LYGAEUS (= SPILOSTETHUS) EQUESTRIS L. (HET.: LYGAEIDAE), A PEST OF SUNFLOWER

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Both the intensification of sunflower growing and the concentrated stands of valuable plants (e. g. hybrids) threw a new light on the production of sunflower. Due to the high propagation quotient of sunflower, the seed requirement of the whole Hungarian sunflower production is met by the seed growers on not more than 4000 hectares. The knowledge of all insect pests present in this plot is therefore of outmost importance, besides the fact that nearly all insects living in the stand participate in the process of pollination. Such a representant of the local fauna is the bug Lygaeus (= Spilostethus) equestris, the activity of which in its original habitat might even be considered as benefical. The overwintered adults of this bug feed namely on the flower heads of dangerous weeds, like Carduus acanthoides, Cirsium spp. or on capsules of Asclepias syriaca, decreasing thus the vitality of their seeds.

INTRODUCTION

The 100-200 hectar sunflower stands provide favourable ecological conditions for different bug (Heteroptera) species.
The results of our extensive research show that the Miridae, Lygaeidae, Pyrrhocoridae, Coreidae, Rhopalidae, Scutelleridae and Pentatomidae family species feed and cause loss in crop from the beginning of the budding stage.

As for causing damage the Miridae family, and within it the Lygus genus is of outmost importance. The damage caused by Lygus species, significantly decreases before the ripening of seeds. Their role is taken over by the stronger sticking-sucking mouth bugs, namely Oxycarenus pallens H.-SCH. and Lygaeus (= Spilostethus) equestris L. The latter species has been considered as a typical "edge pest" in the past years. In 1990-1991 this pest multiplied spectacularly and caused demonstrable damage inside the stands, mainly in the south of Hungary (Bácsalmás).

The number of generations of this species comes to 4-5 every year. Overwintered adults appear on the first warm spring days. Following copulation, early generations lay eggs either in the loose upper soil layer or perhaps in the soil cracks, however, later generations lay eggs among the seeds of the sunflower head.
Egg-laying often takes place between the peripheral row of seeds and the sguamae.

Besides direct loss in crop it increased the linolacid (C 18:2) volume by 2,5 % which has a negative influence on the storability of the seeds.
Damage caused by Lygaeus (= Spilostethus) equstris L. can be expected in fields which are infected by Asclepias syriaca L. and Vincetoxicum officinale MNCH. These plants are its primary nutrition source.

Chinery (1987), Camprag (1988), Dolin (1987), Bujáki et. al. (1988) and Horváth (1984, 1987, 1989a, 1989b) published data on the feeding, life cycle and systematic ranking of Lygaeus (= Spilostetmus) equestris L. and other sunflower insect pests. L. equestris is present from the south of England to Siberia, the central part of Sweden to the Mediterranean Sea, by Günther (1975). It is less common in areas to the north of Central Europe, because it prefers warmer climate. Its favourite habitat is the soil and also, different flowers. It mainly prefers Vincetoxicum officinale MNCH., syn.: Cynanchum vincetoxicum (L.) PERS. The spreading of this species is the European part of the Soviet Union as far as Leningrad, furthermore the Jaroslav, Kirov and Sverdlovsk conty, also South Siberia, Northern Asia, Caucasus and Northern India (Dolin, 1987). Our data about the life cylce of L. equestris are vague, although this species is wide-spread (Vásárhelyi, 1983). Horváth (1984) concluded the specialization of this species for its preferable plants from the total nytrogen content and with a special method, from the total amino-acid content of the seeds of several plants such as, Asclepias syriaca L. In view of this, the aminoacid content of A. syriace seeds is very similar to the compound of sunflower, soya bean, flax and peanut. We can suppose that because of its similarity to sunflower, L. equestris likes sucking ripening sunflower seeds (Horváth, 1984, 1987, 1989a, 1989b).

Several authors mention the different species of the Lygaeidae family (Camprag and Djurkic 1980, Vásárhelyi 1983 wrote about the damage caused by Oxycarenus pallens H.-SCH.; Bujáki et. al. 1988, Camprag 1988, Dolin 1987). Sunflower seeds are widely used for feeding mass-breading of Oncopeltus fasciatus (DALL) which is an American related species of L. equestris (Walker 1976). According to Camprag (1988) the damage caused by L. equestris is primarily present in the sunflower production areas of Soviet Union, Bulgaria, Yugoslavia and Hungary.

