

Potential of Pheromone and Yellow Stick Traps for Management of *Tuta absoluta* (Povolny) (Lepidoptera: Gelechiidae) in Field and Greenhouses

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(Presented by Academy Member Avtandil Korakhashvili)

Abstract. The South American tomato moth, *Tuta absoluta* (Povolny) (Lepidoptera: Gelechiidae) is an invasive species and one of the most economically important pests affecting tomato crops in the Black Sea regions. In recent years, the rapid growth of *Tuta absoluta* population has caused the significant damage of tomato in Georgia. The aim of this work is the monitoring of *Tuta absoluta*, using pheromone traps and colored sticky traps for the established level of pest in the field and greenhouse farms. The studies were carried out in two geographically and climatically distinct regions, Shida Kartli (550-600 m a.s.l.) and Samtskhe-Javakheti (1000-1100 m a.s.l.) of Western Georgia, in 2020-2022. Pheromone TUA-Optima® for trapping of *Tuta absoluta* (Russell IPM) were installed with Delta traps and yellow traps separately. The high capture rate was observed in the open fields of Shida Kartli using these pheromones at the density of 4 traps/1000 m² with a total of 5 989 adults (min = 44, max = 460), in Samtskhe-Javakheti 1239 adults (min = 3, max = 208) were observed. In greenhouses, a total of 14 676 adults (min = 142, max = 560) were caught in 4 traps/1000 m² of Shida Kartli and 1844 adults (min = 14, max = 77) recorded in Samtskhe-Javakheti. Yellow sticky traps 4 traps/100 m² show significantly high results, where in open field conditions totally 4 144 (min = 25 max = 549) rats were attracted and in greenhouses 2252 adults (min = 37, max = 581) were captured. © 2025 Bull. Georg. Natl. Acad. Sci.

Keywords: *Tuta absoluta*, open field, greenhouse, pheromone, yellow sticky traps

Introduction

The South American tomato leafminer, *Tuta absoluta* (Meyrick, 1917) (Lepidoptera: Gelechiidae) is an economic pest of this crop, which is a highly destructive and harmful to tomato plants and fruits. Its invasion species are known as an oligophagous pest, associated with solanaceous crops. It

causes reductions in yield and fruit quality and quantity. It can be devastating at times, causing 50-100% loss of either greenhouses or fields grown crops under favorable conditions [1].

The larvae of this pests feed on all aerial parts of the plant, destroying vegetative and reproductive organs (leaves, stems, apices, flowers), including

fruits (Miranda et al., 1998) [2] and can cause production losses completely, if no effective control methods are used [3-4]. The species is mainly associated with tomato plants, but recent studies suggest that it can develop on a wider range of cultivated and wild plant species. Solanaceae are the most preferred hosts, and include tomato (*Solanum lycopersicum* L.), potato (*Solanum tuberosum* L.), eggplant (*Solanum melongena* L.), pepino (*Solanum muricatum* Aiton) and black nightshade (*Solanum nigrum* L.) [5-7]. This moth is native to the Andes region (Peru) of South America but can now be found in Europe and North Africa, Latin America and the Mediterranean and Black Sea basin [3, 8].

In Georgia, *T. absoluta* was first found in 2011, and quickly spread across all regions of the country due to its high reproductive capacity. It has become a key pest and is now getting a status of a major pest in Georgia. During vegetation season, *T. absoluta* can develop 10-12 generations making necessary the development of effective control measures [9-11]. The aim of this work is to monitor *T. absoluta*, using Pheromone traps and color sticky traps for the established level of pest in the open field and greenhouse farms.

Material and Methods

The studies were carried out in Shida Kartli (550-600 m a.s.l.) and Samtskhe-Javakheti (1000-1100 m a.s.l.) in western Georgia from 2020 to 2022. These two regions are different geographically and climatically and we assume that the biological characteristics of this insect are also different.

Pheromone TUA-Optima® for trapping *T. absoluta* was obtained from Russell IPM and installed with Delta traps and yellow traps separately.

Results

Experimental data showed that the high capture rate observed in open field conditions of Shida Kartli, with these pheromones at the density of 4

trap/1000 m² in totally 5989 adults, (min=44, max=460), in Samtskhe-Javakheti 1239 adults (min=3, max=208) were observed (Fig. 1). In greenhouses totally 14676 adults (min=142, max=560) were caught in the with 4 trap/1000 m² of Shida Kartli and 1844 adults (min=14, max=77) in Samtskhe-Javakheti (Fig. 2).

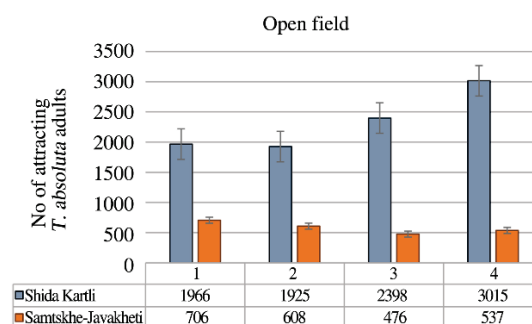


Fig. 1. Captured adults of *T. absoluta* in open field conditions.

