THRIPS ON OAT IN WESTERN ROMANIA

F. PARNEA, Ana – Maria VÎRTEIU[1*], Ioana GROZEA[1]
[1]Department of Biology and Plant Protection, Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara
[*]Corresponding author: anamaria.badea@gmail.com

Abstract. *The oat crop in western Romania has begun to occupy increasingly large areas, as the fertile soil in this area along with a modern, properly applied technology has allowed farmers to obtain high yields. Thus, in order to develop an adequate pest control strategy for oat crops, it is necessary to understand the particularities related to phenology, distribution and life cycle of major pests of this crop. Among insects present in oat crops, thrips are between those that cause significant yields losses. Regarding biology, ecology, and control of thrips, a significant number of works have been published so far, but the changing climate conditions with arid tendencies make this knowledge to be far from satisfied. In Romania, research on this group of insects were numerous, being localized mainly on the species present in economically important cereal crops. In this context, the authors have recently conducted a series of research on the taxonomy of thrips species present in this crop. The experimental plots were placed in the western part of Romania, near the village of Sag, the experience being carried out during 2017 - 2018. In the investigated period, 474 specimens were collected from the oat crop, belonging to 8 species of thrips. In each experimental variant Limothrips cerealium Holiday and Limothrips denticornis Holiday were the dominant species. Haplothrips aculeatus Fabricius and Frankliniella tenuicornis Uzel also occurred in great number on oat plants. Even if they do not cause major yields losses to oat crops: Thrips angusticeps Uzel, Stenothrips graminum Uzel, Frankliniella tritici Fitch and Anaphothrips obscures Müller are present every year in the experimental field.*

Keywords*: thrips species, yield loss, oat, western Romania*

INTRODUCTION

In our country, as a result of increasing demand, oat-grown areas have increased considerably in recent years. The presence of phytophagous insects in these crops is one of the limiting factors of production, and their uncontrolled attack can cause the production to be compromised by up to 30-40%.

The increasing numbers of varieties, the high humidity, along with the high temperatures during the vegetation period, are the most important factors that cause the emergence and rapid growth of some of the most important pests, namely the thrips, which besides the diminution the quantity of cereal crop production, also affect their quality to the same extent.

Thrips are systematically included in the *Thysanoptera* order, which is characterized by the presence of two pairs of wings, strongly narrowed and fringed on the edges. They are insects that attack by puncturing epidermises and sucking cell contents (LEWIS, 1973). The mouthparts of these insects are different from that of the *Hemiptera*, they only presents a single mandible, the left one.

This mandible is used as a needle for the penetration of the plant tissues, and the extraction of the cell juices, is carried out through a tube, which is formed from the union of the mobile maxillary stylets. In both larvae and adults, the mouthparts are transformed into a conical structure, the mouthcone (PESSON, 1951; BENMESSAOUD – BOUKHALFA ET AL., 2010).

Due to their biological characteristics, such as: rapid development, high mobility, high reproductive rate (both sexuated and parthenogenetic), thrips rapidly disperse in crops, in the present study in oat crops (CRESPI, 1993; MOUND, 2007).

The first observations related to the damage caused by thrips to oat crops were made by HEWITT in 1914. Since then, many investigators have been made on the damage caused by this group of insects; among the researches we remember those of: SCHLIEPHAKE & KOCH (1980); PELIKAN (1990); STRASSEN R. ZUR (2003).

In Romania, we have to highlight the research done by KNECHTEL (1956, 1963), which materialized through the publication of over 40 scientific papers; his most important work was published in 1951 in Fauna RPR - Volume VIII. We also mention the works of VASILIU - OROMULU (1994, 2004, 2008), which brought essential clarifications on biology, ecology and thysanoptera spreading, and the working methodology that can be used in case of investigations of the attack caused by thrips.

The aims of this paper is to highlight the most important species of thrips present in oat crops in western Romania, comparing wintering behavior, distribution and abundance of thrips species collected from 3 oat varieties.

MATERIAL AND METHODS

The field experiment were conducted on oat crops in Sag locality (Timis county), in 2017 – 2018 period. The experimental field was placed after the randomized block method, in 3 variants and 3 repetitions, each plot size being of 40 m^2.

In order to establish the species of thrips and their population density in oat crops, 3 varieties were chosen: Effektiv, Efessos and Cory.

