AgroSym

BOOK OF PROCEEDINGS

IX International Scientific Agriculture Symposium
"Agrosym 2018"
Jahorina, October 04-07, 2018

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Impressum

IX International Scientific Agriculture Symposium „AGROSYM 2018“

Book of Proceedings Published by

University of East Sarajevo, Faculty of Agriculture, Republic of Srpska, Bosnia
University of Belgrade, Faculty of Agriculture, Serbia
Mediterranean Agronomic Institute of Bari (CIHEAM - IAMB) Italy
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http://agrosym.ues.rs.ba

CIP - Каталогизација у публикацији
Народна и универзитетска библиотека
Републике Српске, Бања Лука

631(082)

INTERNATIONAL Scientific Agricultural Symposium "Agrosym 2018" (9 ; Jahorina)
Book of Proceedings [Elektronski izvor] / IX International Scientific Agriculture Symposium "Agrosym 2018", Jahorina, October 04 - 07, 2018 ; [editor in chief Dušan Kovačević]. - East Sarajevo =Istočno Sarajevo : Faculty of Agriculture =Poljoprivredni fakultet, 2018

Način pristupa (URL):
http://agrosym.ues.rs.ba/index.php/en/archive. - Bibliografija uz radove. - Registar.

ISBN 978-99976-718-8-2

COBISS.RS-ID 7815448

IX International Scientific Agricultural Symposium "Agrosym 2018"
Jahorina, October 04-07, 2018, Bosnia and Herzegovina

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PREFACE

A Word from the Editor-in-Chief

Dear colleagues,

In your hands are the Proceedings of the 9th International Scientific Agricultural Symposium "AGROSYM 2018" held on 4-7 October 2018 in Jahorina, Bosnia and Herzegovina. The Symposium gathers about 1200 participants from 85 different countries and organizers received over 1200 abstracts/full papers. Symposium themes covered all branches of agriculture and were divided into seven sessions: 1) Plant production, 2) Plant protection and food safety, 3) Organic agriculture, 4) Environmental protection and natural resources management, 5) Animal husbandry 6) Forestry and Agro-forestry, and 7) Rural Development and Agro-economy.

In the plenary lectures was presented the importance of new information and communication technologies for agriculture in the 21st century and biological protection in plant production. Furthermore, a particular attention was devoted to avoiding knowledge waste through networking and partnership.

Agriculture has a complex relationship with natural resources and the environment, thus attributing specific environmental effects to agriculture is difficult and not fully understood. Today, it is obvious that conventional methods of agricultural production, in addition to providing sufficient food and other products, have led to a number of negative impacts, including direct or indirect effects on human health. Excessive use of agrochemicals can cause various disorders in the biological equilibrium of agroecosystems and beyond. These negative impacts raise serious questions about long-term sustainability of high-input agriculture. Measures to protect soil and water in agriculture include comprehensive and complex undertakings and pre-planned measures. These problems are a constant reason for 'popularisation' of all ecological trends in agriculture (e.g. organic agriculture, permaculture, biodynamic agriculture, conservation agriculture, regenerative agriculture, integrated farming, agroecology, etc.). Meanwhile, there are also calls for a genuine, deep transformation of agro-food systems that goes beyond 'ecologisation' of agricultural production. All these developments in agricultural research field, as well their implications on farmers' fields, were discussed during the 4 days of AGROSYM 2018.

All papers included in the Proceedings were peer-reviewed. Full texts of the accepted contributions are available in electronic form on AGROSYM website (http://agrosym.unssa.rs.ba).

I hope that the Proceedings will be useful to many agriculturalists and to those engaged in related fields and enable better collaboration of scientists, researchers and producers.

Many thanks to all the authors, reviewers, session moderators and colleagues for their help in editing the Proceedings "AGROSYM 2018". Special thanks go to all co-organizers for their unselfish collaboration and comprehensive support.

