site specific)

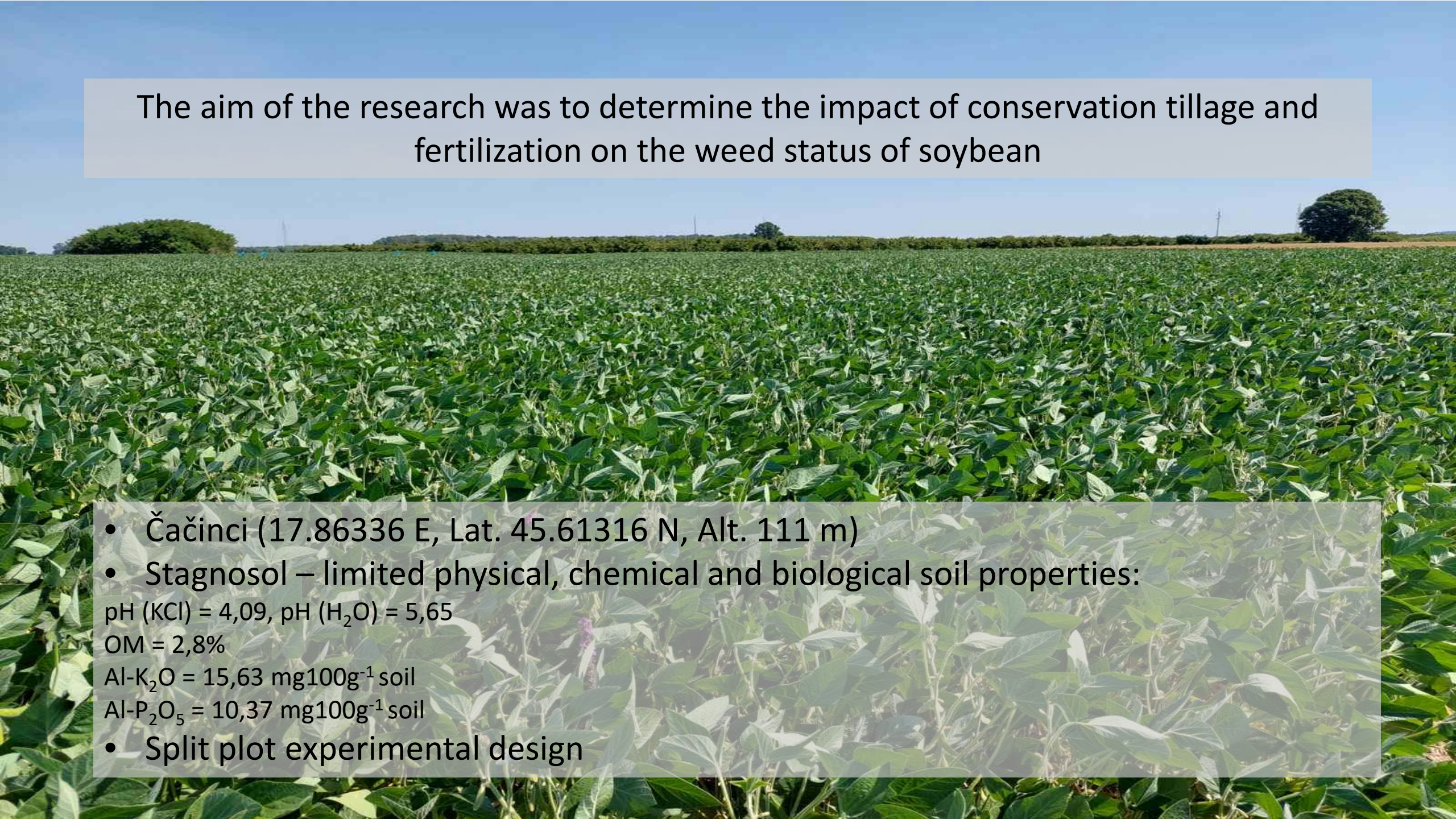
- Pronounced variation, simple and prompt alternation to new environmental and agricultural conditions

- Damage - up to 80% yield loss

Conservation tillage

- Different possibilities of changes in weed abundance
- Extensive dominance of perennial weed species, but also annuals
- Higher total weeds densities, biomass, coverage, greater weed species number

The impact of conservation soil tillage on weed occurrence also depends on specific agroecological conditions combined with weed management strategies, whereby increased weediness does not always lead to yield loss.