MATERIAL AND METHODS

We started our experiments with 60 adult bugs which we collected in September, 1986. We put separated couples in covered glass dish (observing the conditions of egg-laying and the egg-production). The

adults were fed with Asclepias syriaca L., Helianthus Annuus L. and Daucus Carrota L. slices.

For egg-laying we provided sifted sand in a separate palstic dish, from which we removed the eggs in 40 % NaCl solution under continuous stirrign. We removed the eggs which got to the surface of the concentrated salt solution, washed in destilled water, dried then kept in antiseptic, wet alfol catridges at 15 ^{o}C, 25^{o}C and 30 ^{o}C temperature, examining the vitality of eggs and intersity of larval production at different temperatures.

Besides these experiments concerning the biology of L. equestris, from 1990 we also examined how its nutrition influenced the fatty-acid compound of the sunflower oil. For this purpose we had 1000-1000 pieces of Antlia and S-281 hybrids damaged by bugs and sound seeds examined at the laboratory of the Plant Oil Research Institute. For plant control we used 1000 pieces non-selected Iregi H-Nk-173 hybrid seeds free of pesticides.

RESULTS

L. equestris overwinters as adult in the soil, among plant fragments, in bark shakes, cliff chasms and wall cracks. The adults are active on the late autumn and early springs days. We often found adults "lying in the sun" on walls free of wind.

After spring has come, adults start their maturation feeding on the flowers of dangerous weeds such as Carduus acanthoides L., C. nutans L., Onopordum acanthium L., Centaurea spp. and the fallen and open of Asclepias syriaca. After maturation feeding and copulation the female makes a little hole in the loose upper soil layer with its back left leg and laies a varied number of eggs (ranging from 7-45 eggs) then covers the hole. On the 11th August, 1991 we observed an egg-laying which was different from the "normal" ones where L. equestris laid its eggs among the seeds, the preripheral row of seeds and the periclinium and certain squame. This fact was new information about the biology of L. equestris for us. The number of eggs depends on the feeding condition the quality of preferable plants, the external temperature and other ecological factors. As a function of these data it is very difficult to define the maximum number of eggs (the highest

production was 235 pieces so far). Tha change of the extrenal temperature has a decisive influence on the time of the embryo development and larval production intensity. At 15°C temperature eggs ripe for 6 weeks, at 25°C for 11 days and at 30°C for only days. We observed the first larva generation - on the average of several years - in natural surrounding at the end of May or early June and the last generation in the middle of October. (Kéleshalom, 1983-1988) We can say the in our country the number of generations of L. equestris is 4-5.

PREFERABLE PLANTS OF L. EQUESTRIS

The result of our experiments show that the main preferable plant of L. equestris are the Ascepliadaceae family: Asclepias Syracia, Vincetoxicum officinale L.V. hirundinaria MED and the Compositae family: Carduus acanthoides, C. nutans Centaurea spp. Onopordum acanthium, Carthamus tinctorius and Helianthus annuus.

DAMAGE CAUSED IN THE SUNFLOWER

The damage caused by L. equestris is most common in the seeds following the fall of capsule flowers on the so-called coronula. The reason is that capsule flowers sit on the coronula and after their fall an open gate is left for 3-4 days. Around the wound caused by penetration - due to sunshine - an intensive chorofill formafion starts in the kernel and as a result of this a characteristic green spot appears on the coleoptil sprouts. Although bugs do not attack the germ directly, the damage caused by them can be significant because as a result of sucking, different fungi generate (Alternaria sp. Botrytis cinerea, etc.) which are known for damaging the germ.

In 1991, adults (picture 2.) appearing in large groups 20-25 per head decreased the germ capacity of seeds be 13 % on average. Adults continue their maturation feeding not only on the seeds but also on the axis inflorescentiae, the torus and the squame. After the damage characteristic wounds appear on the torus which can help the penetration of different fungi (mainly Phizopus orrhizus FISHER) Although earlier L. equestris was considered as a typical "edge pest"

the years 1990, 1991. contradicted this cate gorization. These two years we did not find significant difference between the numbers of individuals on the edge and inside the stand and the percent of the damage.

It was also confirmed that L. equestris significantly affects the kernel quality of the damaged seeds by increasing the linol-a-cid content ($C_{18:2}$) by 2.5 % which has a negative influence on the storability of the seeds.

NATURAL ENEMIES OF L. EQUESTRIS

The natural enemies of L.e. are very rare. Special literature only mentions the parazite of Elomya lateralis Meiger Dipt. Tachinidae (Mihályi 1986).

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