East Sarajevo, 07th October 2018

Prof. Dušan Kovačević, Editor-in-Chief

OCURRENCE OF *TETRANYCHUS URTICAE* ON SOUR CHERRY TREES IN SOUTHEASTERN OF MACEDONIA

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Abstract

The two-spotted spider mite is probably one of the most polyphagous arthropods that feeds on tree fruits. It is distributed worldwide and is an economic pest of many crops. Its innumerable hosts include many weeds, field crops, ornamental plants, vegetables, forage crops, small fruits and tree fruits (apple, pear, peach, nectarine, apricot, cherry (sweet and sour) and plum). The research was conducted during 2017 in sour cherry orchards in southeastern of Macedonia (the region of Stip, Strumica and Gevgelija), before and after the harvest of the sour cherries (01.06. – 30.09.2017). Scouting for mites began prior the harvest. The method of monitoring two-spotted spider mite motile populations consists of sampling 10 leaves from 10 randomly selected trees (100 leaves) on an area of two ha. To estimate the number of mites per leaf, we count the number of leaves that have two or more two-spotted spider mite motile from each sample and follow the presence-absence sampling method look-up table. The results showed that after harvesting the sour cherries, during the summer and autumn, the number of two-spotted spider mite increases and exceeds the economic threshold (8-10 spiders on the leaf), so chemical treatment is required in order to control the population of the spider. The problem in the Republic of Macedonia is that sour cherries producers rarely perform postharvest treatment of the sour cherry trees, so the two-spotted spider mite population increases, which in turn contributes to a reduced yield of sour cherries.

Keywords: *two spotted spider mite, sour cherry, presence, acaricides.*

Introduction

The two-spotted spider mite is probably one of the most polyphagous arthropods and the most destructive within the family of the Tetranichidae (Vassiliou & Kitsis, 2013). It is distributed worldwide and is an economic pest of many crops, having a host range of more than 1100 species of plants (Paulo et al., 2015). Its innumerable hosts include many weeds, field crops, ornamental plants, vegetables, forage crops, small fruits and tree fruits (apple, pear, peach, nectarine, apricot, cherry (sweet and sour) and plum) (Beers H. E. and Hoyt C. S., 1993: http://jenny.tfrec.wsu.edu). *T. urticae* is particularly dominant and destructive in intensive, high-yield cropping systems, and affects crops by direct feeding. In cases of severe infestations, it reduces the area of photosynthetic activity and causes leaf abscission (Gorman et al., 2002). Two-spotted spider mite can be a problem on cherries in hot and dry years. Bronzing is the most common damage caused by high populations of two-spotted spider mites. This phenomenon can cause a reduction in photosynthesis and fruit bud initiation. Bronzing caused by two-spotted spider mite is often more gray in color than bronzing by European red mites (*Panonychus ulmi* Koch). Although bronzing presents an obvious challenge, one of the biggest threats of mites in sour cherries in a hot, dry year is "firing." Firing is an immediate result of increased temperatures and droughty conditions, most often in combination with high mite populations. Firing results in a collapse of a portion of the tree, this malformed segment can be a branch, a terminal, or a whole section of the tree. The leaves of a fired part of a tree turn brown very quickly (Fig. 1), with no prior wilting, and the overall effect is similar to fire blight in apples. Although firing may occur with low mite populations, it is found most commonly, where mite numbers are high.

Figure 1. Sour cherry trees infested with *Tetranichus urticae* in the region of Gevgelija

A major problem in the control of *T. urticae* is the response to develop resistance to many acaricides (Abd El-Moneim et al., 2012). Also, the cherry growers are often faced with the crucial decision of applying an acaricide before or after harvest. If growers intend to spray for mites before cherry harvest, the pre-harvest intervals of most acaricides are 14 days or longer, which is an important factor in the decision making process. Another confounding factor of pre-harvest mite control is that often the mite population is lower early in the season, and the numbers may not warrant an acaricide at that time. The problem in the Republic of Macedonia is that sour cherries producers rarely perform postharvest treatment, so the two spotted spider mite population increases, which in turn contributes to a reduced yield of sour cherries.

Material and Methods

The research was conducted during 2017, in six sour cherry orchards in the region of Stip, Strumica and Gevgelija (two orchards in each region), in southeastern of Macedonia, in the period of 01.06. – 30.09.2017. Scouting for mites began prior the harvest. This pre-harvest monitoring period should begin early enough to consider the long acaricide pre-harvest intervals. A fairly reliable and easy-to-use sampling method for mites is called presence-absence, or binomial, sampling (Jones, 1990). Rather than counting the number of mites on leaves, which is difficult because of their small size, presence-absence sampling requires only that the scout determine whether pest mites are present on each leaf sampled. The method of monitoring two-spotted spider mite motile populations (Morphological Identification of Spider Mites (Tetranychidae) Affecting Imported Fruits: https://www.nappo.org) consist of sampling 10 leaves from 10 randomly selected trees (100 leaves) on an area of two ha. Because spider mites are first, found in the lower center and at the top of tree canopies, spreading to the periphery over time, leaves are selected from inside the canopy, as well as from the edges. Using a 10–20x magnifying hand lens, the number of leaves from each infested tree is counted. The look-up table (Table 1) was used to estimate the number of mites per leaf. The estimated mite density for all 10 trees is collected and divided by 10 to obtain an average for the trees sampled in the block.

Table 1. Web spinning spider mite presence-absence sampling method look-up table (Jones, 1990).

