The risks assessment of *Aceria kuko* (Kishida) and *Halyomorpha halys* (Stal) pests for the Romanian goji growers

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1 Introduction

The global trade is one of the leading causes of the introduction of non-native pest species, which may became invasive on a new territory (Colunga-Garcia, 2013). The total "*monetary impacts of invasive species in Europe amounts 12.5 billion EUR/year*" (Kettunen *et al.*, 2008). *Aceria kuko* and *Halyomorpha halys* were first time recorded in Europe in 2007, the goji gall mite (*A. kuko*) being illegally imported in UK, via Netherlands from China by orders by mail (Giltrap *et al.*, 2009; Anderson and Ostoja-Starzewski, 2010), while the marmorated stink bug (*H. halys*) was first time identified around the city of Zürich in Switzerland (first adult captured in a light trap in 2004 in Liechtenstein), probably imported on ornamentals or fruit trees (Wermelinger *et al.*, 2008). The import from third countries into the EU of Solanaceae and other species intended for planting is prohibited according to Dir. 2000/29/EC, but the parcels ordered by mail and the packaging used for different products escape the pest and disease control services (DEFRA, 2008). *A. kuko* mite was first time mentioned in Romania in 2013 (Mencinicopschi *et* Balan, 2013; Balan *et al.*, 2014) and *H. halys* stink bug in 2014 (Macavei et al., 2015). The impact of both pests was ignored, but our field observations indicate that both species are a potential threat for Romania and Europe. Romania is one of the main producers of goji fruits (30 – 100 ha), production partially exported into Europe.

We consider that monitoring the presence of the goji gall mite in the Romanian Goji plantations and research concerning the changes in the *A. kuko*`s and *H. halys*`*s* biology has a strategic importance and should be regarded as a biosafety measure not only for Romania, but for entire Europe. In the same time, in 2015 and 2016, *H. halys* produced major damages not only to goji, but also to corn, vegetables and some fruit species and also become a nuisance pest in the residential area of Bucharest.

2 Methods & Materials

The experimental field of the University of Agronomic Science and Veterinary Medicine of Bucharest, the goji plantation and the multiplication area

$$F(\%) = \frac{n}{N} x100$$

The attack frequency **F (%)**
N = the number of plants observed, **n** = the number of plants showing specific attack symptoms

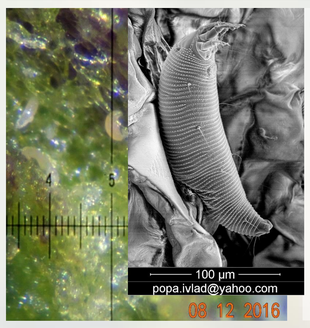
$$I(\%) = \frac{\Sigma(ixf)}{n}$$

The attack intensity I(%)
i = % of plants with attack symptoms, **f** = the no. of plants with the specific % of attack, **n**= the total no. of plants attacked.

6 year old goji plants. Initially, 30 goji plants, of two different biotypes, were imported from China, via Hungary. In the next years, plants were multiplied by cuttings and by seeds.

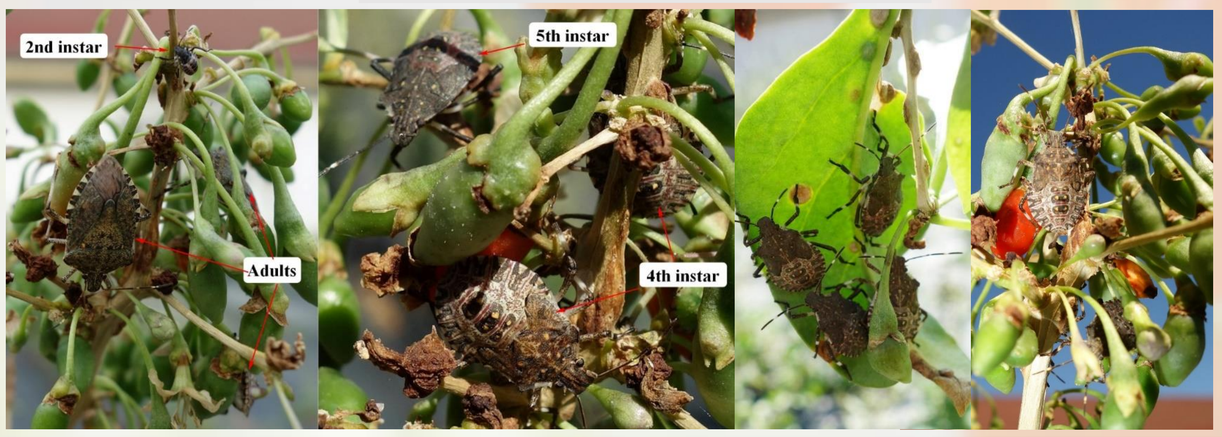
3 Results – *Aceria kuko*

F (%) = 100% (for both V1 and V2 biotypes); I (%) leaves = 45% - 85%. The production losses (June) estimated ~ 80% - 100%, as the majority of flowers buds were distorted by galls. In the multiplication area, the first galls that damaged the young shoots and leaves of the cuttings and seedlings appear in the first decade of April.



The observations made in July and August on the fruits could not conclude to a clear comparison of the quantitative losses, as all the plants were infested and the majority of fruit stalks had at least 1 to 4 galls on them. *A. kuko* was believed a thermophile species (25 – 35°C optimum). Inside the gall activity below 0°C was described by Anderson, 2010. Our observations show that the goji gall mites survives at temperatures of -25°C in the winter. On 08.12.2016 activity in the galls was still found, after several nights with -3°C.

4 Results – *Halyomorpha halys*



The first 4 and 5 instars and adults of *H. halys* were found in the middle of June but their presence was considered harmless. Starting beginning of July, the larvae of *H. halys* started to produce damages to the goji crop, but still the first goji harvest (02.08.2016) seemed to be unaffected.

Between 19 and 47 adults and larvae were found on a single plant. F(%) was 100% starting with 17 June until 9 September. I(%) reached 100 % in the second half of August, when no fruit was edible. Starting with 15 October, the presence of the *H. halys* on goji plants become harmless again, as the adults start to look for overwintering shelters.

N. viridula and *H. halys* species of stink bugs were observed in cohabitation.

5 Discussions and Conclusion

Both species produced major damages to the goji fruits, although for *A. kuko* the quantitative and qualitative losses could not be quantified.

The survival of *A. kuko* at -25°C is a major adaptation at the new climatic factors and proves the high species adaptability.

The economic damage threshold for both species need to established, as well as their determination methods. The presence of galls on plants leads, in the case of severe infestation, to the plant death, fact that makes the chemical intervention mandatory.

Curently there is no determination of the economic threshold of *H. halys* for goji crop. but as the adults and larvae are very mobile, we consider that more than 5 individuals on one goji plant can lead to important losses.

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