

Fig.1: Crimson clover and alfalfa

Introduction

Plants damaged by thrips include large-scale crops as well as less common plant species. The former include alfalfa, which is one of the most widely used fodder plants, while the latter include crimson clover, which is grown in small areas, typically for seed production. These two plants are taxonomically close to each other, making them ideal for conducting a comparative study of thrips species. The aim of the study was to investigate Thysanoptera species living in flower of crimson clover and their dominance compared to the alfalfa.

Crimson clover or italian clover (*Trifolium incarnatum* L.) is an one-year overwintering leguminose forage plant (Fig.1). The agricultural role of this fast establishing nitrogen fixing legume may increase due to climate change. Like other leguminous plant it is an excellent soil improver, it covers the soil well in winter and protects the soil from erosion and compaction. It can also be used as green manure in the spring in addition also a well-honeyed crop. Its inflorescence is visited by honeybees even during acacia flowering. In the case of a poor acacia flowering, a nearby purple clover can almost completely replace the acacia. It is sown on 4-5,000 hectares in Hungary, mainly for seed production. The crop is predominantly exported to Western Europe. The place of crimson clover in the sowing structure is important, its role in farming is professionally justified. The blooming field offers a beautiful view.



Materials and Methods

The experiments were conducted during May-June (in alfalfa also in August) 2019 in the western part of Hungary near Pápa on a 20 ha crimson clover field and 1 ha alfalfa field. We designated 4 sampling plots (A B C D) in both field (Fig. 2 and Fig. 3.) There was not insecticide treatment. During blooming 10 flowers were collected from the plots once a week. A total of 40 flowers or buds were also picked from crimson clover and alfalfa one sampling time. Samples were taken from the upper 10 cm of the plant and delivered home in a resealable nylon bag. Only adult thrips were collected by the knocking method using a moistened brush. The collected imagoes were stored in AGA solution until preparation. From the thrips microscope preparations were made and the occurring species and their dominance were determined. Species determination was performed using the Nikon Eclipse Ni-U fluorescence research microscope (Fig. 4). The definitions were made on the basis of taxonomic keys of Jenser G. (1982).



