SUBSTITUDE DIET FOR LARGE MILKEED BUG ONCOPELTUS FASCIATUS (DALLAS) (HEMIPTERA: LYGAEIDAE)

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ÖZET

Oncopeltus fasciatus (Dallas) (Hemiptera: Lygaeidae) un laboratuvarda muhtelif gıdalarla beslenmesi.

İyi bir laboratuvar hayvanı olan Oncopeltus fasciatus birçok araştırıcılar tarafından deneme hayvanı olarak kullanılmaktadır. Tabiatta bu böcek Asclepias spriaca L. bitkisi tohumları üzerinde beslenmektedir. Bu bitkinin tohumları, ticarette satılmadığı için çok hallerde temini güç olmaktadır. A. spriaca tohumlarının temin edilmediği zaman, alternatif yem olarak nelerin kullanılabileceğini tesbit etmek maksadıyla bu çalışma yapılmıştır.

Asclepias spriaca bitkisi hülâsası ve kabuğu soyulmuş ayçiçeği tohumları bu denemede yem olarak kullanıldı. Bitki hülâsası çeşitli yollarla böceğe verildi. Kontrol olarakta A. spriaca tohumları kullanıldı. Bitki hülâsası ile beslenen nymphler azami 19 gün kadar ancak yaşayabildiler. Nymph'lerin ortalama ağırlıkları 0,00043 gram olup ayçiçeği ile beslenenlerin 1/2 si, kontrolyemle beslenenlerin ise 1/6 sı kadar ağırlıkta olabildiler.

Ayçiçeği ile beslenenlerde beslenmeğe tabi tutulan 640 nymp'den % 20,93 ü ergin oldu. Bitki hülâsası ile beslenenlerle mukayese edildiğinde ayçiçeği tohumunun çok daha üstün olduğu görülür. Fakat kontrol ile karşılaştırıldığında ayçiçeği tohumu ile beslenenlerde yaşama oranının kontrola nazaran çok daha düşük olduğu ortaya çıkmıştır (Şekil 1, 2 ve tablo 1, 2, 3).

Netice olarak ayçiçeği tohumlarının muvakkat bir zaman için Oncopeltus fasciatus böceğinin laboratuvarda yetiştirilmesinde kullanılabileceği anlaşılmaktadır.

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INTRDUCTION

The large milkweed bug, *Oncopeltus fasticiatus* (Dallas) is a very good laboratory issect, and it has been widely used as an experimental animal. The food of the milkweed bug is the seed of the milkweed plant. However there is no commercially available source of milkweed seeds which are necessery to maintain laboratory colonies. Those who wish to rear the bugs must collect pods from milkweed plants and clean the seeds. Much time is consmued in this procedure and this might discourage the use of *Oncopeltus fasciatus* as alaboratory animal, in spite of its good features (Frings and Peissner 1952).

The purpose of this study was to determine if a food substitudes could be found which would provide the essential nutrients necessary to effectively rear large numbers of the milkweed bugs. Another purpose was to find some other food substitudes that might be used in emergencey situations.

In this study sunflower seeds and milkweed plant extract were used as artificial diets. Unfortunately these diets were not satisfactory for rearing milkweed bugs when compared with those reared on milkweed seeds (Table 1,2 and 3).

This experiment was conducted at the Insectory between september 15, 1968 and February 1, 1969.

LITERATURE REVIEW

Andre (1934), found that *Oncopeltus fasciatus* (Dallas) feeds on milkweed species, an it is essentially a monophagous insect. Eggs, nymphs, and adults were collected from the flowers and pods of commen milkweed *Asclepias spriaca* L. nmyphs in the third and fourth instars from pods of the whorled milkweed, *Asclepias verticillata* L., and several mating pairs from the showy milkweed, *Ascplepias speciose* Torr. He also observed that the bugs would occasionally pierce the tissues of grass-plants, bu he could not rear them on such hosts. Hussey (1952), pas reported that cleander serves as ahost plant in Florida. He had taken adu.ts and nymps of all stages on oleander during the early days of May. Scheel et al (1957), have reared the milkweed bug on natural and purified diets. The growth obtained was subobtimal; the insects on the purified diets growing at half the rate of the controls on natural diets and attaining but about half the normal weight.

The milkweed bug has been reared by Lea and Niswander (1950) in the Ohio State Entomology Laboratory for a number of years on milkweed seeds. Ithas been observed thatif sufficient food was not available there was a dicrease in egg production lack of vigor in the individuals and smaller size of the adults. It was suggested by these authors that considerable time was consumed in collecting and cleaning

of the seeds. To find other food substitutes easily avalible and in large quantities, they used kidney beanes, roled oats, squash cantaloup and watermelon seeds. The bugs did not feed on the watermelon seeds unless the seed coat was removed or cracked First instar nymphs matured and produced fertile adults when feed on exposed embryo. Their results indicated that there was no difference in te rate of development, size or vigor of individuals reared on watermelon seeds comparied with those reared on milkweed seeds.

