

## On Relation between the Feeding Behavior of *Laodelphax striatellus* FALLÉN (Delphacidae) and the Ovarial Maturation<sup>1</sup>

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The smaller brown planthopper, *Laodelphax striatellus* FALLÉN is an important pest as a vector of the rice stripe disease which is caused by virus. The adult planthopper usually probes about 50—150 times at different parts of the host plant with its proboscis in throughout 24 hrs., but the frequency of probing is variable according to environmental factors such as temperature (ISHII and NAITO, 1964) and also developmental stages of the insect.

This paper deals an experiment to prove the relationship between the feeding frequency and the insect development, especially the ovarial growth.

### MATERIAL AND METHOD

The long winged female (macropterous) adults were collected from field by sweeping and the insects were separately bred with the rice plant leaf in test tubes to observe the probing frequency on a limited area of the leaf as shown in Fig. 1. Whole tubes were kept in a thermostat at 25°C

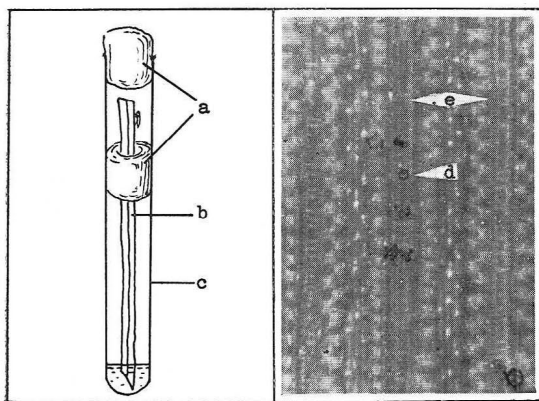


Fig. 1. Feeding cage (left) and probing punctures of *L. striatellus* (on the rice leaf  $\times 100$ ): a, cotton; b, leaf; c, test tube; d, probing puncture; e, leaf vein.

with continuous illumination. After 48 hrs., the attached leaf was taken out and number of punctures were counted. The probing puncture was stained by erythrosine (NAITO, 1963, 1964, 1964 a). The detailed technique of the staining is as follows. The infested leaf was placed under dark condition for 15—30 min. to let the stomata close, and dipped in 70 per cent alcohol, next transferred to 1 per cent solution of erythrosine, which acts selectively upon the probing puncture. After 1—5 min. the stained leaf was transferred into tap water and washed several min., then the leaf was dried up and pressed, by this treatment the punctures become clear, affording easy detection of probed part for observers under microscope.

The degree of ovarial maturation was observed by dissection immediately after estimation of feeding test. The degree of ovarial development was classified into three stages as maturation division stage (stage of polar body discharge), yolk forming stage and chorion forming stage, as SUENAGA (1963) did about *Nilaparvata lugens* STÅL.

### RESULT

The process of ovarial maturation in the adult of *L. striatellus* was divided as follows. The smaller oocytes were observed in oviducts in a newly emerged adult, this stage was assumed to be maturation division stage. The egg size and ovary grown day by day after emergence, then the yolk forming continued for several days. The egg size was further increased rapidly at this stage and then entered into the chorion forming stage, which coincides with the oviposition of the adult.

The relation between the frequency of the oral probing of the insect and the ovarial development stage is shown in Fig. 2. The highest frequency of oral probing was observed in the yolk forming stage and its average frequency was 267.4 for 48 hrs., and next value of frequency was 182.3 in maturation division stage, the last was 161.9 in the chorion forming stage. The frequency of probing was not frequent in the matured stage. Taking into account ovarial development in 48 hrs. feeding test, the real probing activity may be highest in the later period of maturation division stage. When huge number of punctures were observed by a certain individual during oviposition being abnormal one, it was omitted from the estimation.

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(Received for publication, August 31, 1965)

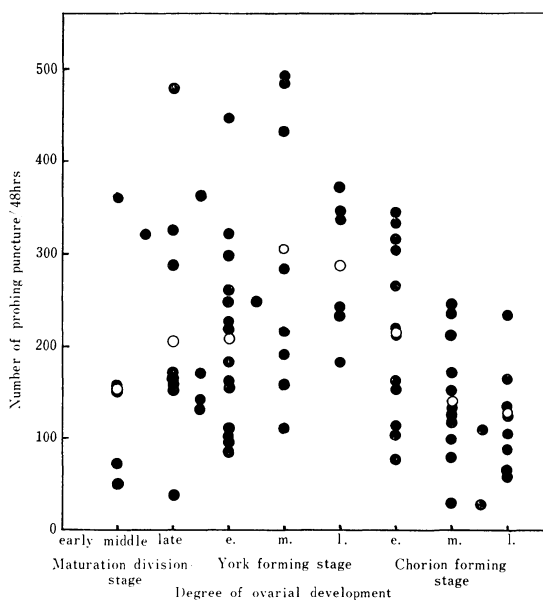


Fig. 2. Relation between ovarian maturation of *L. striatellus* and the probing frequency. (White circles are mean value)

## 抄 録

### アブラムシ類の唾腺分泌物に関する研究

MILES, P. W. (1965) Studies on the salivary physiology of plant-bugs: The salivary secretions of aphids. *J. Ins. Physiol.* 11: 1261-9268.