Fig. 4: Nikon Eclipse Ni-U fluorescence research microscope

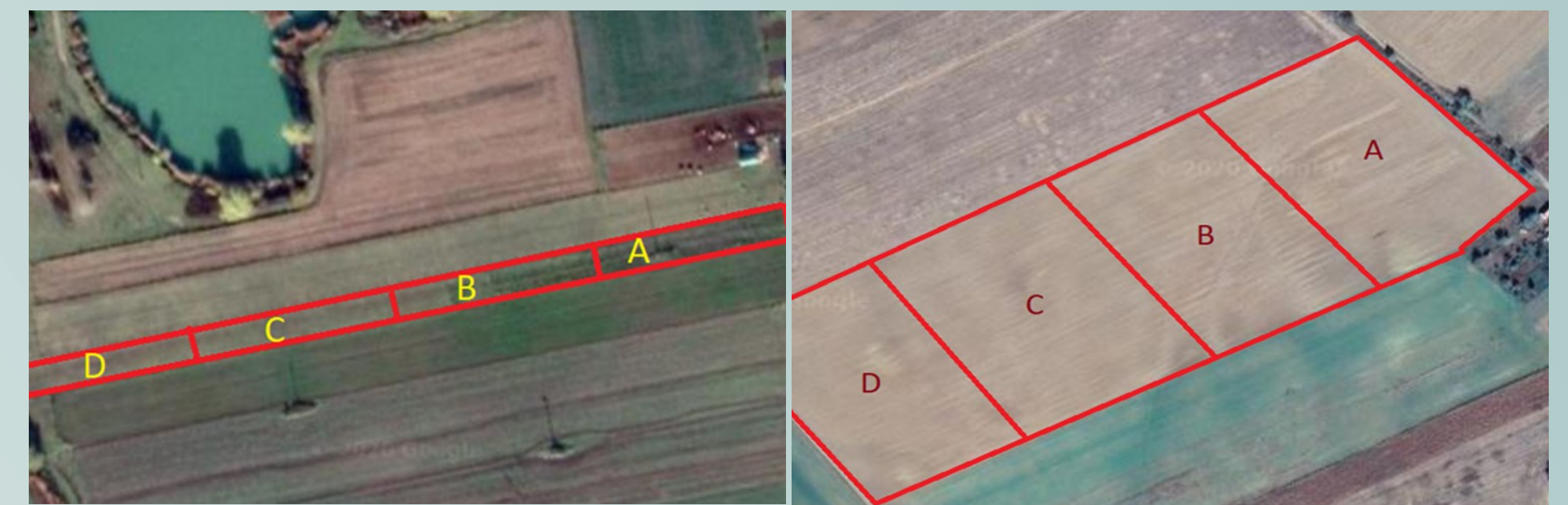


Fig. 2: Alfalfa field near Pápa

Fig.3: Crimson clover field in Lovászpata

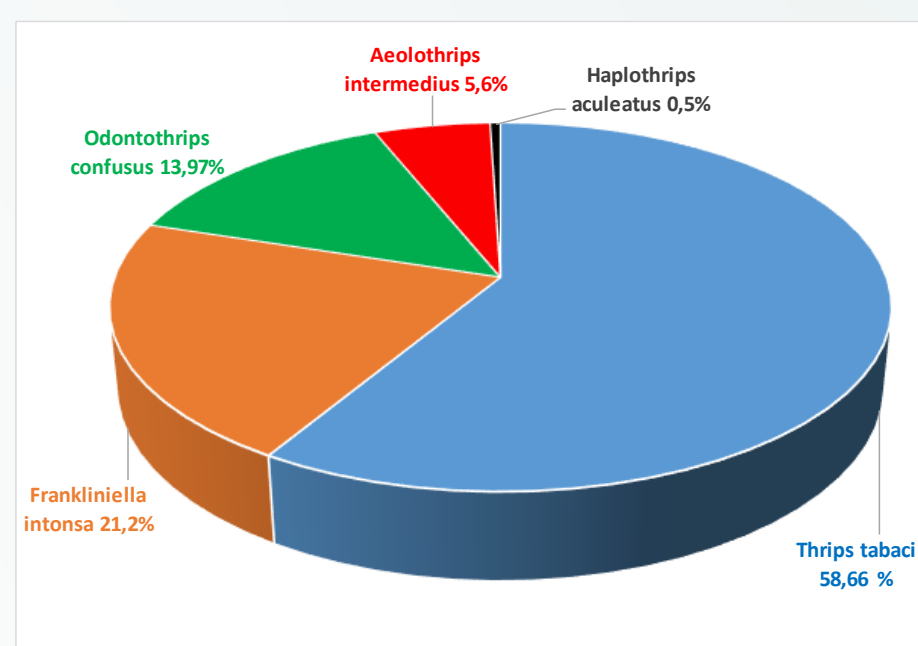


Fig. 5: Specific composition in the alfalfa flowers



Fig. 6: *Odontothrips confusus*



Fig. 7: *Thrips tabaci*



Fig. 8: *Aeolothrips intermedius*

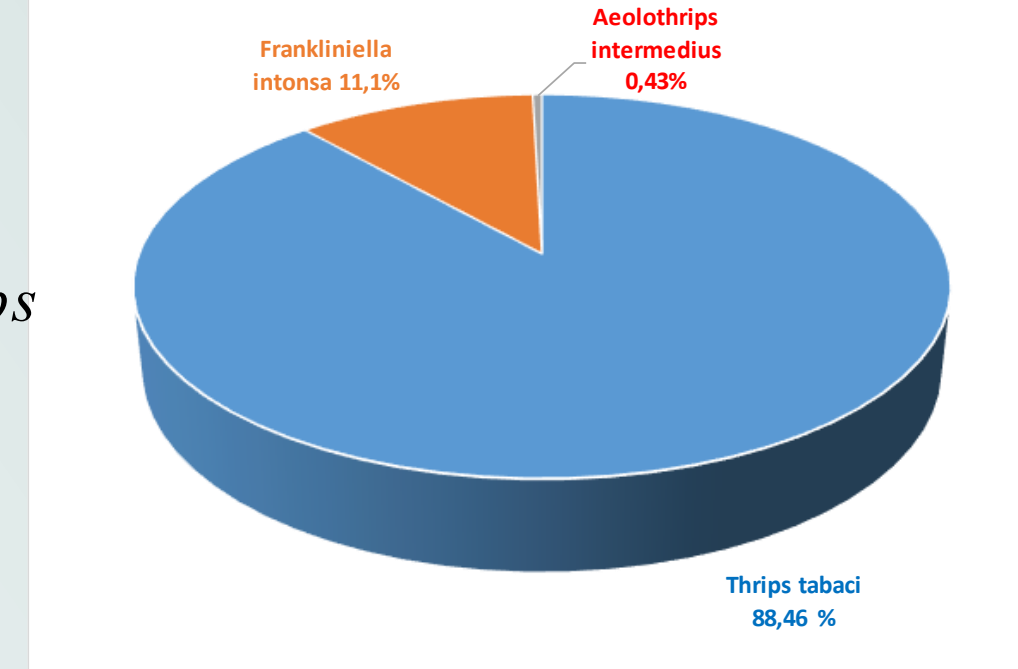


Fig. 9: Specific composition in crimson clover flowers



♂ Fig. 9: *Frankliniella intonsa*



♀

Specific composition of thrips found in flowers

We collected a total of 179 thrips in alfalfa and 234 in crimson clover. There were found always more thrips in a flower of crimson clover at a time of sampling than in alfalfa although alfalfa was more species-rich. The following species were found on alfalfa flowers: *Thrips tabaci* Lindeman (Fig. 7), *Frankliniella intonsa* Trybom (Fig. 9), *Odontothrips confusus* Priesner (Fig. 6), *Haplothrips aculeatus* and the predatory *Aeolothrips intermedius* Bagnall (Fig. 8). The composition of species in alfalfa is showed in Fig. 5. Regarding both alfalfa and crimson clover *Thrips tabaci* was the dominant species. In alfalfa, tobacco thrips (*Thrips tabaci*) make up more than half (58,6%) of the species found. In addition the polyphagous *Frankliniella intonsa*, occurred in significant amounts in 21,2% of adults. Imagoes and larvae living and feeding on flowers cause more serious damages. *Odontothrips confusus* occurred in proportion of 13,9%. A higher incidence of this species was expected based on previous results. *O. confusus* can help at the pollination with moving in the flowers but they damage mostly the buds in higher numbers. Among the predatory species *Aeolothrips intermedius* was found in 5,6%. This rapacious species feeds mainly on the larvae and imagoes of tobacco thrips, but they feed on mites as well.

