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Influence of Tillage System and Weed Management on Weed Dynamics and Soybean Performance

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• Introduction

Soybean is an economically and nutritionally important crop, but its early growth stages are highly vulnerable to weed infestation, which can limit its adoption by farmers. Proper and rational weed control practices are essential to reduce significant yield losses caused by weed competition.

• Material and method

A field experiment conducted in 2025 at ARDS Turda evaluated the effects of soil tillage systems and weed control methods on weed infestation, yield, and soybean quality (protein, oil, and fatty acid content). The study used a split-plot design (Figure 1) with two replications, testing the Felix soybean variety sown at 50 cm spacing and a density of 55 germinating seeds/m^2.

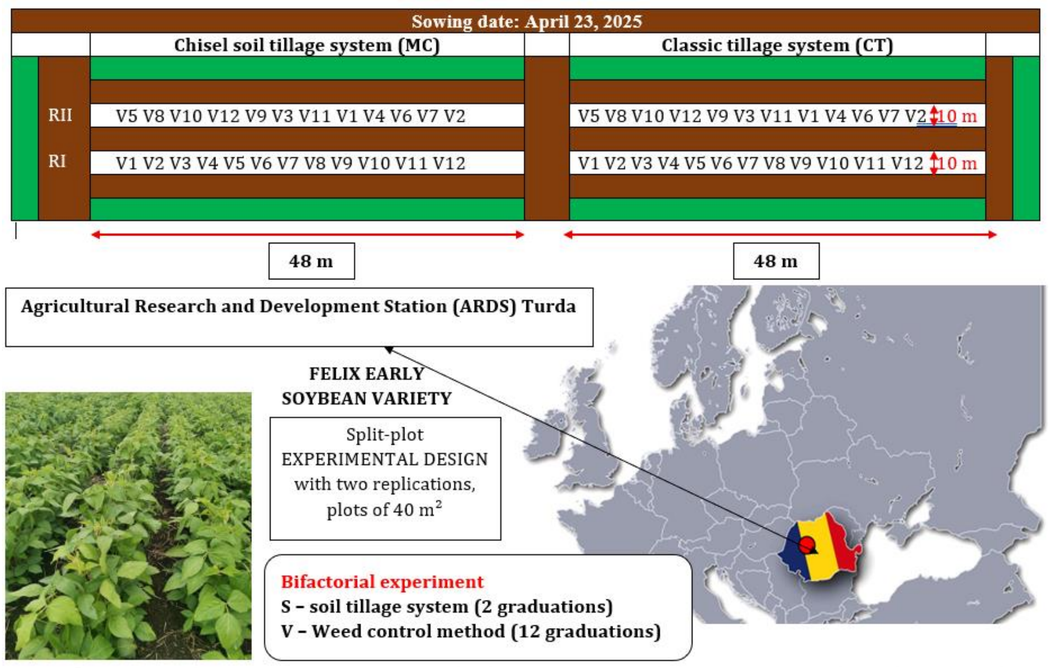

Figure 1. Experimental design and location, biological material, sowing date

• Results and discussions

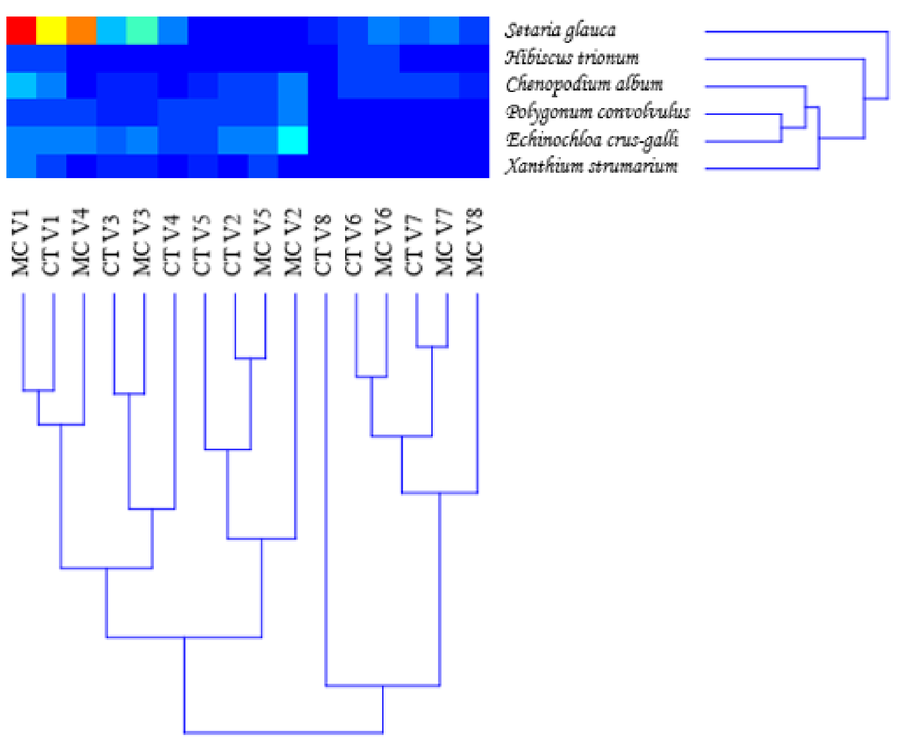

Figure 2. Effect of tillage system and weed control strategy on weed infestation at 21 days after application

