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DAMAGE IN SUNFLOWER FIELDS AND IN HYBRID MULTIPLICATION CAUSED BY SPECIES OF THE *Coleoptera (Anthiciadae)* FAMILY

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SUMMARY

Maturation feeding habits of tiny beetles (4-6 mm) on sunflower heads have been observed in comparative studies involving different sunflower varieties in industrial scale sunflower fields in 1994. When determining these beetles, it has been established that they belong to the species of the group (*Coleoptera, Heteromera)* to the family of *Coleoptera, Anthicidae,* and to the two genera *Notoxus* and *Formicomus*.

Formicomus pedestris ROSSI., *Notoxus brachycerus* FALD., *Notoxus appendicinus* DESBR. were the most frequent species, as contrary to the beetle population observed in maize fields where the dominant species were *Notoxus brachycerus* FALD. and *Notoxus appendicinus* DESBR. *Formicomus pedestris* ROSSI. had "only" the third place in terms of population density.

Each of the three species starts its maturation feeding on sunflower heads at the end of July or at the beginning of August. At first, the beetles consume pollen and later on they hollow out the seeds. It happens that as many as 15-20 beetles are seen feeding on a single flower head.

Based on literature data, mass appearance of the beetles of the *Coleoptera, (Anthiciadae)* species is expected on cadavers of *Meloe* species (*Meloe proscarabeus* L., *Meloe violaceus* MRSH, *Meloe variegatus* DON.) and of *Meloidae* species (*Coleoptera, Meloiade*), for example *Cerocoma schaefferi* L., *Lytta vesicatoria* L. and *Epicauta rufidorsum* GOEZE, that contain chantaridine, i.e., they are considered as necrophagous species. Damages on plants caused by these species were reported in the works of Horváth (1995a, 1995b, 2000, 2002).

It needs further research to establish if feeding of these *Anthicidae* species, which were considered as necrophagous species, on maize and sunflower really reflects a new form of damage or it should be considered as feeding on substitute aliments forced by the drought period. Nevertheless, the damage caused by these insects in the year 2000 was most significant ever.

Key words: ***Anthicidae, Notoxus brachycerus, N. appendicinus, Formicomus pedestris, Meloe species***

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INTRODUCTION

The *Coleoptera, Anthicidae* insect family had spread worldwide and about 2500 of its species in 30 genera have been discovered. Most of these species have been found in tropical areas and in the Mediterranean. In our regional fauna, the 7 *Coleoptera* genera include 38 species, 2 sub-species and 32 varieties. Going north, the number of these species decreases significantly, but to the south - as close as the Balkan Peninsula - it is fairly high (Kaszab, 1956). Studies of Günther *et al.* (1975) support this observation; they state that the species in the genera of the *Anthicidae* family have spread widely in tropical areas, but nevertheless we know very little about their habits. As it is quite usual with the species in the *Heteromera* family, the head of these beetles is separated from their thoracic shield by a deep constriction.

The beetles of the subject species living in Europe are 2-3 mm long, with two conspicuous characteristic features. The first one is the long, forward looking horn on the thoracic shield of several species (the Hungarian name of these beetles refers to this horn) that covers the head like a shield; the second is their strong similarity to ants. Such similarity is due not only to the existence of the constriction between the thoracic shield and the abdomen but also to their brownish color and swift movement (e.g., the ant-like beetle, the *Formicomus pedestris* ROSSI). Certain species live together with ants, so their miming of ants may be deemed as a phenomenon of adaptation (mimicry). The data reported by Franz (1974) are very interesting due to geographical proximity (Austria). In his monograph Franz emphasizes the importance of *Notoxus brachycerus* FALD., *N. monocerus* L., *N. trifasciatus* L., *Formicomus pedestris* L. and the species of the genera *Anthicus* (*A. antherinus* L., *A ater* PANZ., *A. axillaries* SCHMIDT, *A. bifasciatus* ROSSI., etc.).

The species on the *Anthicidae* were first mentioned as pests in both Hungarian and international literature by Horváth (1995a, 1995b, 2000). Horváth argues that in years with a very hot summer, the following species have a decisive role in damaging cornfields and sunflower fields: *Notoxus brachycerus* FALD., *Notoxus appendicinus* DESBR. , *N. monocerus* L., and *Formicomus pedestris* ROSSI.

MATERIAL AND METHOD

Our observations started parallelly with comparative studies involving different sunflower varieties grown on industrial scale and hybrid multiplication at the Research Station of Bácsalmás Agráripari Rt. The studies were repeated in the year 2000 (when there occured a drought in the summer) using the same methodology.

In addition to the damage and dominance relations between the species (Tables 1 and 2), the dynamics of their swarming were studied as well (both in 1994 and 2000).

