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Soybean insect pests occurring at podding stage in Taichung

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Abstract: A survey of insect pests infesting soybean at the podding stage was carried out at Wufeng in Taichung in 1979. 7 orders, 16 families and 33 species of insect pests were found attacking this crop. Among them, 10 species, viz, *Halticus tibialis*, *Cletus trigonus*, *Riptortus clavatus*, *Cletus punctiger*, *Nezara viridula*, *Piezodorus hybneri*, *Eysarcoris guttiger*, *Aphis glycines*, *Etiella zinckenella*, *Spodoptera litura*, attacked the pods. *Nezara viridula* and *Etiella zinckenella* are recognized as the most serious pests. The damage and the economic importance of other soybean insect pests are also discussed in this paper.

Research on soybean insect pests in Taiwan has always been focused on leaf-mining insects, such as *Ophiomyia phaseoli*, *Melanagromyza sojae*^(3,5,7,8,9), or pests' chemical control^(1,2,4,10,11,12), but surveys on insect pests species are rare, and related information or data is serious lacking. In fact, soybeans can be attacked by many species of insect pests from the young seedling to mature stages, and the species of insect pests involved are quite complex. At the same time, the long soybean podding stage, which takes about a half of the whole growing period of soybeans, make it possible for insects to harm pods directly or influence pod development by attacking other parts of soybean plants. This paper introduces results from a preliminary survey on the species of soybean insect pests found during the podding stage, with the purpose of assisting pest control by clarifying insect species. Due to the relatively short time of the survey, the insect pests collected in this paper are just a portion of all soybean insect pests involved.

Materials and methods:

The survey was carried out in soybean fields of Wufeng Farm in the Taichung Region, in 1979. The growing soybeans were not given any pesticide, and field practices were conducted as normal. The survey date started from the time when more than half of the plants reaching podding stage (stage R3)⁽¹³⁾, and finished when pods were in the maturing period (stage R7), once a week. The survey date was from April 26 to June 7 for spring soybeans and from August 6 to September 10 for summer soybeans.

Two survey methods were used. One was using the insect sweeping net, which was relatively easy but was difficult in capturing larvae and interior-feeding insect pests. Another method used was to visually inspect the whole plant, which could catch almost all insect pests without missing any, but was time-consuming. So our survey combined two methods to be mutually complementary. All insect pests collected were made specimens and given their scientific name by identification.

Results and discussion:

Totally 33 species of insect pests were collected in this survey, 8 of them specially harmful to soybean pods, 23 of them harmful to soybean parts other than the pod, 2 of them harming both pod and other parts of soybean (see table 1). Among the 23 species, leaf-feeding insect constituted 19 species. So the species of pod-feeding and leaf-feeding insects make up of 88% of the all insect pests collected in this survey. The remaining 12% are the insect pests that harm root, stem and flower of soybeans.

Table1: Soybean insect pests occurringd at the podding stage, Wufeng, Taichung

Insect pests	Injured part
Orthoptera	
Acrid idea	
<i>Atractomorpha anbigua</i> Bolivar	L
Gryllotalpidae	
<i>Gryllotalpa africana</i> Palisot de Bbeauvois	R
Thysanoptera	
Thripidae	
<i>Thrips hawaiiensis</i> (Morgan)	F
Hemiptera	
Miridae	
<i>Halticus tibialis</i> Reuter	P
Coreidae	
<i>Cletus trigonus</i> Thunberg	P
<i>Riptortus clavatus</i> Thunberg	P
<i>Cletus punctiger</i> Dallas	P
Pentatomidae	
<i>Nezara viridula</i> Linnaeus	P
<i>Piezodorus hybneri</i> Gmeiln	P
<i>Eysarcoris guttiger</i> Thunberg	P
Homoptera	
Jassidae	
<i>Empoasca fermesana</i> Paoli	L
<i>Balclutha inthrusa</i> (Melichar)	L
<i>Erythroneura arachisi</i> (Matsumura)	L
Aphididae	
<i>Aphis glycines</i> Matsumura	S, P
Lepidoptera	
Gelechiidae	
<i>Dichomeris ianthes</i> Meyrick	L
Pyrilidae	

