Practical
Insect Control Ent 408
مكافحة الحشرات 408 ش

4th year- Chemistry and Entomology

الفصل الدراسى الثانى
2022/2023

Biological control

"Predaceous insects"

1. Lethocerus niloticus (Hem., Belostomatidae)

(Giant-water bug)

a. **Relation to host:** predator

b. **Preys:** small flies, small mosquitoes, butterflies, tad poles

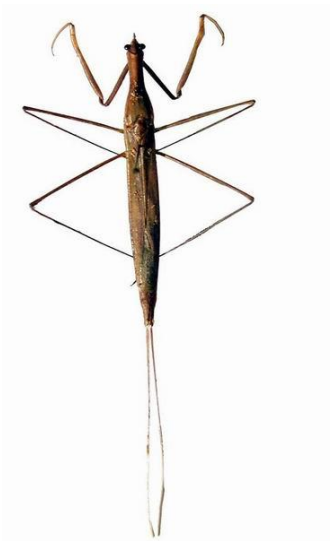
c. **Stage of predation:** Adult and nymph

d. **Habitat:** Semi aquatic live in ponds and lakes.

e. **Mode of feeding & life cycle:** The insect catches its prey by its seizing fore leg then by aide of its piercing-sucking mouth parts, predator inject digestive enzymes into prey body to digest tissues extra intestinally then suck up the fluid formed.
(Eggs are laid on the back of male till hatching)

2. *Laceotrephes fabricii* (Hemip., Nepidae)

Ranatra vicina **(Hemip., Nepidae) (Water scorpion)**



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3. *Cybister tripunctatus* (Coleo., Dystiscidae)

(predaceous diving beetle)

4. *Eretes sticticus* (Coleo., Dystiscidae)

a. **Relation to host:** predator

b. **Preys:** small flies, small mosquitoes, butterflies, tad poles.

c. **Stage of predation:** Adult and larva.

d. **Habitat:** adult is semi aquatic; larva is true aquatic.

e. **Mode of feeding & life cycle:** Larva called water-tiger catches preys by the sickle-shaped mandible, where food channel occurs as a groove on it, it secretes digestive enzymes into its prey body, externally digested food is sucked up.(Eggs are laid on stem of aquatic plant; larva pupates in cavity in damp soil)

5. *Sphodromantis viridis* (Mantodea, Mantidae)

a. **Relation to host:** predator.

b. **Hosts:** Nymphs feed on aphids, leafhoppers, and coccids.

c. **Stage of predation:** Adult and nymph.

d. **Habitat:** terrestrial

e. **Mode of feeding:** female lay eggs in clusters in eggpod covering it by foamy secretion from its abdomen and stick it to plant stems, insect catches the prey with its seizing fore leg, feed on it by the chewing mouthparts.

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6. *Polistes gallicus* (Hymenoptera, Vespidae)

a. **Relation to host:** Hunter

b. **Hosts:** Caterpillar

c. **Stage of predation:** Adult and larva

d. **Habitat:** Adult is aerial, larva is terrestrial.

e. **Mode of feeding:** female lay eggs in nests built of chewed leaves held together to plant stems. The female provides the larva with the prey after being paralyzed with the female's mouthparts.

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7. *Ammophila tydei* (Hymenoptera, Sphecidae)

a. **Relation to host:** Hunter
b. **Hosts:** Caterpillar, cockroaches, and mole cricket.
c. **Stage of predation:** Adult and larva
d. **Habitat:** Adult is aerial, larva is terrestrial.
e. **Mode of feeding:** female lay eggs in underground nests built with mud cells then cover it by sand. The female provides the larva with the prey after being paralyzed with the female's mouthparts and sting.

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8. Paederus alferii (Coleoptera, staphylinidae)

a. **Relation to host:** predator
b. **Preys:** Adult feed on white fly, scale insects, leafhoppers, and mosquito, Larvae prefer to feed on collembolans.
c. **Stage of predation:** Adult and larva
d. **Habitat:** terrestrial live in decaying matters.
e. **Mode of feeding & life cycle:** eggs are laid singly in mud, moisted soil, or decaying organic matters, larva is more voracious than adult.

