The 3rd International Electronic Conference on Agronomy 15–30 Oct 2023

# Impact of Pests and Diseases on Three Tomato (*Solanum lycopersicum* L) Genotypes Productivity Under the Hedgerow System

## Running title: Hedges impact tomato production

Mohammed Mustafa [1, 3], Joel Ayebeng Adjei [1] , László Menyhárt [2] , László Csambalik [1] , Szalai Zita [1]

1 Department of Agroecology and Organic Farming, Institute of Rural Development and Sustainable Production, Hungarian University of Agriculture and Life Sciences, 29-43 Villányi út, H-1118, Budapest, Hungary.

2 Institute of Technology, Georgikon Campus, Hungarian University of Agriculture and Life Sciences, Deák F. u. 16, Keszthely, H-8360, Hungary

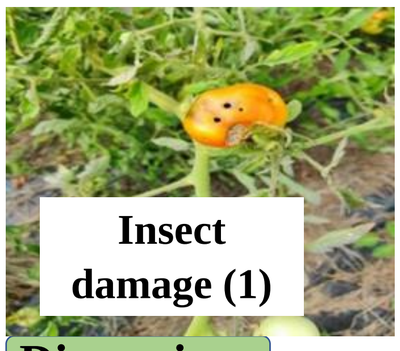
3 Agriculture Research Corporation (ARC), Wad Madani 126, Horticultural Research Center, Khartoum, Sudan

## Introduction:

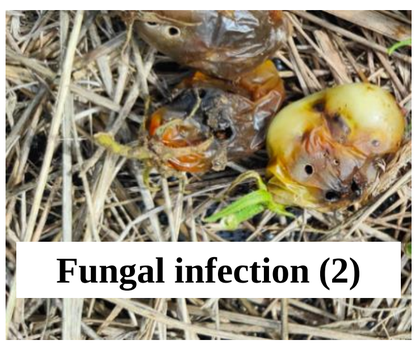
- Pests and diseases in tomato production can significantly impact yield and profitability, reducing the economic value of fruits. They pose challenges in cultivation, affecting growth and yield. Disease control is a significant issue in agricultural operations, with methods allowing for plant protection. Disease-resistant traits are advantageous for producers.
- Hedgerows and other agroforestry methods can benefit sustainable agriculture systems by planting trees, shrubs, forbs, and grasses. These systems support ecosystem services and encourage producers to switch to agroecological agriculture. Natural enemies protect crops by eliminating insect pests
- The research aims to evaluate pest and disease infections in three tomato genotypes under hedgerow systems, comparing performance on windy and protected sides under organic farming practices.

## Methodology:

- The experiment took place at Soroksár research farm (May-September 2022) involving a hedgerow planted in 1999-2000 with local plants. Tomato genotypes (Roma VF, Ace 55, Szentlrinckáta) were grown in Hungary MATE, using random block design with five replicates on either side of the hedgerow. Plots were at varying distances (3m to 15m) from the hedgerow, situated on windy and protected sides.
- **Measured and observed parameters.**
- **Insect damage** (*Leptinotarsa decemlineata* ) and *(Helicoverpa armiguera*)
- **Fungal infection** by (*Phytophthora infestans*)
- **Physical damage** by wild animals, (rabbits: *Oryctolagus cuniculus* and roe deer (*Capreolus capreolus*): Cervidae)
- **Harvested fruit number and weight**.



Insect damage (1)



Fungal infection (2)

wild animals damage (3)

## Discussion:

- Variety plays a vital role in insect damage to potato beetles (*Leptinotarsa decemlineata*), with ACE55 showing less damage than Roma and Szentlőrinckáta. Additionally, tomato varieties differ in susceptibility to cotton bollworm damage, with Szentlőrinckáta being the most vulnerable.
- Fungal damage to tomato genotypes showed no significant variation over the study duration, regardless of distance from hedges. Effective practices can mitigate fungus-related harm.
- Distance notably influenced wild animal damage, with greater distances causing more fruit damage. Tomato variety did not significantly affect animal damage. However, diverse tomato varieties notably affected healthy green and red fruit production, with ACE55 yielding fewer fruits than Roma and Szentlőrinckáta. Farmers should account for distance from animal habitats and implement protective measures against damage.
- The protected side yielded the most healthy red fruit in tomato genotypes. Interactions between varieties, sides, and distances significantly affected healthy green fruits, with location's impact being notable. Despite severe insect damage, the wind-protected side produced more healthy red fruits compared to other treatment sides and distances ($p<0.05$).