Fewer species were present in the crimson clover (Fig. 9): *O. confusus* and *H. aculeatus* absent. We expected the presence of *O. confusus* however it was not detected. The dominance of *T. tabaci* exceeded 88,4 %, *F. intonsa* occurred in 11,1%, *A. intermedius* only in 0,43%.

Effect of sampling area on the number of thrips

Within the field, the number of thrips was different at the sampling sites. For example, in alfalfa, the number of individuals in sample area D was outstanding compared to the others (57 pcs / 40 flowers), which was probably due to the brook at the end of the field, where the vegetation developed better (Fig. 12).

Slightly fewer thrips were found on the crimson clover in sample plots A and D, one of the reasons for this may be the border effect (Fig. 13). In addition, significant weed pressure was observed on plots A. The predominant weed species was scentless mayweed (*Tripleurospermum inodorum* L.).

Flight dynamic of thrips

Samples were taken 8 times in alfalfa and 6 times in crimson clover. Figures 10 and 11 provide information on the distribution of species at each sampling time point. The peak-number was 79 thrips / 40 flowers in the crimson clover (developed on 18th May) and 44 thrips/40 flowers in alfalfa (developed on 8th June). It can be observed that the population dynamics of tobacco thrips was very similar for the two plants. The number of individuals peaked one week apart, but developed similarly. Lucerne had the highest number of tobacco thrips adults on May 11 and crimson clover on May 18.

According to data from June 8, the proportion of *F. intonsa* adults in both alfalfa and crimson clover has increased significantly, while the number of *T. tabaci* has decreased. This is probably related to the onset of flowering, as both *F. intonsa* and *O. confusus* are specifically flower-damaging species.