The aim of the research was to determine the impact of conservation tillage and fertilization on the weed status of soybean

- Čačinci (17.86336 E, Lat. 45.61316 N, Alt. 111 m)
- Stagnosol – limited physical, chemical and biological soil properties:

pH (KCl) = 4,09, pH (H_2O) = 5,65
OM = 2,8%
Al-K_2O = 15,63 mg100g^{-1} soil
Al-P_2O_5 = 10,37 mg100g^{-1} soil

- Split plot experimental design

Materials and methods

Main treatment

- Soil tillage
  - ST tillage - conventional, plowing (30 cm)
  - CTD tillage - conservation, loosening with a minimum of 30% of crop residues
  - CTS tillage - conservation, shallow tillage up to 10 cm with a minimum of 50% crop residues

Subtreatment

- Fertilization
  - FR (according to the recommendation)
  - FD (50% of the recommendation)
  - Recommended fertilization: NPK 40:150:94 + 40 kg N ha^{-1} KAN

Herbicide application

- Uniform for all treatments
- Pre-em: 960 gl^{-1} S-Metolachlor (1.2 l ha^{-1}), Metribuzin 70 % (0.6 kg ha^{-1})
- Post-em: 22.4 g l^{-1} Imazamox, 480 g l^{-1} Bentazon (1 l ha^{-1})

Weed assessment

Weed sampling – V3 (three trifoliate) and R7 (beginning maturity).

Weed density, above-ground biomass, number of weed species, weed coverage were determined on each treatment and subtreatment.

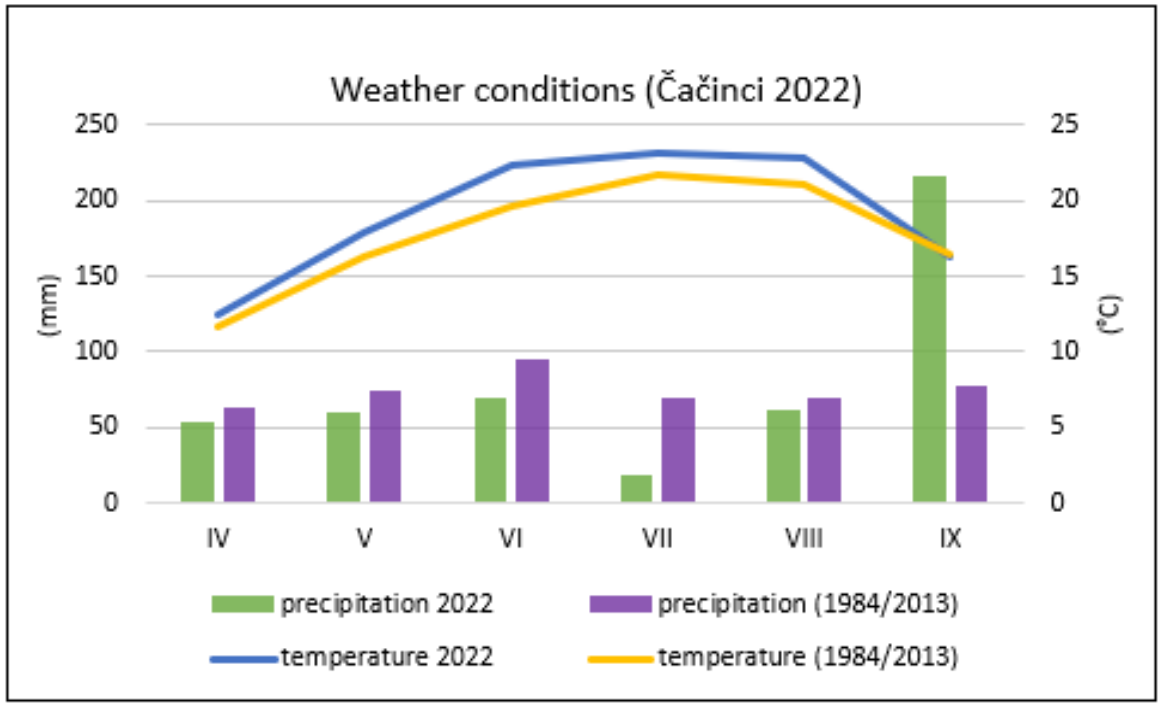
All classified weed species on the area of 0.25 m^2 in four repetitions were counted and cut off on the ground level, separated by different weed types and dried at 60 °C for 48 h.

Weed coverage was determined visually.