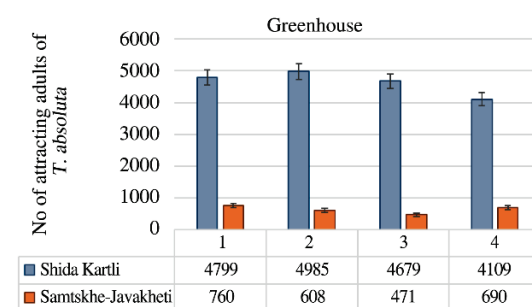


Fig. 2. Captured adults of *T. absoluta* in greenhouses.

Yellow sticky traps 1 traps/100 m² show significant high results, where in Shida Kartli in field condition attractive adults totally archive 4144 (min=25 max=549) and in Samtskhe Javakheti 2252 (min=37 max=581) exemplars were observed.

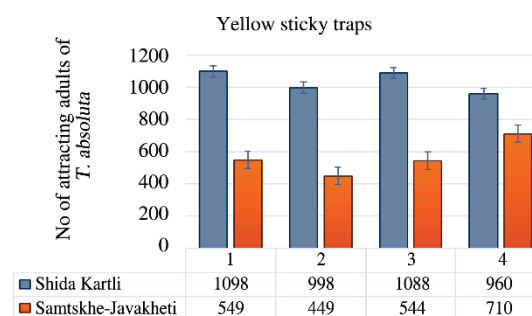


Fig. 3. Captured adults of *T. absoluta* by yellow sticky traps in open field.

Table. Tukey's multiple comparisons between total numbers of captured *T. absoluta*

Plot	Mean diff.	95.00% CI of diff.	Significant	Summary	Adjusted <i>P</i> value
Greenhouses	9.917	6.90 to 12.93	Yes	****	<0.0001
Shida Kartli (field)	13.29	10.27 to 16.31	Yes	****	<0.0001
Samtskhe-Javakheti (field)	3.375	0.36 to 6.39	Yes	*	0.0247

There was a significant statistical difference between the proportion of greenhouses and open field in the captured adults of *T. absoluta* (Table). In this case, the sticky trap proved to be the high effective.

Conclusion

The discovery of the aggregation pheromone has allowed researchers to design lures which attract the *T. absoluta* to the vicinity of the lure types location. The results obtained revealed that,

Pheromone TUA-Optima® are very effective types of traps for monitoring *T. absoluta* population. Overall, our results suggest that *T. absoluta* monitoring traps can be further improved to reduce cost and labor associated with deployment and maintenance.

Acknowledgements

The research was supported by Samtskhe-Javakheti University, Georgia.

ენტომოლოგია

ფერომონიანი და ყვითელი საჭერების გამოყენების პოტენციალი *Tuta absoluta*-ს (Povolna) (Lepidoptera: Gelechiidae) მენეჯმენტისთვის ღია გრუნტსა და სათბურში

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(წარმოდგენილია აკადემიის წევრის ა. კორაბაშვილის მიერ)

ნაშრომში წარმოდგენილია პომიდვრის სამხრეთამერიკული ჩრჩილი – *Tuta absoluta*-ს (Povonny) (Lepidoptera: Gelechiidae) ინვაზიური, ეკონომიკური მნიშვნელობის მავნებელი, რომელიც საქართველოში არის გავრცელებული და აზიანებს პომიდვრს როგორც ღია გრუნტში, ასევე სათბურში. სამუშაოს მიზანია *Tuta absoluta*-ს მონიტორინგი, ფერომონიანი და ფერადი წებოვანი საჭერების გამოყენებით, დასავლეთ საქართველოს გეოგრაფიულ და კლიმატურ სხვადასხვა ორ რეგიონში, შიდა ქართლსა (550-600 მზდ.) და სამცხე-ჯავახეთში (1000-1100 მზდ.) მონიტორინგი ჩატარდა 2020-2022 წლებში. ფერომონი TUA-Optima® *Tuta absoluta*-ს (Russell IPM, UK) პეპლების დასაჭერად ჩამოიკიდა როგორც დელტა ტიპის, ასევე ყვითელი საჭერები ცალ-ცალკე. ფერომონით მიზიდული პეპლების რაოდენობა შიდა ქართლში, ღია გრუნტში შეადგენდა 5989 ეგზემპლარს, სამცხე-ჯავახეთში – 1239, ხოლო სათბურში, შესაბამისად – 14676 და 1844 მიზიდულ პეპელას. შიდა ქართლში, ღია გრუნტში ყვითელ საჭერზე მიზიდული პეპლების რაოდენობა შეადგენდა 4144, ხოლო სამცხე-ჯავახეთში – 2252 ცალს.

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Received January, 2025