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Preliminary communication

Aceria kuko (Kishida), (Acari:Eriophyidae) new type of pest in the fauna of Macedonia and the success in chemical measurements of protection

Abstract

In 2014, in Macedonia, on the plant goji berry (Lycium chinense Mill.) which is rapidly expanding in the plantation and the surroundings of village Krivogashtani, but only on the seedlings that have been imported, we found symptoms of thickening on the leaves, which haven`t been determined on this new plant and its plantations (of goji berry) until today. Based on the laboratory analysis we found that the cause of these changes was the goji gall mite Aceria kuko Kishida. We have not determined the onset of this new mite, when reviewing other plantations of this plant, in Republic of Macedonia. During 2014 and 2015 we made an effort to protect these plants by treating the plants with the following acaricides and insecticides, insecticide-acaricides: Alverde (metaflumizen), Ethiol prah 5 (malathion), Talstar 10 EC (bifenitrin), Perfecthion (dimetoat), Vertimec 0.18 EC (abamectin). Based on the results we found that the acaricide Vertimec 0.18 EC and insecticide-acaricide Ethiol prah 5 exhibited the highest efficiency index, which amounted 76.3%,and 73.1%. While insecticide Perfecthion showed slightly lower efficiency index which amounted 56.5%. In 2015, doing the experiments we found that the greatest efficiency index showed insecticide Ethiol prah 5 with an index of efficiency of 72.9%, slightly less efficiency 71.6 % has been exhibited acaricide Vertimec 0,18 EC. Insecticide Alverde exhibited the lowest index of efficiency and in experiments in year 2014 it was 50.3% and 2015 it was 46.0%.

Key words: *Goji gall mite, Aceria kuko, identifications, chemical protection.*

Introduction

In the year 2014 some localities in Republic of Macedonia began to cultivate goji berry on plantations. Latter from 2016, there is a company that is specialized in production and purchase of the product also one can make bound by agreements such that sells seedlings and production technology and purchase of the product. From this year, Republic of Macedonia gives subsides to the producers of this type of goji berry. Growing goji berry has been more and more massive. The cultivation of this plant is an attraction because it has guaranteed purchase of the product, more precisely said, once when the contract for seedlings is assembled with the company/person than an agreement for purchase of the product is made too.

In Republic of Macedonia, purchase of the final product is one of the major problems in the agricultural production of the other crops. Goji berry is a new plant that is spreading massively all over Macedonia, because of the commercial production and because of massive planting in several regions. Earlier, the seedlings were imported and now, small-type producers who are trying to cultivate just 1 or 2 plants and produce for themselves, purchase plants from the nurseries which are imported from of neighboring countries or from other distant countries that produce such seedlings. Because of that, there is great possibility of transferring disease agents over seedlings. Different kind of insects can be transferred too, over eggs, larvae, pupae or small, tiny imagoes or pathogens fungi through conidia. Spores and other fungi are possible to transfer and possibly other pathogens even more difficult can be determined by other patho-

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gens such as bacteria, viruses and others. The possibility of some new parasite or pests that can be transferred from the planting material (seedlings) is the most frequent case. Transferring diseases trough the seedlings is always possible, since pest, or their eggs or their larvae, or pupae, even the small adults are very hardly noticed. Sellers of the seedlings of these plants argue that the cultivation is relatively easy and there are no attack of pathogens and pests, which is certainly not true, because according to our research, there are agents of the diseases and also harmful insects or pests that can threaten the production of this nearly new plant in Republic of Macedonia. The cultivation of these new plants may threaten some domestic animals and poultry, as well as wild animals such as deer, rabbits and some birds etc.

Polyphagous diseases and pests are especially dangerous and they are representing the major threat for the crops that are massively grown for a long time in Republic of Macedonia. These crops are most important and notable cultures as by the surface on which they are planted (or the number of hectares), so by the economic significance of an export culture or the actual revenues on which depends the survival of farmers. Such culture that is host of this mites is the plant *Capsicum annuum* more known as pepper, and eventually other representatives from the family *Solanaceae* such as potato, tomato as well as the plant known as black nightshade - *Solanum nigrum* from spontaneous flora, and as a weed which occurs in nature (Anderson and Ostoja-Starzewski, 2010).