In both years (1994 and 2000) 100-1000 uniform sunflower heads were selected and marked with colored ribbons in large-scale sunflower fields that had been officially qualified for hybrid multiplication. These sunflower heads were thoroughly examined on a weekly basis. Because of the mobility of the different species (and possible inaccuracies caused by this mobility), only those species were counted that were actually feeding when observations were made. This means that the specimen running around the sunflower head were not considered, only those were counted that were shaken out of the seed part of the sunflower head to a yellow paper sheet by vigorously knocking the disc several times. The characteristic damage caused by the *Anthicidae* species (a regular round hole at the bottom part of the seed) was observed before harvesting the sunflower by removing the seeds from the selected heads.

RESULTS

It was established on the basis of our study that the frequency of occurrence of the species of *Anthicidae*, which damage sunflower, was as follows: *Formicomus pedestris* ROSSI. (583 and 832 specimens found in 1994 and in 2000, respectively; i.e., 1415 specimens altogether); *Notoxus brachycerus* FALD (376 and 448 specimens in 1994 and 2000, respectively; 824 specimens altogether); *Notoxus appendicinus* DESBR. (166 and 294 specimens in 1994 and 2000, respectively; 460 specimens altogether) (Tables 1 and 2). Numbers of the other species belonging to the *Anthicidae* family (167 and 156, altogether 423) were also fairly high. Some of them were competitors to the three dominant species, the others were obviously not considered as pests. It was found during the examinations that the latter specimen consumed the pulpy mass similar to flour that became accessible as a result to the damage caused by the pest species.

It is likely that this is also the role of *Formicomus pedestris* ROSSI. that was found as the most widely spread species. The fact is that in the examination of maize damages conducted in 1994 only the species *Notoxus brachycerus* FALD. and *Notoxus appendicinus* DESBR. were caught “in situ” feeding (hollowing corn seeds in a conical form) on the open ends of hybrid corn cobs. In our opinion this shall be the way of feeding on sunflower heads as well, although we note that on the heads densely populated with seeds the process of feeding can be monitored with much less accuracy than on the open ends of hybrid corn cobs.

During our examination it turned out that the *Anthicidae* species damaging the plants were creating regular round holes in the bottom third of the seed, protected by the rows of seeds. These holes cannot be mistaken for the damage caused by *Homoeosoma nebulellum* HÜBN. Then the *Anthicidae* species hollow the kernel. This damage affected 4.73% and 5.27% of the seeds in 1994 and 2000, respectively. As not all of the damaged seeds can be removed during the seed cleaning opera-

tions, these damages may decrease the germination value of the seed in proportion with their occurrence ratio.

Table 1: Population density of species of the *Anthicidae* family on 100 discs of sunflower hybrid B-201 in Bácsalmás (Observation period: July-September 1994)

Species	Dates of observation							Total
	24.07-31.07	01.08-07.08	08.08-15.08	16.08-23.08	24.08-31.08	01.09-07.09	09.09-16.09	
Formicomus pedestris	13	20	36	79	170	129	136	583
Notoxus brachycerus	6	11	42	43	69	103	102	376
N. appendicinus	4	8	16	33	40	37	28	166
Other *Anthicidae* species	6	5	21	23	29	39	44	167
Sum Total	29	44	115	178	308	308	310	1292

Table 2: Population density of species of the *Anthicidae* family on 100 discs of sunflower hybrid B-203 in Bácsalmás (Observation period: July-September 1998)

Species	Dates of observation							Total
	24.07-31.07	01.08-07.08	08.08-15.08	16.08-23.08	24.08-31.08	01.09-07.09	09.09-16.09	
Formicomus pedestris	24	32	97	110	184	207	178	832
Notoxus brachycerus	11	21	33	63	93	118	109	448
N. appendicinus	9	17	21	71	64	49	63	294
Other *Anthicidae* species	7	5	11	26	30	36	41	156
Sum Total	51	75	162	270	371	410	391	1730

CONCLUSIONS

In the recent dry years the composition of the pests of the sunflower has changed significantly. New pests, e.g., *Acanthoscelides pallidipennis* MOTSCH. (*Col., Bruchidae*) have been observed to consume pollen, while others typically damage the seeds (e.g., *Spilostethus* (=*Lygaeus*) *equestris* L. (*Het., Lygaeide*), and partially *Helicoverpa armigera* HÜBN., (*Lep. Noctuidae*)). The damage caused by these pests is not significant in individual years, but their aggregated effect may create a new damage situation. Examination of these species is unavoidable from the professional point of view so that the safety of hybrid multiplication operations can be maintained.

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LOS DAÒOS CAUSADOS POR UNAS ESPECIES DE ESCARABAJOS (*Cleoptera, Athicidae*) EN CULTIVOS DE GIRASOL Y PLANTACIONES DE HÍBRIDOS

RESUMEN

En los experimentos comparativos de especies de girasol en plantaciones de gran envergadura, empezados en 1994 por la Industria Agraria de Bácsalmás, S.A., observamos en la inflorescencia del girasol la alimentación de pequeños escarabajos durante su maduración.

En la identificación de especies se determinó que los insectos de 4 a 6 mm de tamaño son de las especies de escarabajos de dos géneros, *Notoxus* y *Formicomus*, pertenecientes a la familia *Anthicidae* de los heterómeros *(Heteromera)*, dentro del orden de coleópteros *(Coleoptera)*.