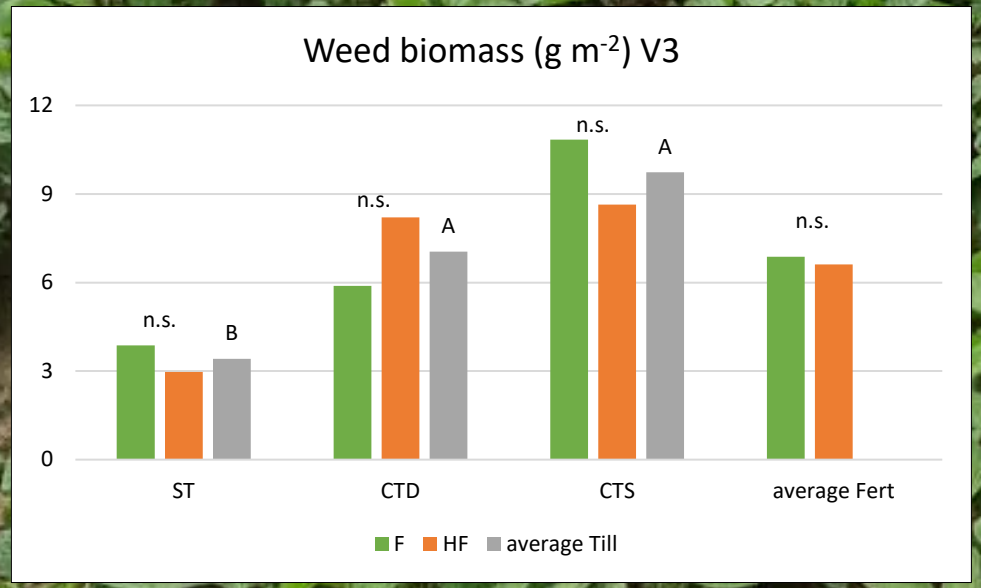
Determined weed species

- *Ambrosia artemissifolia* L.
- *Calystegia sepium* (L.) R. Br.
- *Cirsium arvense* (L.) Scop.
- *Convolvulus arvensis* L.
- *Lythrum salicaria* L.
- *Mentha spicata* L.
- *Setaria glauca* (L.) P. Beauv.
- *Setaria viridis* (L.) P. Beauv.
- *Panicum capilare* L.
- *Xanthium strumarium* L.