モモアカアブラムシ, エンドウヒゲナガアブラムシ, ダイコンアブラムシ, および *Aphis craccivora* KOCH を用いて, アブラムシ類の唾腺分泌物である口針鞘形成物質と漿液状唾液の生理学的研究がなされた。

凝固した口針鞘形成物質は 亜硫酸ナトリウム飽和 8M 尿素溶液中で速かに溶解し, 蛋白鎖間に水素結合と共に SS 結合による架橋の存在が暗示された。またエチルマレイミドおよびチオグリコール酸塩による前処理を含む DDD (dihydroxy dinaphthyl disulfide)法によって SS 結合および SH 遊離基の存在が証明された。分泌直後の口針鞘形成物質中に DOPA (dihydroxyphenylalanine) を酸化するポリフェノール酸化酵素の活性が認められた。この酵素の活性がシアン化物と尿素の連合作用によって完全に阻害されたと考えられる条件下では口針鞘の形成が観察されなかった。このことはポリフェノール酸化酵素が口針鞘形成物質の凝固過程において必須の要素であることを示唆した。口針鞘形成物質およびポリフェノール酸化酵素は唾腺主腺(main salivary gland)の主細胞(main cell)と被覆細胞(cover cell)からそれぞれ分泌されることがわかった。pH 指示薬を含むシラップ状蔗糖溶液の薄層を吸収させることによって漿液状唾液の排出が明確に観察できた。4 種のアブラムシの漿液状唾液の pH 値はいずれも約 8 であった。一方口針鞘形成物質は約 pH 6 であった。

以上の結果を考察し, 著者がすでに明らかにしているカメムシ類の口針鞘形成に関する生理学的知見を, アブラムシ類にも普遍し得ることを結論した。(名大農 寒川一成)

It is supposed that the feeding behavior of the insect is active at younger stage of ovarian development. The virus transmission by this hopper may be correlated to their ovarian development that is related to the insect activity.

## ACKNOWLEDGEMENT

The author express his sincere thanks to Dr. S. NASU and Prof. N. YAGI for their kind advice and suggestions during the experiment, and also wishes to thank Dr. J. MASAKI for his encouragement.

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### アブラムシ類の唾液によるセルロースの分解

ADAMS, J. B. and M. E. DREW (1965) A cellulose-hydrolyzing factor in aphid saliva. *Can. J. Zool.* 43: 489-496.

アブラムシが口針挿入中に分泌する唾液によるセルロース分解作用が研究された。24ないし48時間パラフィルム膜を通してアブラムシに吸収させたカルボキシメチルセルロース(CMC)を沓紙(Whatman paper 3MM)につけ, ブタノール・酢酸・水(4:1:5上層)で上昇または下降法により一次展開し, 風乾後アニリン・フタル酸溶液を噴霧し呈色反応および紫外線下で蛍光を調べ分解生成物が検出された。58種類のアブラムシが調べられ *Aphis pomi* DE GEER, *Myzus cerasi* FAB., *Hyadaphis foeniculi* (PASS), *Prociphilus tessellata* FITCH, *Aphis fabae* SCOP., *Neomyzus circumflexus* BUCKTON および *Macrosiphum euphorbiae* (THOMAS) を含む31種類に CMC をグルコースに, あるいはグルコースとセロビオースに加水分解する作用が認められた。しかし他の23種類には分解作用が認められなかった。また数種類のアブラムシでは, 型, 季節, あるいは寄主植物の違いにより分解作用に相異が示された。例えば *Brassica napus* L. 上から採集されたモモアカアブラムシには分解能力が認められたが, *Raphanus* の一種で育ったものには認められなかった。

分光分析の結果, 吸収された CMC 溶液中に蛋白質が検出され, CMC の分解は唾液中の酵素の作用によるものと考えられる。しかしこの酵素が唾腺の腺細胞で産出されたものか, あるいは共生微生物に由来するものかは不明である。アブラムシ類の唾液のセルロース分解作用は口針挿入を容易にするばかりではなく, この分解能力の差異が寄生選択を支配する一因となっているかもしれないことが暗示された。(名大農 寒川一成)