Entre estos insectos, las especies que encontramos con más frecuencia eran *Formicomus pedestris* ROSSI., *Notoxus brachycerus* FALD., y *Notoxus appendicinus*, mientras en maíz las especies dominantes eran *Notoxus brachycerus* FALD., y *Notoxus appendicinus* DESBR., siendo *Formicomus pedestris* ROSSI. sólo la tercera en cuanto a su número de población.

Las especies de los tres géneros empiezan a alimentarse en la inflorescencia del girasol, durante su maduración, a fines de julio, principios de agosto. Los imagos al principio consumen el polen y luego perforan los aquenios en maduración. En un disco de girasol viven a veces hasta 15-20 imagos dañando la planta. El daño causado por ellos es continuo y creciente hasta la cosecha.

Según datos de la literatura, los imagos de las especies pertenecientes a la familia *Anthicidae* de los *Coleoptera* se conocen como especies típicas necrófagas que se propagan principalmente en los cadáveres de los escarabajos que contienen cantaridina, como son las *Meloe species (M. proscarabaeus*

L., *M. violaceus* MRSH., y *M. variegatus* DON.*)* y otras especies de la familia *Meloidae*, como por ejemplo *Cerocoma schaefferi* L., *Lytta vesicatoria* L., y *Epicauta rufidorsum* GOEZE. Sobre el daño causado por los *Anthicidae* en plantas, los primeros datos se tienen de los trabajos de Horváth (1995a, 1995b, 2000, 2002).

No se sabe aún si la alimentación de las especies de *Anthicidae* (normalmente consideradas como necrófagas) en girasol y maíz debe considerarse como una nueva forma de depredación, o será sólo una forma de alimentación coercitiva (xenofagia), causada por la sequía. De todos modos, ya pudimos percatarnos del daño, mayor que nunca, que causaron estos insectos en el año 2000 en Hungría.

LES DOMMAGES CAUSÉS PAR DES ESPÈCES DE LA FAMILLE DES SCARABÉIDÉS *(Coleoptera, Anthicidae)* AUX CULTURES DE TOURNESOL ET AUX PLANTATIONS D'HYBRIDES

RÉSUMÉ

Au cours des expériences comparatives relatives aux espèces de tournesol cultivées en grandes exploitations, commencées en 1994 par la Société Anonyme de l'Industrie Agraire de Bácsalmás, nous avons observé l'alimentation de petits scarabées sur l'inflorescence du tournesol, pendant la période de maturation. Au cours de l'identification des espèces nous avons déterminé que ces insectes d'une grandeur de 4 à 6 mm appartiennent à deux genres des espèces de la famille des Scarabéidés (*Coleoptera*, *Anthicidae*), et à l'ordre des Coléoptères (*Coleoptera*, *Heteromera),* notamment aux espèces de *Notoxus* et de *Formicomus*.

Les sous-espèces d'insectes les plus fréquemment rencontrées lors de nos expériences étaient le *Formicomus pedestris* ROSSI., le *Notoxus brachycerus* FALD., et le *Notoxus appendicinus* DESBR., tandis que dans le cas du maïs les espèces dominantes étaient le *Notoxus brachycerus* et le *Notoxus appendicinus* DESBR., et, du point de vue de la densité de sa population, le *Formicomus pedestris* ROSSI. n'était que le troisième.

Les espèces de ces trois genres commencent à s'alimenter sur l'inflorescence du tournesol pendant la maturation de fin de juillet, début d'août. Les imagos consomment d'abord le pollen, ensuite ils perforent les akènes en maturation. Il y a parfois jusqu'à 15 à 20 imagos qui vivent dans un plat de tournesol, et qui détériorent la plante. Ils font ravage continuellement, mais avec une intensité augmentant jusqu'à la récolte.

Selon les données de la littérature du sujet, les imagos des espèces de la famille des Scarabéidés (*Col., Anthicidae)* sont connus comme des espèces typiquement necrophages qui envahissent principalement les cadavres des insectes qui contiennent de la cantharidine, comme les espèces de *Méloé (M. proscarabaeus* L., *M. violaceus* MRSH., et *M. variegatus* DON.*)* et des autres espèces de la famille des *Meloidae*, par exemple le *Cerocoma schaefferi* L., le *Lytta vesicatoria* L. et l'*Epicauta rufidorsum GOEZE*. Ce sont les ouvrages de Horváth (1995a, 1995b, 2000, 2002) qui peuvent nous fournir les premières informations en ce qui concerne les dommages causés par les *Anthicidae* aux plantes.

On ne sait pas encore si le fait que les espèces d'*Anthicidae* (normalement considérées comme nécrophages) se nourrissent de tournesol et de maïs peut être considéré comme une nouvelle forme de la déprédation, ou ce n'est qu'une forme de l'alimentation forcée (xénophagie) due la sécheresse. En tout cas, en l'an 2000 plus que jamais, on a pu voir l'importance du ravage qu'elles sont capables faire.