## Conclusion:

Hedgerow | Pest and Disease | Tomato

This study evaluates the impact of insect damage, fungal infection, and wild animals on tomato yield in hedgerow systems. Results show that variety and location significantly affect potato beetle damage, with ACE55 being more resistant. The protected side produces healthier red and green fruits, while wind protected areas may be more favorable for pests. The use of wind protected sides in agroforestry hedgerow systems can result in healthier, pest- and disease-free tomatoes.

## Results:

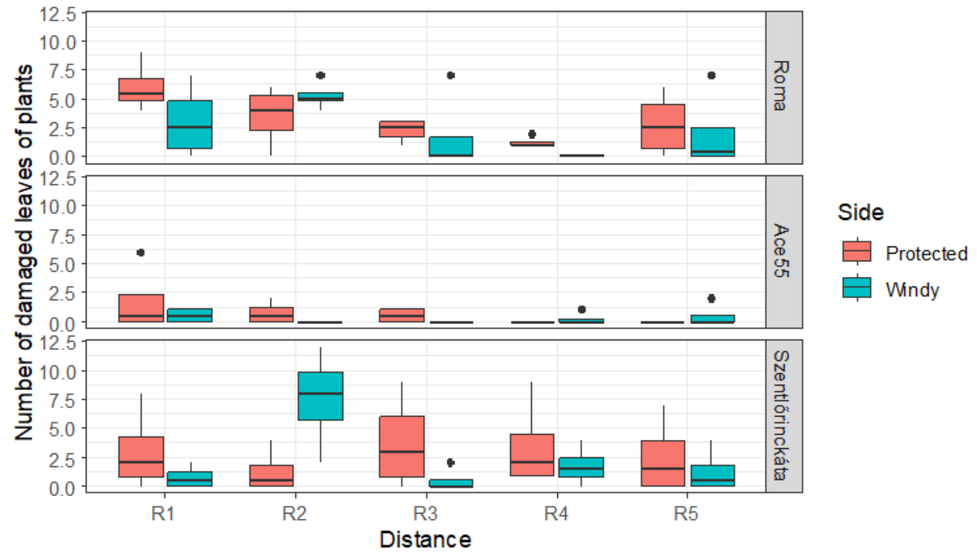



**Figure 1**: A box-plot diagram displays potato beetle damage by variety, side, and distance R, where R means the replications, with median, maximum, minimum damage, and outliers represented by whiskers and dots.

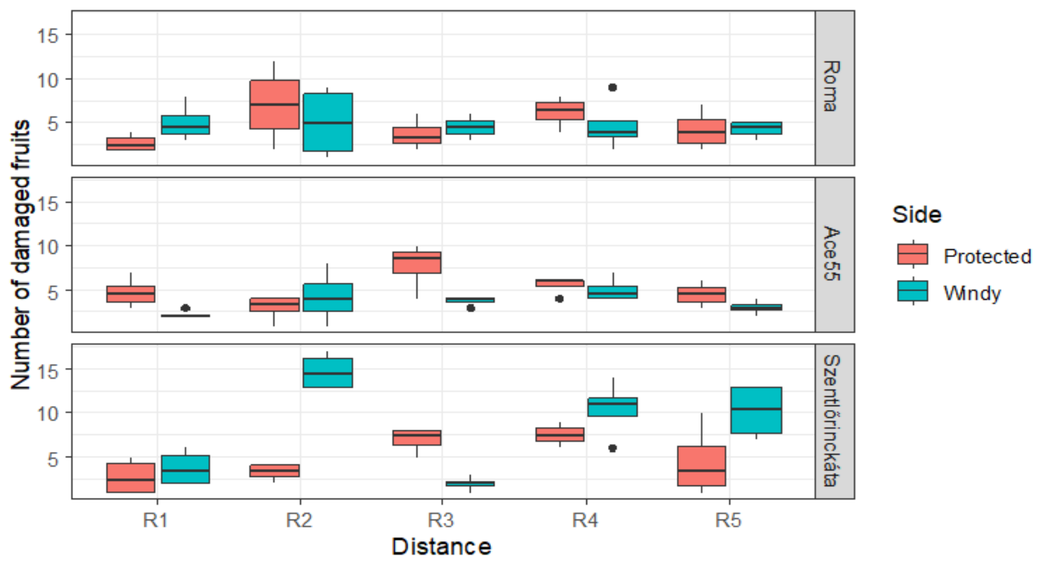



Figure 2: Cotton bollworm damage to fruits by variety is represented by R, where R means the replications, side, and distance is shown in a box-plot diagram, with median, maximum, and minimum damage represented by whiskers and outliers.