Number of leaves out of 10 with at least one mite present*	Estimated number of mites per leaf
1	0.1
2	0.4
3	0.7
4	1.1
5	1.7
6	2.4
7	3.5
8	5.2
9	8.8
10	--

*Note: for each tree sampled, determine the number of leaves out of 10 with at least one mite present

On the second orchard in each site, after harvesting the sour cherries, acaricide treatment was performed. Two active substances were used: Dimetatoate, with a concentration of 0.15% (13.09.2017) and Abamectin, with a concentration of 0.1% (28.09.2017). After the treatment the leaves of the sour cherries were surveyed again with presence-absence sampling method.

Results and Discussion

During 2017, the control plantations of sour cherries in regions Stip, Strumica and Gevgelija, provided the following condition (Table 2).

Table 2. Average number of two-spotted spider mites on 100 overviewed leaves of sour cherry, in the control plantations, in Stip, Strumica and Gevgelija.

Stip									
	01.06.	15.06.	30. 06.	15.07.	30. 07.	14.08.	30.08.	15.09.	30.09.
Avg	0,65	0,89	2,78	3,26	4,68	5,03	7,92	8,08	4,52
Strumica									
	01.06.	15.06.	30. 06.	15.07.	30. 07.	14.08.	30.08.	15.09.	30.09.
Avg	1,35	2,01	2,46	2,84	4,01	5,03	7,0	8,08	4,88
Gevgelija									
	01.06.	15.06.	30. 06.	15.07.	30. 07.	14.08.	30.08.	15.09.	30.09.
Avg	2,30	3,17	3,96	4,66	6,11	5,39	8,08	8,80	4,88

According to the obtained results (Table 2), the highest occurrence of the two-spotted spider mite is on the plantations in the region of Gevgelija. This part of Macedonia is characterized by higher average temperatures, so there are more favourable conditions for the development of the two-spotted spider mite. In all examined regions, the number of mites increases in warmer months of the year, so its number is the highest in late August and early September.

Biological and cultural control for spider mite management should be the goal of every orchard pest manager. In many situations, chemical control is unnecessary and may only make the mite problem worse. The use of acaricides will eliminate the beneficial predatory mites, which are capable of keeping spider mite populations below economically damaging levels. Another reason to avoid chemical control is that populations of two-spotted spider mites have developed resistance to acaricides (Rothwell N. (2014). Managing two-spotted

spider mites in cherries: http://msue.anr.msu.edu). However, when the number of the two spotted spider mite increases and exceeds the economic threshold (8-10 spiders on the leaf), chemical treatment is required in order to control the population. The use of resistant cultivars is considered the ideal control method because they maintain the mite populations below levels of economic damage, minimize the environmental impact of pesticides at no extra costs to the farmer, and serve as an auxiliary tool in integrated pest management (Karlec et al., 2017).

The first treatment of the sour cherry was done on 13.09.2017, with the active substance Dimethoate, in a concentration of 0.15%. After treatment, it was noted that the number of two-spotted spider mites was reduced by almost 50% (Table 3). Another treatment with the active substance Abamectin was performed on 28.09.2017, in a concentration of 0.1%. When checking the number of two-spotted spider mites, it was determined that its number was reduced to 70% from the from the original population level, before first treatment (Table 3).

Table 3. Average number of two-spotted spider mites on 100 overviewed leaves of sour cherry, in the plantations treated with Dimethoate (0,15%) and Abamectin (0,1%) in regions Stip, Strumica and Gevgelija.

Active substance	Stip		Strumica		Gevgelija	
	15.09	30.09	15.09	30.09	15.09	30.09
Dimethoate	4,68	2,78	4,01	2,44	4,66	2,46
Abamectin	2,59	1,53	3,17	1,31	3,26	1,87

These results indicate that after the harvesting the sour cherries, much more favourable conditions are created for the development of the two-spotted spider mites, thus increasing their number on sour cherries. Moreover, when it exceeds the economic threshold of harmfulness, it is desirable to use chemical means for destroying the spider mites. The problem in the Republic of Macedonia is that sour cherries producers rarely perform postharvest treatment of the sour cherry trees, so the two spotted spider mite population increases, which in turn contributes to a reduced yield of sour cherries. Because of these issues, we recommend applying an acaricide after harvest, when the mite numbers are higher and when the pre-harvest intervals are no longer a concern.

Conclusions

Based on the above the following conclusions can be made:

- The number of the two-spotted spider mites is the highest in the region of Gevgelija, where there are also the most favourable conditions for its development.
- The number of two-spotted spider mites increases in the summer months, reaching the peak at the end of August and early September.
- Treatment of sour cherries with acaricides, after harvesting is necessary to reduce the number of two-spotted spider mites. In this way, the damage from the mites will be reduced and the yield of the crop will increase.

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