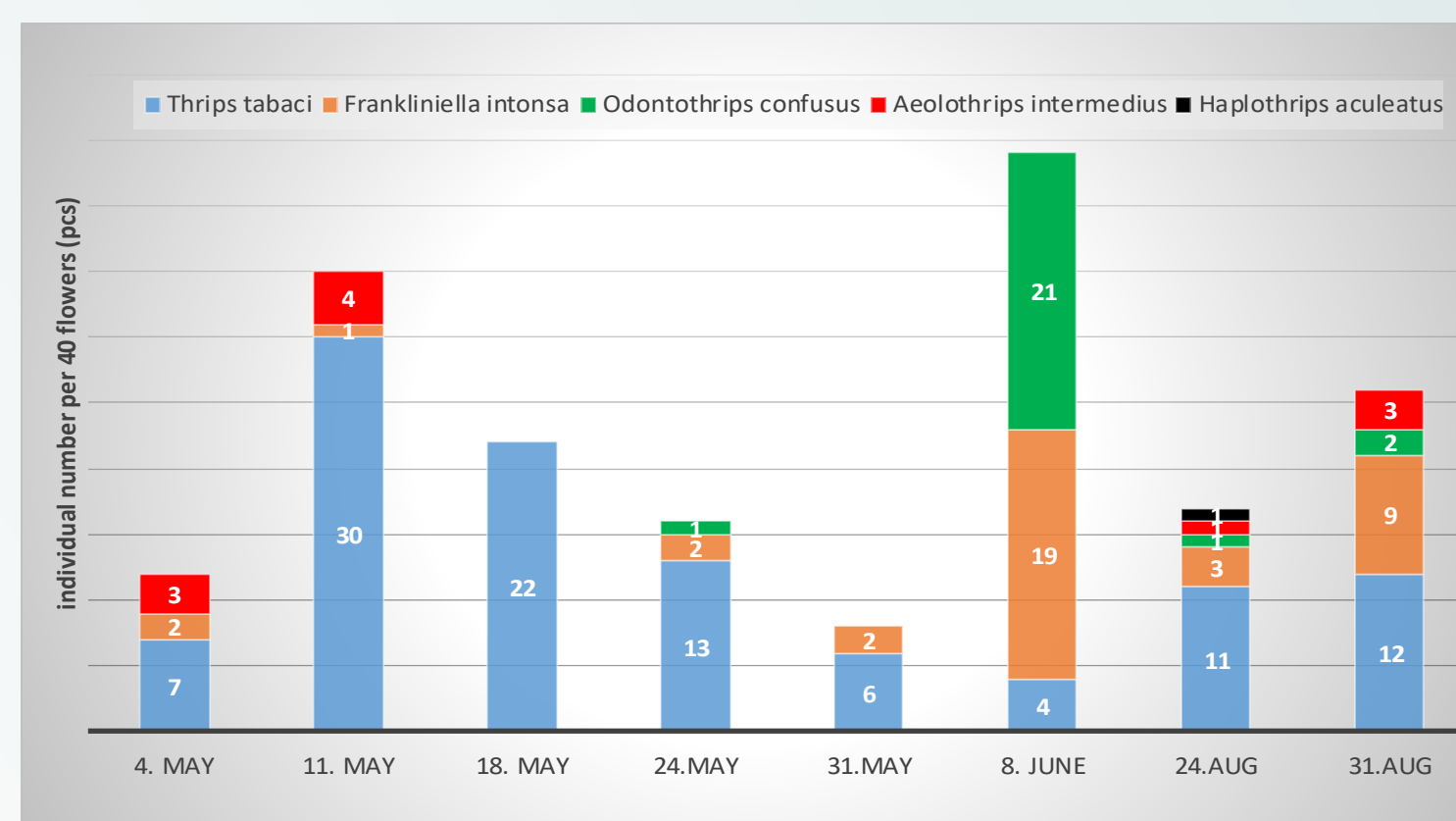


Fig. 10: Number of thrips at different time points in alfalfa

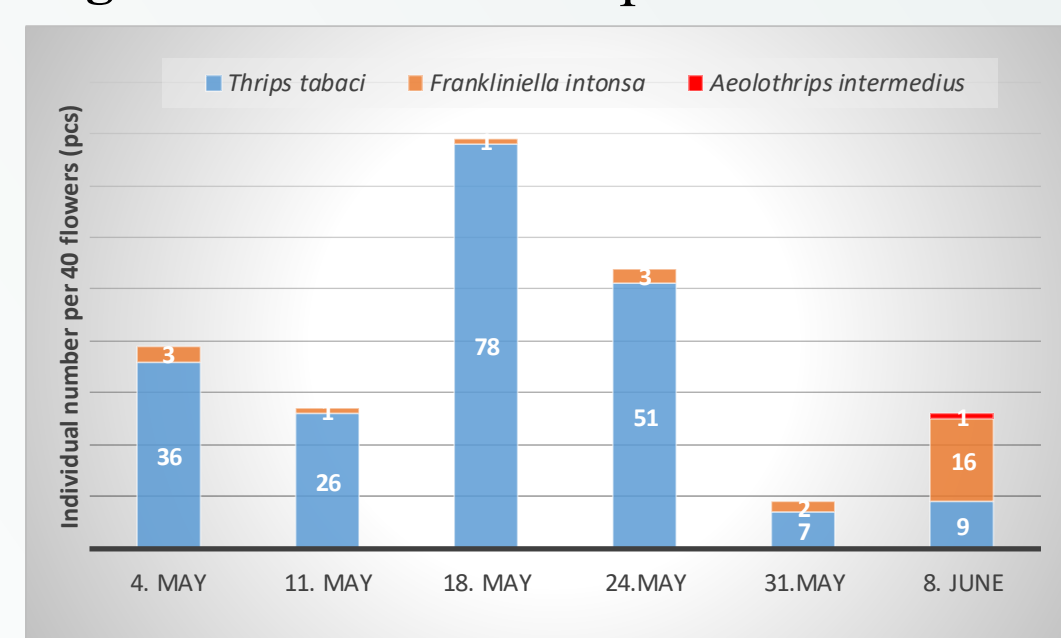


Fig. 11: Number of thrips at different time points in crimson clover

Conclusion

We have found in crimson clover flowers *Thrips tabaci*, *Frankliniella intonsa*, *Aeolothrips intermedius*, however *Odontothrips confusus* was absent. There were found always more thrips in a flower of crimson clover at a time of sampling than in alfalfa although alfalfa was more species-rich. Regarding both alfalfa and crimson clover *Thrips tabaci* was the dominant species and it was present in the flowers from beginning of May. Adult thrips living and feeding on flowers did not cause visible damages to any of the plants.