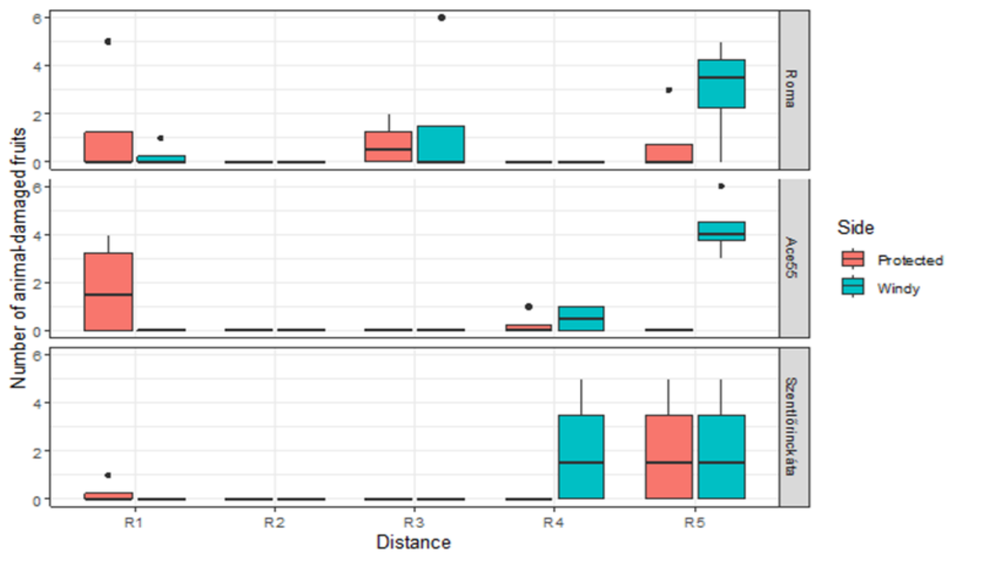



**Figure 3**: The text shows a box-plot diagram of wild animal-damaged rabbits and roe deer fruits, displaying damage by variety, side, and distance, with whiskers representing maximum and minimum damage.

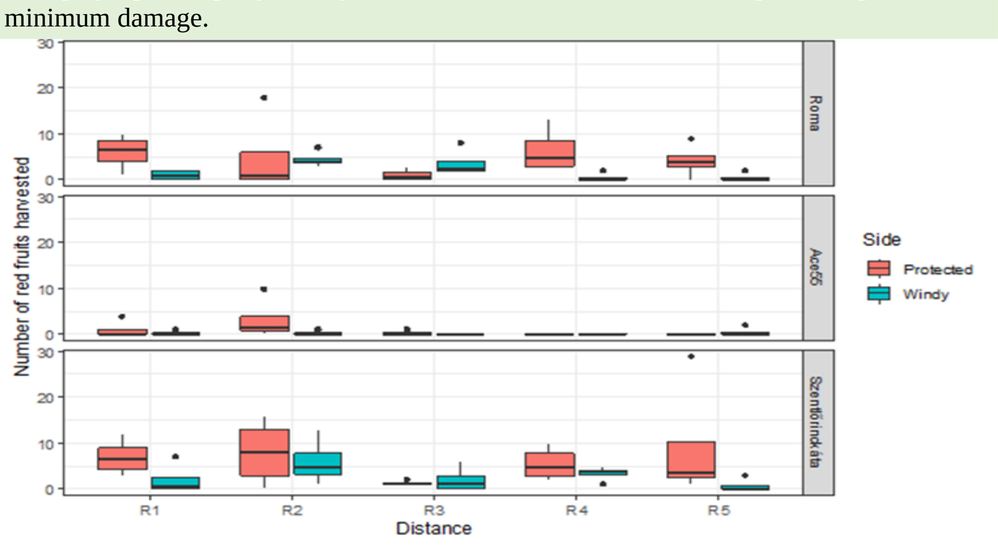



**Figure 4:** Box-plot diagram displays healthy red harvested fruits by variety, side, and distance represented by R, where R means the replications, with median, maximum, minimum damage, and outliers represented by whiskers and dots.

## References:


- Schwarz, D.; Thompson, A. J.; Kläring, H. P. Guidelines to use tomato in experiments with a controlled environment. Frontiers in Plant Science 2014, 5(NOV), 1–16. doi:10.3389/fpls.2014.00625.
- Foolad, M. R.; Merk, H. L.; Ashrafi, H. Genetics, genomics and breeding of late blight and early blight resistance in tomato. Critical Reviews in Plant Sciences 2008, 27(2), 75–107. doi:10.1080/07352680802147353.
- Harterreiten-Souza, É. S.; Togni, P. H. B.; Pires, C. S. S.; Sujii, E. R. The role of integrating agroforestry and vegetable planting in structuring communities of herbivorous insects and their natural enemies in the Neotropical region. Agroforestry Systems 2014, 88(2), 205–219. doi:10.1007/s10457-013-9666-1.