

Protecting and Enhancing Ecosystem Services and Plant Defenses in Tomato Crop

V. Chatzaki *, N. Kamou, A. Papafoti, E. Balampekou, N.Kouloussis, D. Koveos, A. Kapranas

Laboratory of Applied Zoology and Parasitology, School of Agriculture, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece

BACKGROUND

Tomato represents a vital crop in Greece and other Mediterranean countries contributing substantially to their economy and food security. Yet, tomato cultivation faces significant challenges, particularly from pest and disease infestations.

To sustain the productivity and quality of their crops, farmers heavily rely on widespread pesticide and fertilizer applications. However, their increased use poses threats to the environment, disrupting the local ecological balance and biodiversity, as well as jeopardizing human health.

AIM OF THE STUDY

The aim of this project is to establish a resilient, sustainable, reliable, and high-yielding tomato cultivation system. This system will be based on agroecological principles, minimizing external inputs while maximizing ecosystem services through functional biodiversity.

We conducted a study to explore the impact of companion plants, in combination with the beneficial plant growth fungi *Trichoderma harzianum* strain T22 (Trianium®), on biodiversity, pest population, and the agronomic characteristics of the plant on tomato crop. Additionally, we compared our findings regarding biodiversity and pest populations with those of conventional tomato cultivation methods. This comparative approach enables us to better evaluate the effectiveness and impact of our treatments.

METHODS

1. CONVENTIONAL FARM

Tomato field



400 m², Agrimis farm, Epanomi, Greece

2. AGROECOLOGICAL FARM

a. Tomato field with *P. tanacetifolia*



330 m², AUTH farm, Thermi, Greece

b. Tomato field with *F. esculentum*



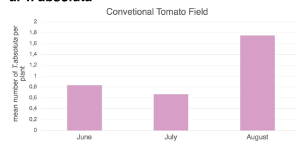
330 m², AUTH farm, Thermi, Greece

RESULTS

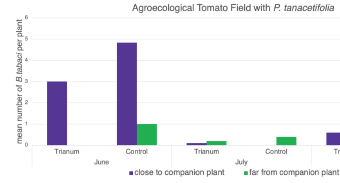
2. PESTS

Agroecological Fields vs Conventional Field

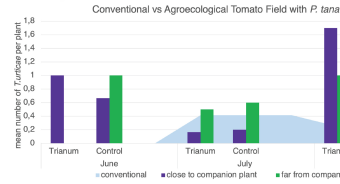
a. *T. absoluta*



b. *B. tabaci*



c. *T. urticae*



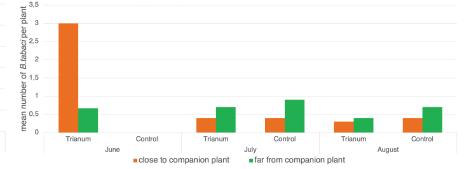
1. BIODIVERSITY

Agroecological Farm vs Conventional Farm

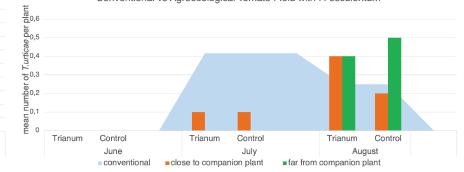


Focusing on the different species of Hymenopteran parasitoids and pollinators

Agroecological Tomato Field with *F. esculentum*



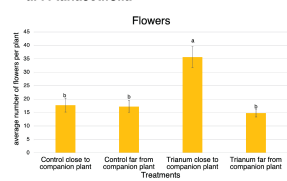
Conventional vs Agroecological Tomato Field with *F. esculentum*



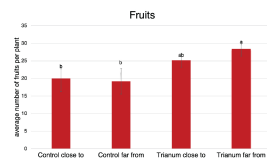
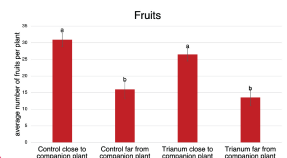
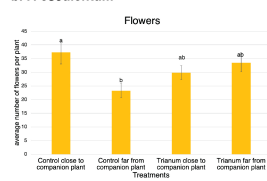
3. AGRONOMIC CHARACTERISTICS

Agroecological tomato field with:

a. *P. tanacetifolia*



b. *F. esculentum*



CONCLUSIONS

- Companion plants initially exhibit higher pest numbers in the nearby tomato plants, which later decrease and stabilize, but increase in the tomato plants farther away. Both companion plants seem to have a positive impact on flower and fruit production in the tomato plants that are close to them.

- T. harzianum* appears to maintain low pest numbers regardless of the proximity of companion plants from the tomato plants. Additionally, it seems to have a positive impact on flowering, both independently and in interaction with companion plants, and it enhances fruit production in a unique interaction with *F. esculentum*.

- T. urticae* populations persist in both conventional and agroecological crops, being generally lower in the latter despite constant pesticide use in conventional farming. However, no *T. absoluta* infestations occurred in agroecological fields, and there were no *B. tabaci* infestations in conventional crops, preventing further comparisons.

ACKNOWLEDGMENTS

Assistant Prof. Vaya Kati for her scientific advice; Moschos Agrimis, who allowed us to conduct this experiment in his field; Giannis Delligiorgakos, Dr. George Floros, Dr. Anastasia Kokkari, Eleni Koutsogeorgiou, Gueye (Abu) Mbaye and Antonis Toulgaridis for their field assistance

CONTACT

Vasileia Chatzaki
vchatzaki@agro.auth.gr
Vasileia Chatzaki