Dog biscuit, milk powder, and rolled oats were tried both dry and moistened by Frings and Peissner (1952), on none of these did the insects survive for more than ten days. They found squach to be the most convenient. They also used peanuts whose seed coat were removed with hot water treatment. Peanut was as succesfuly as milkweed seeds. But Fring, et al. (1957) indicated that the bugs grew more slowly and with greater variabilitiy in rate on balanched peanuts than on milkweed seeds, and survival was poorer. Egg production by bugs fed on peanuts was about that of bugs fed on milkweed seeds. Thay concluded that raw peanuts can be regarded as a substatitude food for the large milkweed bug, but not as sutisfuctory as milkweed seeds.

Beck *et al.*, (1958) studied the feeding behavior of fifth instar nmyps utilizing photagraphic techniques and purrified diets. Intensity of feeding and characteristics of feeding behavior were markedly influenced by the presence or absence of the milkweed seed coat. They presumed that, its role might be chemotactic in nature.

The feeding behavior of the milkweed bug has been studied by Feir and Back (1963), and they concluded that; (1) orientation to the dietary substarate was an antennal funciton. Atractants in the milkweed seed coat elicited an orientation responce (2), initiation of feeding began with labial chemoreceptors contacting nutrient subbstrate followed by stylet penetration and release ofsalivary secrations (3), maintenance of feeding was dependent upon sencory input from chemoreceptors situated internal to the stylets. Sugars and aminoacids as well as unidentified stimulants in the seed coat played a role in tedermining the duration of feeding, (4) cessation of feeding occurred as the result of sensory adaptation to the feeding stimulants and probaly deplation of the insect's supply of salivary secrations.

MATERIALS and METHODS

As food, milkweed seeds, milkweed plant extract, corn oil, wheat flour, sunflover seeds, and water were used. Pint jars, vials, cotton wicks, four-inch plastic tubes, chees-cloth, and small wooden boxes were items used in the conducting the experiment.

In each experiment 16 pint jars cuntaining each candidate or control food were used for growth chambers.

Milkweed seeds were for control, sunflover seeds and milkweed plant extract were candidate foods. Procedures for milkweed seeds and sunflover seeds were the same, but for the milkweed plant extract, there were some differences.

Each jar contained milkweed seeds or sunflover seeds and a vial, containing a cotton wick with a four-inch plastic tube served as a water reservoir. The reservoir, was filled by adding water through the plastic tube which extended through a cheas-cloth cover.

Twenty newly laied eggs were placed in every 'ar which were then placed in atemperature cabinet wehere the temperature was 25°C The 'ars remained there for the duration of the experiment except when the insects were weighed and their food changed.

The fallowing procedures were used when milkweed plant extract was the canditate food: (1) the vial contaning a cotton wick was filled with plant extract and thus the vial served as both the water reservoir and the food source. Every day the vial and cotton wick were changed to prevent bacteria and fungi growth, (2) in another experiment cotton wicks were cut into 4-5 pieces and each piece was dipped into the plant extract and placed in a jar. Every day cotton pieces were changed, (3) plant extract was poured in a smallvial and covered with parafilm and placed in a jar. That time also vials and plant extract chaned veery day, (4) a small amount of plant extract was put in a petri dish and allowed to dry. The dried plant extract was mixed with wheat flour by adding very litt-le corn oil and rolled into small pallets. Three ot four pallets were placed in each jar and the same procedures were followed as for the milkweed seeds and sunflover seeds. The remainder pallets were frozen and stored until needed.

The nymphs were initially weighed at the first instar and after each succeding moult till the end of the fifth week. All insects in each jar were weighed and individual weigts were calculated, the mean weght was determined for all insects in eacn instar in all 16 jurs and for every food. The milkweed seeds and sunflover seeds experiments were replicated two times however the plant extract was repliacated three times.

The sunflover seeds had no seed coat, they were exposed embryos.

RESULTS AND CONCLUSION

When milkweed plant extract was used as candidate food for the rearing of milkweed bug in procedurs one, the nymph did not survive more than ten days, they were all dead at the end of that much time. In the second prosedure the stuationwas better than the first one but in average 14 days they died. Some of them moulted. In three jars nine nymp survived for 19 days and they were in second instar. As it is seen in the Table 1 the average weight of nymphs was 0.00043 grams which was 1/2 of the nymps which were reared on sunflover seeds and than 1/6 of the control. In prosedure three no feeding was ob-

served, and they all died bacause of starvation. In fourth prosedure no feeding was observed either. Secon and third instar nymps were tried to rear on the same food that used in fourth procedure but they did not feed.