Seller of the goji berry seedlings, for marketing goals, claim that the production of this plant can be carried out practically without using measures of protection, which is of course incorrect and for organic production it is necessary to implement measures of protection such as treatment with extracts of some herbs and other means permitted by the law. Parasites and pests that can cause serious and extensive damage attack plant goji berry. Therefore, the subject of this research for the first time in the Republic of Macedonia is to identify the presence of goji gall mite *Aceria kuko* (Kishida), as well as the success of chemical protection measures. *A. kuko* is easy reproductive and maintainable goji gall mite, especially if the goji berries are produced in greenhouses. The probability of transmission is high. It is very difficult to protect the goji berry from this goji gall mite under greenhouse conditions.

For the first time, in 1927, in Japan goji gall mite *A. kuko* is identified. Later this mite disseminated in neighboring countries and in other Asian countries such as China (Kuang,1983; Hong et al. 2006), South Korea (Kim, 1968; Yiwongu, 2006), Taiwan (Manson, 1973; Huang, 2008). It is also identified in some European countries: Netherlands, United Kingdom (Preston et al.2002; EPPO RS, 2008/222), Germany (EPPO RS, 2011/218; EPPO RS 2012; Albert et al. 2013); Greece (European Commissions, 2012); Hungary (Ostoja-Strazewsky, 2009; Ripka, 2015); Slovenia (European Comission, 2012; Seljak, 2013); Cyprus (Soraphides, 2014); Romania (Mencinicopschi and Balan, 2013 a, b, c; Balan et al. 2014; Chireceanu et al, 2015; Ciceoi and Mardara, 2016). This mite is identified in Serbia in 2014 (Vidović et al. 2015).

In the world of the goji berry plants, there are 7 different kinds of *Aceria* mites (Ostoja-Starzewski, 2009; Vidovic et al. 2015). Apart from these seven species that only attack goji berry, there are other representatives of the *Aceria* kind that attack other plants. It is necessary to carry out specific test methods to identify this kind of mite, considering the fact that it has similarities with other representatives of *Aceria* family. Measurements for successful protection of this very harmful mite are insufficiently known in Republic of Macedonia as well as in the rest of the world. Because of that, by using experiments, in this research we claimed the success of chemical protection with some acaricides, insecticides, insecticide-acaricides. The application of chemical substances has been and remains the dominant mode for suppression and protection against harmful mite, in the production of agricultural and ornamental plants (Petanovich et al, 2010). Therefore, in this research we were using chemicals and acaricides. This is especially

important because of the emergence of resistance and other adverse effects on human health, environment and effects on beneficial organisms and so on. In more advanced countries, slowly but surely, the compounds that express these unfavorable properties are eliminated.

In some countries, if attack of this mite it is identified, it is practiced to remove all the plants from the plot plantation, although according to Directive 2000/29 /EC *A.kuko* is not marked as quarantine mite.

There is need to act quickly to prevent the spread of mites to other locations or to other host plants in Macedonia and in the world too.

Materials and methods

tPercentage of attacks and efficiency index of the acaricides, insecticide-acaricides and insecticides are determined. The effectiveness of the acaricides, insecticide-acaricides and insecticides is calculated according to the method of Abbott (1925), and Puntener (1981).

Table1. Review of the examined acaricides, insecticide-acaricides and insecticides and variant in research

Number	Acaricide/ Insekticide	Active ingredient g/kg g/l	Concentration %, dose, g/ha, l/ha	Producer
1	Alverde	240 metaflumizen	0.25 l/ha	BASF
2	Etiol prah 5	50 malation	20 kg/ha	Galenika Fitofarmacija
3	Perfecthion	400 EC dimetoat	0.1%	BASF
4	Talstar 10 EC	10,8 bifenitrin	0.01 %	FMC
5	Vertimec 0,18 EC	abamectin	0.075 %	Syngenta
6	Check	-	-	-

Results and discussion

In Republic of Macedonia from 2013 to 2014, there is a massive trend of popularization of cultivation of these new and promising goji berry plants. Along with these new plants there is a risk of transmission of new pathogens and pests. Thus, by using the seedlings for these plants the new-emerged mites *A. kuko* is transferred, which we found on the newly planted seedlings in the plantation of 0.1 ha in village Krivogashtani. The attack symptoms are manifesting on the leaves with the appearance of gall and thickening due to attack of this new mite from the new-presented plants. Initially, on the attacked spot on the leaves, small freckles/spot were formed, with bright yellowish and greenish color. Later the thickening of the back of the leaves emerged. Within the development and growth of the plant, the number of thickening increased, and such thickenings of the leaves are more convex to the underside of the leaves and have a yellowish, yellow-green color on the upper side of the leaves. On the upper side (face) of the leaves there wasn`t any kind of bulges, but only annular changes in color (purple) gradually emerged on the spot where galls were formed. Within these changes the development and nutrition of the mites takes place. The symptoms on the leaves look like yellowish bulges that are visible on the underside (on the back) of leaves and darkly purple discolorations on the upper side of the leaf (on the face). Around of dark part, a yellowish thin ring can be noticed, just around the thickening, which is also in the form of bold ring, and the center is lighter