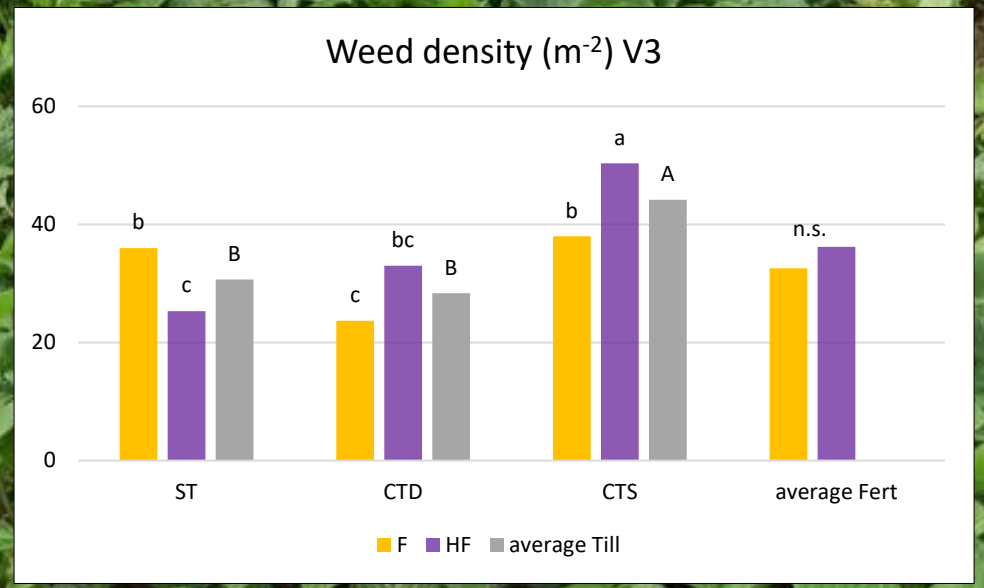
Weather conditions



Results – first weed sampling in critical weed free period of soybean V3



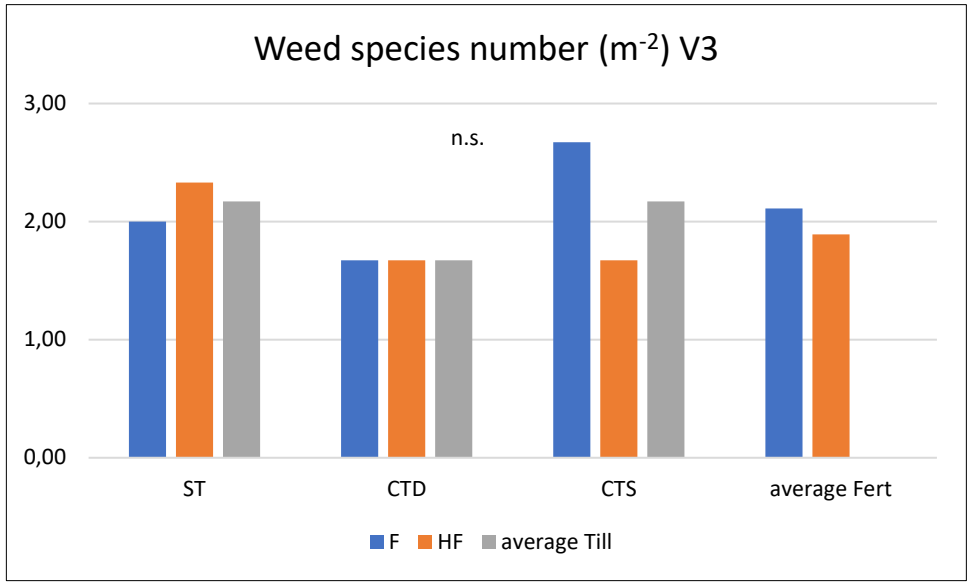
Graph 1. Weed biomass – V3



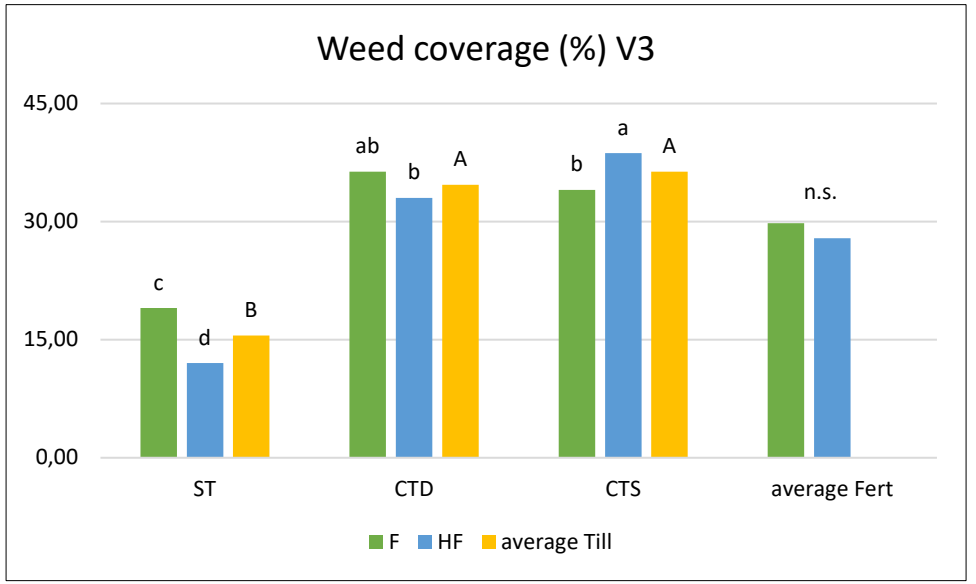
Graph 2. Weed density – V3

- columns marked with the same upper or lower case letter are not statistically significantly different ($p<0.05$)
- ST tillage - conventional, plowing (30 cm)
- CTD tillage - conservation, loosening, 30% crop residues
- CTS tillage - conservation, shalow tillage, 50% crop residues
- F (according to the recommendation)
- HF (50% of the recommendation)