The insect reared on sunflover seeds were better than tne milkweed plant extract (Table 1,2,3) 20.93 % of 640 nymphs reached adult stage but when compared those reared on milkweed seeds (control) it was seen that the average weight of nymps and survival rate were very low and mortality was very high (Table 1,2,3, and Fig. 1,2).

We can coclud that the uses of sunflover seeds would probably be to support a colony of milkweed bugs for a limited time if milkweed seeds became exausted.

Table 1. The weight of insects in replication 1 and 2.

Candidate Foods	Average Weekly Weight of Nymphs (Gram)				
	Week 1	Week 2	Ieek 3	Week 4	Week 5
Milkweed plant extract	0.00043	.000	.0000	.000	.000
Sunflover seed	0.0008	.0037	.0054	.0184	.0298
Milkweed seed (Control)	0.0028	.0252	.0624	.0673	.0691

Table 2. Mortality rate for replication 1 and 2. Nümbuer in ( ) represents accumulated fweekly deaths.

Candidate foods	Total num- of insects used in rep. land 2	Accumulated weekly desth in %				
		Week 1	Week 2	Week 3	Week 4	Week 5
Milkweed plant extract	640	12 (77)	all dead			
Sunflover seeds	640	5.78(37)	29.38(188)	45.78(293)	58.75(376)	70.46(451)
Milkweed seeds (Control)	460	2.18(16)	10.15(65)	11.78(76)	12.50(80)	12.81(82)

Table 3. Maturation rate. Number in ( ) representess number of adults insects.

Candidate foods	% reaching maturity weekly				
	Week 1	Week 2	Week 3	Week 4	Week 5
Milkweed plant extract	0	0	0	0	0
Sunflover seeds	0	0	0	4.21(26)	20.93(134)
Milkweed seeds (Control)	0	0	8.28(43)	80.65(554)	80.73(558

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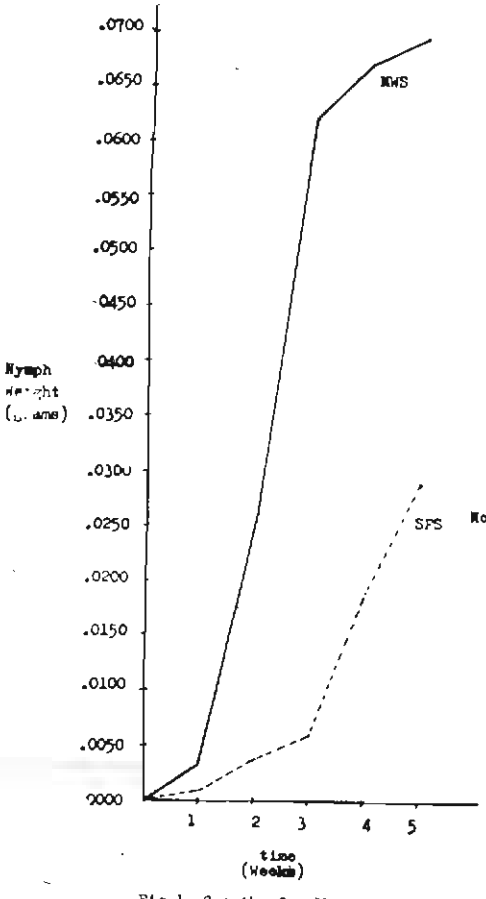

Fig.1. Growth of milkweed bugs on milkweed seed(MWS), and sunflower seed(SFS)

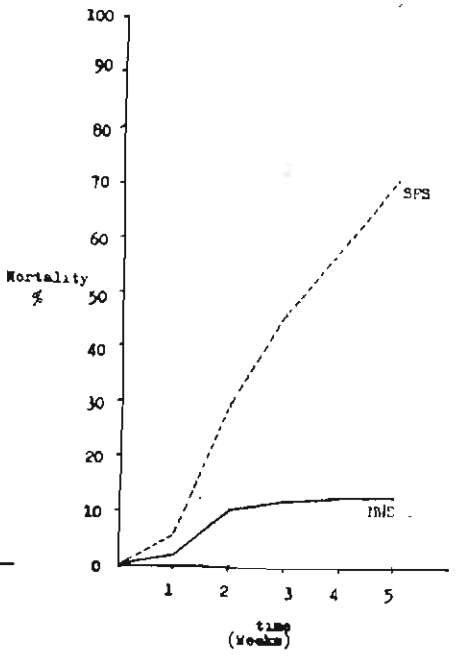

Fig.2. Mortality of milkweed bug.