<i>Hedylepte indicata</i> (Fabricius)	L
<i>Etiella zinckenella</i> Treitschke	P
Arctiidae	
<i>Amsacta lactinea</i> Cramer	L
Noctuidae	
<i>Spodoptrra litura</i> (Fabricius)	L, P
<i>Phytometra agnata</i> Stgr.	L
Liparidea	
<i>Notolophorus posticus</i> Walker	L
<i>Porthesia taiwana</i> Shiraki	L
<i>Cifuna locuples</i> Walker	L
Coleptera	
Scarabaeidae	
<i>Anomala expensa</i> Bates	L, R
<i>Protaetia orientalis</i> Gony et Percheron	L, R
<i>Adorctus sinicus</i> Burmeister	L, R
<i>Adoretus</i> sp.	L, R
Curculionidae	
<i>Lixus</i> sp.	L, R
<i>Eugnathus</i> sp.	L,R
Diptera	
Agromyzidae	
<i>Melanagromyza sojae</i> (Zehntner)	S
<i>Ophiomyia phaseoli</i> (Tryon)	R
<i>O. centrasematis</i> (de Meijere)	R
<i>Japanagromyza tristella</i> (Thomson)	L
Note: L for leaf, R for root, F for flower, P for pod, S for stem.	

Among the collected insect pests, Lepidoptera were in the dominant position by 9 species. Damage of Lepidoptera larvae to soybeans was divided in two categories, leaf biting and boring, or consuming the pod. Most of the leaf-eating soybean insect pests will feed on any part of the leaf where they crawl, but *Dichomeris ianthes* and *Hedylepta indicata* prefer to hide in a nest formed by binding adjacent leaves with silk they produce themselves, and feeding on mesophyll within the nest. Insect pests feeding on leaves could cause a decrease of leaves, causing the photosynthesis of plants to be impaired. Although soybeans have some ability to compensate for the damage, yields will be influenced if the damage to leaves exceed a maximum tolerance level. The larvae of *Etiella zinckenella*, a kind of insects of Pyralidae, is the most important pest which bores and feeds on pods. It bores pods and feeds on beans after incubation, and all stages of larvae are developed within the pods until pupating. This kind of insect pest causes serious pod damage at the soybean podding stage, and the greatest influence on soybean yield is at the middle and late podding stages. ^(14,15,16,17)

Insect pests of the order Hemiptera cause pods and beans to wither and yellow by

sucking their sap. The amount of feeding increases gradually with growth, therefore mature pests cause severe damage. Although stink bugs in early stages feed only a little, the damage symptoms on pods is very obviously due to its aggregation habit. The survey found that stink bugs (6 species) were dominant among the species of pod insect pests. They occurred from the beginning to the end of the podding stage. *Nezara viridula* caused the most serious damage among them and was the most important insect pest at the soybean podding stage in Taiwan. Furthermore, all planted soybean in the world has been suffered from damage by this pest.

Leaf miners of order Diptera are quite widespread at the young seedling stage of soybeans in Taiwan, and it can cause desolation of entire fields by withering of all plants. Therefore they were taken into consideration by researchers, locating so far 5 species of them in Taiwan. Our survey indicated that *Melanagromyza sojae* is the most common pest in soybean fields, with almost all plants surveyed infested by it. *Japanagromyza tristella* and *Ophiomyia phaseoli*, *O. centrasemalis* were found also but not prevalent, and *Melangromyza dolichostigma* did not be collected.

Almost every soybean plant in the survey contained leafhoppers in groups, but a light disturbance caused them to fly away immediately. *Empoasca formosana* made up the majority, followed by *E. arachisi*. Its direct damage caused was only slight. However, much higher attention should be paid to the virus diseases transmitted by this leafhopper.

Most of the larvae of Coleoptera live in soil and feed on rotting plant tissues and plant roots, adults land on twigs and leaves of soybeans, leaves and tender stems are their favorite foods. This survey found that *Anomala expensa* was the only one with a large population in May and June, but the intensity of its feeding on leaves was not yet a threat to soybean plant growth. Other species of insect pests of Coleoptera listed in Ttable 1 are not common. According to the survey results, the density of insect pests of Coleoptera was not high, and neither larvae nor adults presented a threat to soybean plant growth.

Orthoptera *Atractomorpha anbigua* feed on leaves of soybean, *Gryllotalpa africana* harm the roots of soybean, and they could be found in any soybean planting areas. Because of its low density, it did not cause significant losses in the survey areas.

The history of planting soybeans in Taiwan is not very extensive. Only in recent years did producers in some areas replace other crops with soybean, so the ecosystem in soybean fields is not stable yet. Some insects without economic importance or not present in soybean fields now will probably become important soybean pests in the future, and some important pests now will gradually lose their economic importance. Even if in the same period, the difference of climate, environment and cultivation method in different areas will influence the species and density of insects. This survey was only limited to stage R3 to stage R7 of soybeans in new soybean fields of Wufeng,

Taichung. Regarding the insect pests species in old, large fields planted with soybean and other areas of Taiwan, it will need further surveys and reporting.

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