Monitoring of thrips species in oat crop was made using colored sticky traps, and also using the shaking method. In May traps were installed in the field, for each experimental variant using a total of three traps. The oat plants were sampled from growth stage (BBCH) 50 to 89.

The collection of thrips using the shaking method was achieved by means of 50 cm square frame covered with white cloth. 20 samples were taken during the vegetation period, each sample consisting of 25 shakes/ experimental variant (VASILIU – OROMULU, 2009).
The collected insects were placed in bottles containing alcohol to 70 degrees and transported to the laboratory. Using specific methods, they were prepared and subsequently identified.

RESULTS AND DISCUSSION

A total of 495 thrips were trapped and 474 of those were identified to species (Table 1).

Eight different species were identified; the most commonly encountered species were: *Limothrips cerealium* Holiday, *Limothrips denticornis* Holiday, *Haplothrips aculeatus* Fabricius and *Frankliniella tenuicornis* Uzel.

Figure 1. Thrips species present in oat crops

Other thrips species identified included: *Thrips angusticeps* Uzel, *Stenothrips graminum* Uzel, *Frankliniella tritici* Fitch and *Anaphothrips obscures* Müller, attack oat and cause significant yield loss to these crops in the western part of Romania (fig. 1).

Table 1.

Thrips species collected from oat crops

No. indiv./species	**2017**				**2018**				**Total**
	Variety			Σ	**Variety**			Σ	
	Effektiv	Cory	Efessos		Effektiv	Cory	Efessos		
Limothrips cerealium Holiday	13	23	17	53	15	28	23	66	119
Limothrips denticornis Holiday	6	19	6	31	7	26	13	46	77
Haplothrips aculeatus Fabricius	11	13	9	33	5	17	16	38	71
Frankliniella tenuicornis Uzel	6	11	9	26	8	15	10	33	59
Thrips angusticeps Uzel	-	9	-	9	3	9	-	12	21
Stenothrips graminum Uzel	2	7	7	16	-	17	12	29	45
Frankliniella tritici Fitch	8	9	1	18	7	5	11	23	41
Anaphothrips obscures Müller	5	8	10	23	2	11	5	18	41
$\bar{x}$	26,13				33,13				
STDEV	13,44				17,18				
SEM	4,75				6,07				
df	14								
STDEV	15,4								
t test	0,9078								
p value	0,3793								

Across the 2017 - 2018 period, based on the total thrips identified from all specimens (= 474), *Limothrips cerealium* Holiday was the most common species ($p = \leq 0{,}3793$; t=0,9078; df= 4; $\bar{x}$ = 19,83) and comprised the greatest proportion of adult thrips (25,11%). *Limothrips denticornis* Holiday was second most common ($\bar{x}$ = 12,83) and accounted for 16,25% of adult trips identified. *Haplothrips aculeatus* Fabricius and *Frankliniella tenuicornis* Uzel.were also frequently encountered ($\bar{x}$ = 11,83, $\bar{x}$ = 9,83, respectively) and accounted for 14,98, and 12,45 percent of identified thrips, respectively.

Suborder *Terebrantia* Haliday, 1836

The family *Thripidae* Uzel, 1895 – is represented by species of thrips that present the head wider than longer, antennas consisting of 8 articles, with a distinct apophysis. The prothorax with a postero-angular setae.

Subfamily *Thripinae* Stevens, 1829 – include around 1400 species, many of them economically significant pests, some being invasive species.

Genus *Anaphothrips* Uzel, 1895 – the head as wide as long. The ocelli to both sexes present, rarely rudimentary. Antennas made up of 8 to 9 articles; the 6 antennal articles possess an oblique transverse suture.

***Anaphothrips obscures* (Müller, 1776)** – the female body color is light yellow and on the center of the prothorax is a w-shaped spot. The two pairs of long setae on the edge of the 8 abdominal segments are complete.

Genus *Frankliniella* Karny, 1910 - antennas made up of 8 articles; the maxillary palpi of 3. The interocellar setae are in front of the posterior ocelli. The prothorax has one pair of setae on the anterior angle and two pair of setae on the posterior angle. The main rib of the front wings provided with a bristle along its entire length.