to darkly yellow (Figure 1). Colliding more such thickening spots can increase the damage to the leaves and thus can increase the overall level of damage in the development and the final product. This occurs because of the reduced leaf mass (foliage) and the possibility of formation of chlorophyll fades, which matches with the allegations of Chinone (1968) and Kim (1965). This mite destroys the leaves and reduces photosynthesis so that it reduces the leaf mass and therefore if attacks massively on the leaves reduces the photosynthesis of the plant. With mite leaves it will be no final product formed because the flower fell off or there were formed only rare small fruits which only reduced the final harvest of the product. The attack and thickening can occur on any part of the leaf.

While noticing changes like these, the farmers started to treat the plants with fungicides even when there was small amount of these changes. In spite of treatments, the number of such thickening has been increasing on the leaves. Farmers who have cultivated this plant were carrying out a treatment with Ridomil Gold (metalaxy + mankoceb), assuming that this is the causative agent of the disease but there was no success of protection. Such thickenings were hard when checking hardness. When reviewing of such changes on the leaves, one can see whether there are present larvae or are these changes caused by the attack of pests or pathogens. The damages from the attack of the mites may be of direct emergence of residues and pesticide residues on the goji berry due to treating of plants for protection against attacks of these mites. The presence of pesticides is identified in some countries and in some cultures, which are rated as an organic product. The danger and harmfulness of this mites by spreading on the leaves of the pepper plant as a host plant is identified in the world, or better said in the countries where the mites is present for a longer period than here. So, on the leaves the developmental stages and larvae can be seen. Considering the fact that the pepper is economically important plant in our country, if the mites are spread to the peppers a lot of damage may occur. In particular, the mites are developing under a favorable conditions which are relative humidity of 66 % and a temperature of 23^{0}C. In such conditions, the development is done from 7 to 12 days. The results of the experiment with pesticides are presented in table 2.

Table 2. Efficiency of acaricides and insecticides in protection of goji berries against *A.kuko*

No.	Insekticides/Acaricides	Intensitu of atack %		Eficaccy %	
		2014 year	2015 year	2014 year	2015 year
1	Alverde	41.6	49.3	50.3	46.0
2	Vertimec 0,18 EC	19.8	25.9	76.3	71.6
3	Etiol prah 5	22.5	24.7	73.1	72.9
4	Perfecthion	36.4	42.3	56.5	53.7
5	Talstar 10 EC	39.2	47.7	53.2	47.8
6	Check	83.8	91.4	-	-

According to the results shown in the Table 2, it is seen that in 2014, the highest efficiency of 76.3% proved acaricide Vertimec 0.18 EC, while the lowest efficiency of 50.3% proved insekti-

Figure.1. *A. kuko* attack on the leaves, galls on *Lycium sp.*
Photo by author

cide Alverde. Little less efficiency proved acaricide Perfection with 56.5% and insecticide Talstar 10 EC with 53.20%.

In the experiments in 2015, the greatest efficiency in protection of goji bery from *A. kuko* showed Etiol prah 5 with 72.9% and acaricide Vertimec 0.18 EC. with 71.6%. In this year, the lowest efficacy is manifested by insecticide Alverde with index of 46.0 % and insecticide Talstar 10 EC with 47.8%.

Conclusion

First time we have found an attack of *Aceria kuko* Kishida on the goji berry plant, which was also the first identification of this mite in the Republic of Macedonia. The goji galls mites was identified on young field, let's say just planted plantation of 0.1 ha in the area of village Krivogashtani in 2014.

Moreover identification of the mites, we started and tested the efficiency of protection measures, especially the chemical protection measures. In the experiments carried out in 2014, highest efficiency of 76.3 % showed the acaricide Vertimec 0.18 EC (abamectin) and lowest with 50.3% was the insecticide Alverde (metaflumizen).

In experiment carried out in 2015, the highest efficiency of 72.9% showed the insekticide Etiol prah 5 (malathion), and lowest efficiency of 46.0% showed the insekticide Alverde (metaflumizen).

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