Results – first weed sampling in critical weed free period of soybean V3



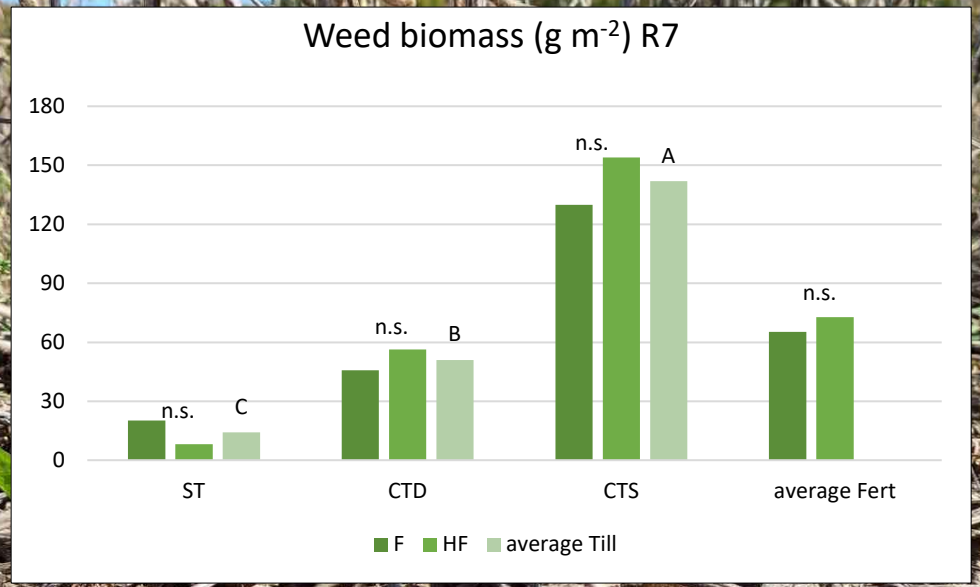
Graph 3. Weed species number – V3



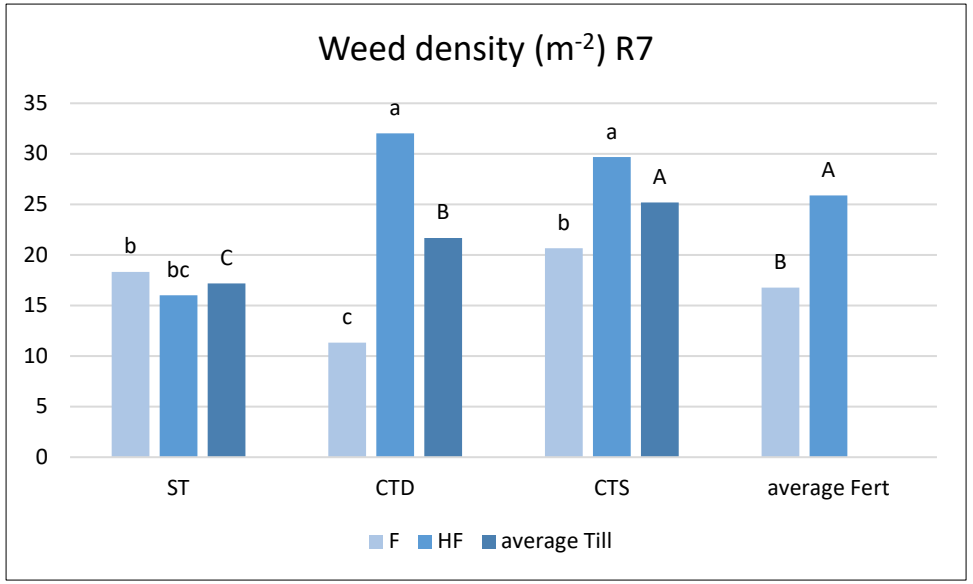
Graph 4. Weed coverage – V3

- columns marked with the same upper or lower case letter are not statistically significantly different ($p<0.05$)
- ST tillage - conventional, plowing (30 cm)
- CTD tillage - conservation, loosening, 30% crop residues
- CTS tillage - conservation, shalow tillage, 50% crop residues
- F (according to the recommendation)
- HF (50% of the recommendation)

Results – second weed sampling (residual weed flora) – R7 growth stage of soybean