***Frankliniella tenuicornis* (Uzel, 1895)** - female body length of 1,3-1,4 mm and body color dark brown. The composed eyes are yellowish. Femurs and tibia yellow brownish, with

the apex and the base yellow light. The interocellar setae of 44 - 52µ and the post ocellar setae of 12 – 24µ length. The front wings slightly yellowish colored, the main rib with 17 – 18 bristle, the secondary rib with 14 – 15 bristle. The 9 abdominal segment setae length of approximate 160µ.

***Frankliniella tritici* (Fitch, 1855)** – the female is approximately 1,5 mm in length, and is an yellow with brow tendencies color. The prothorax present two pair of long setae on the edge. The final part of the tarsi is smooth, the 3rd pair of ocellar setae lies before the two post ocellar.

Genus *Limothrips* Holiday, 1836 - the head wider than longer, previously narrowed, between antennas with a distinct apophysis. Antennas made up of 8 articles; the maxillary palpi of 2. The prothorax with an postero – angular setae. The wings always present. The 10 abdominal segments always provided with long setae.

***Limothrips cerealium* (Holiday, 1836)** – the female body color is brown blackish. Brown legs; anterior tarsi and tibia are yellow, middle and posterior tarsi are yellowish brown. The prothorax with a postero-angular setae, of approximate 36 µ length. Anterior wings are dark brownish. The 10 abdominal segment with 2 setae of 60µ lenght.

***Limothrips denticornis* (Holiday, 1836)** - the color of the female body is darkish brown. The legs are similar to the body color, anterior tibia and tarsi are yellow. The color of the antenna articles is brown, except for the third article that is clearer. The anterior wings gray brownish, with the lighter colored base**;** the proximal main rib with 5-6 setae and distal with 1 + 2 setae. The 8 abdominal segment on each side with twenty-three spines slightly curved, dark brown, 52-60µ long.

Genus *Thrips* Linnaeus, 1758 - antennas made up of 7 articles; the maxillary palpi of 3. The prothorax is usually longer than the head, provided with 2 postero – angular setae. Wings fully developed and provided with two longitudinal ribs

***Thrips angusticeps* (Uzel,1895)** – the female body and legs brown, tarsi light brown. Antennas made up of 8 articles. Head with 2 pairs of ocellar setae. The prothorax with two pairs of postero – angular setae. Fore wing setae relatively long with 5–10 setae on distal half; secondary rib with about 12 setae.

Genus *Stenothrips* Uzel, 1895 - both sexes fully winged. Head longer than wide. Antennas made up of 7 articles, maxillary palps 2-segmented.

***Stenothrips graminum* (Uzel, 1895)** – the female body and femurs light brown, tibia and tarsi brownish-yellow, the 3rd antennal segment yellow; fore wings weakly shaded. Antennae 7-segmented. Head longer than wide, with two pairs of ocellar setae. Prothorax with 2 pairs of long postero - angular setae, 4–5 pairs of postero - marginal setae. Fore wing first rib with 3 setae on distal half; secondary rib with row of about 12 setae.

Suborder *Tubulifera* Haliday, 1836

Family *Phlaeothripidae* Uzel, 1895 - antennas consisting of 8 articles, rarely 7. The maxillary and labial palpi made up of 2 articles. The coxa of the median legs are more distant then the coxa of the other legs. The 9 abdominal segment shorter than the abdominal tube.

Subfamily *Phlaeothripinae* Uzel, 1895 – eye reduced,with few large, variably-sized facets; maxillary stylets retracted in a long U-shape (reaching eye); antenna 7-segmented

Genus *Haplothrips* Amoyet & Serville, 1843 – the prothorax length is the same with the head one or something shorter. The mouth cone is wide and rounded, even though it is slightly narrowed to the top, the top is rounded. The wings always narrow to the middle.

***Haplothrips aculeatus* (Fabricius, 1803)** – the female is black with the exception of the end of the tibia and tarsi that are yellowish brown. The post occular setae of 36 - 40µ

length, light yellow color and topped sharpen. The 3rd antennal article distinct asymmetric, with only one sensory cone on the outside. The forward leg arrays armed with a small tooth.

CONCLUSIONS

The research reveals a great number of thrips species as well as a community structure in dependent relation with abiotic factors, especially the temperature and rain from the vegetation season.

The taxonomic study confirmed the presence of 8 thrips species in oat crops from western Romania.

Further experimental confirmation is required to validate *Limothrips cerealium* and *L. denticornis* as dominant species and also to confirm the presence of *Thrips angusticeps* as pest of oat crops in western Romania.

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