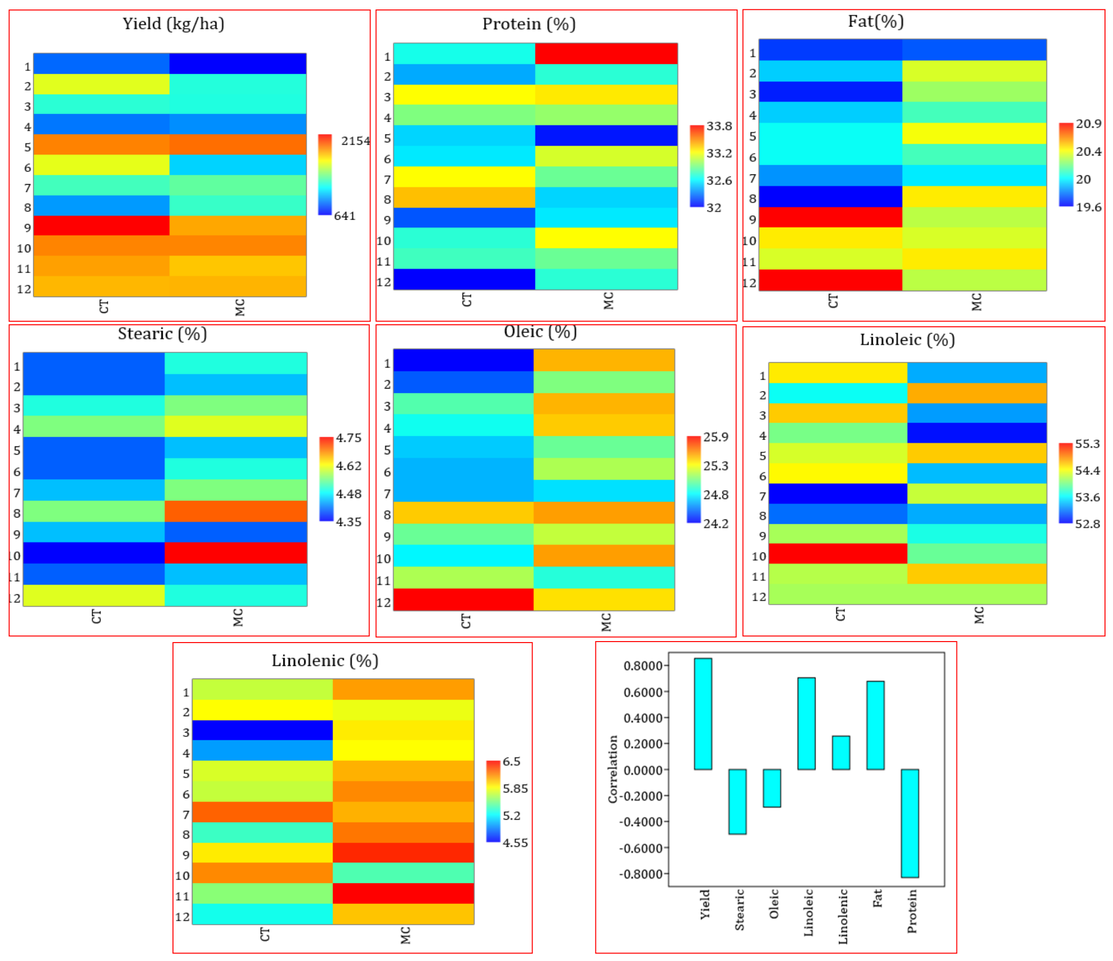

Figure 3. Effect of tillage system and weed control strategy on soybean yield and quality

• Conclusions

- ✓ At 21 days after treatment the weed flora in the experiment is composed of annual monocotyledonous and dicotyledonous species.
- ✓ The dominant species include *Echinochloa crus-galli* and *Setaria glauca* among monocots, and *Chenopodium album*, *Polygonum convolvulus*, *Hibiscus trionum*, and *Xanthium strumarium* among dicots.
- ✓ A clear differentiation is observed between the two tillage systems, with the minimum tillage system (MC – chisel) showing higher weed infestation levels compared to the conventional system (CT – plough).
- ✓ Regardless of the system, the most effective control is achieved in the combined pre- and post-emergence herbicide variants (V5–V7), while the untreated control (V1) records the highest weed pressure. Intermediate effectiveness is observed in pre-emergence-only and mechanical control variants, confirming the superiority of integrated chemical control strategies.
- ✓ Strong positive correlations were identified between yield, fat content, and linoleic acid, while protein showed a strong negative correlation with these variables. Stearic and oleic acids exhibited moderate negative correlations, whereas linolenic acid showed a weak positive correlation. Overall, two opposing groups can be distinguished: yield and lipids versus protein.
- ✓ Both the tillage system and the weed control strategy significantly influence seed yield and quality. The conventional tillage system (CT) tends to promote higher yields in some variants, while the minimum tillage system with chisel (MC) provides slightly better quality, particularly in terms of protein content and a more balanced fatty acid profile. In both systems, variants with integrated weed management (combined herbicide applications and/or mechanical operations) ensure the best overall performance, whereas the untreated control shows the poorest results.

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