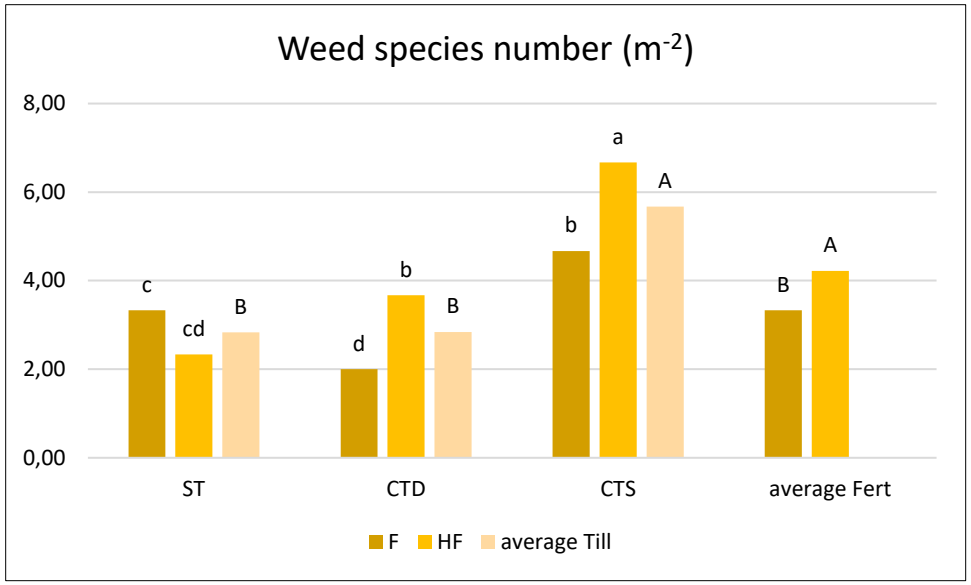
Graph 6. Weed biomass – R7



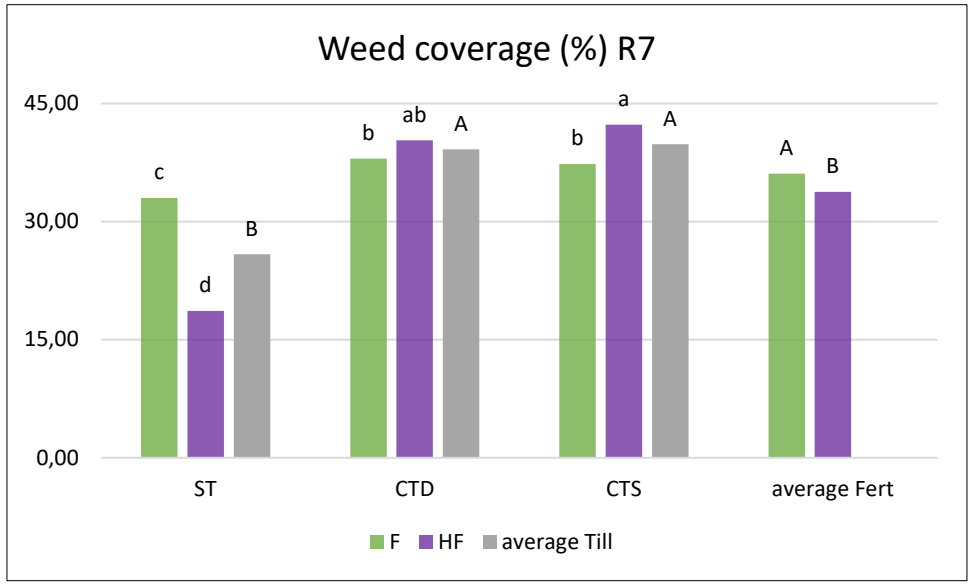
Graph 7. Weed density – R7

- columns marked with the same upper or lower case letter are not statistically significantly different($p<0.05$)
- ST tillage - conventional, plowing (30 cm)
- CTD tillage - conservation, loosening, 30% crop residues
- CTS tillage - conservation, shalow tillage, 50% crop residues
- F (according to the recommendation)
- HF (50% of the recommendation)

Results – second weed sampling (residual weed flora) – R7 growth stage of soybean



Graph 8. Weed species number – R7



Graph 9. Weed coverage – R7

- columns marked with the same upper or lower case letter are not statistically significantly different ($p<0.05$)
- ST tillage - conventional, plowing (30 cm)
- CTD tillage - conservation, loosening, 30% crop residues
- CTS tillage - conservation, shalow tillage, 50% crop residues
- F (according to the recommendation)
- HF (50% of the recommendation)

Conclusion

- Decreasing of soil tillage with increasing soil surface residues depth led to more pronounced weediness of soybean in critical weed free period V3.
- All investigated parameters of weediness were in average the highest on shallow conservation soil tillage system – CTS with exception of weed species number.
- Fertilization did not show a significant effect on the change in the average level of soybean weediness in V3 growth stage.
- Weediness parameters in R7 soybean growth stage were on average the highest on CTS soil tillage treatment.
- Fertilization had a significant effects on average weed density and number of weed species with the highest values on HF treatment.
- CTS soil tillage treatment combine with reduced fertilization in average led to an increase in soybean weediness during the vegetation.

Thank you for your attention