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9. *Mortar hyalinus* (Neuroptera, Mermelionidae)

Palparis dispar

a. **Relation to host:** predator

b. **Preys:** As before, larva called ant lion.
c. **Stage of predation:** Adult and larva
d. **Habitat:** Adult is aerial, larva is terrestrial.
e. **Mode of feeding & life cycle:** eggs are laid in sand, larva excavate cone-shaped burrow in soil then covers its tip by sand. When ants walk on the surface, sand moves downward stimulating the larva to catch its prey with the sickle shaped mandible and piercing its body causing paralysis to the victim.

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10. *Lepidura confusa* (Dermatoptera, Lebiduridae)

a. **Relation to host:** predator
b. **Preys:** Aphids, leafhoppers, first and second larval instars of spodoptera.
c. **Stage of predation:** Adult and nymph.
d. **Habitat:** occur in cracks, crevices, and under bark of trees.
e. **Mode of feeding & life cycle:** Eggs are laid in burrows in ground, regarded by female till hatching, adult hiding during the day, the insect has chewing mouthparts by which it bears its prey.

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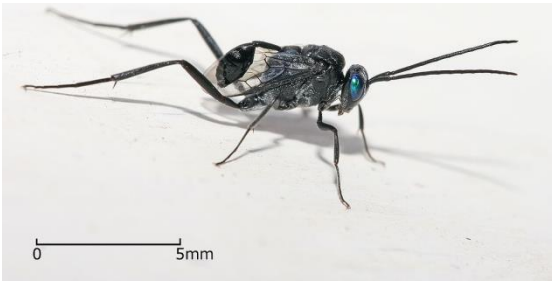
11. *Gataglyphus bicolor or Camponotus maculatus* (hymenoptera, formicidae)

a. **Relation to Host:** predator.
b. **Hosts:** aphid and leaf hoppers
c. **Stage of parasitism:** adult only
d. **Habitat***:* occur in cracks, crevices and under bark of trees
e. **Mode of feeding & life cycle:** eggs are laid in the soil, it is social insect lives in hives in the ground, the insect catches its prey with the strong mandible.

PARASITOID

12. *Evania appendigaster* (Hymenoptera, Evanidae)



a. **Relation to Host:** egg parasitoid, endoparasitoid**.**
b. **Hosts:** Ootheca of cockroaches.
c. **Stage of parasitism:** larvae, adult is nectar feeder
d. **Habitat:** adult is aerial, larva occur within host.
e. **Mode of feeding & life cycle:** female lays eggs within ootheca of cockroaches before it is completely hardened ….at the first larval instar, larva is considered a true egg parasite then moult and become an egg predator, pupation take place in host remains, emergence occur in late spring

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13. *Mintho isis* (Diptera, Tachinidae)

(As before)

a. **Hosts:** + lepidoptera

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14. *Trichograma sp*. (hymen., trichogrammatidae)

a. Relation to Host: egg parasitoid, endoparasitoid**.**

b. Hosts: egg of hymenoptera, Diptera and lepidoptera as Ephestia

c. **Stage of parasitism:** larvae, adult is nectar feeder.

d. Habitat: adult is aerial, larva occur within host.

e. Mode of feeding & life cycle: female lays eggs within the host eggs, larva feed on the host, pupation take place in the host.

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15. *Telenomus nawai* (Hymeoptera, Scelionidae)

(As before)

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16. *Brachon hebetor* (Hymenoptera, Brachonidae)

a. Relation to Host: Ectoparasitoid, larval parasitoid

b. Hosts: Ephestia, plodia, Corcyra larva

c. Stage of parasitism: larvae, adult is nectar feeder.

d. Habitat: adult is aerial, larva occur beside the host in its burrow

e. Mode of feeding & life cycle:

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17. *Diaeretella rapae (*hymenoptera, Brachonidae*)*

a. **Relation to Host**: larval, endoparasitoid**.**
b. **Hosts:** third and fourth nymphal instar of aphid.
c. **Stage of parasitism:** larva.
d. **Habitat:** adult is aerial, larva occur in the body of the host.
e. **Mode of feeding & life cycle:** solitary parasitoid, female lays only one egg in each host, hatched larva start feed on its host.

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18. *Gonia bunaculata* (Diptera, tachinidae)

a. **Relation to Host:** larval, pupal endoparasitiod.
b. **Hosts:** spodoptera, agrotis, pieris larva and pupa**.**
c. **Stage of parasitism:** larva
d. **Habitat:** adult is aerial, larva occur in the body of the host.
e. **Mode of feeding & life cycle:** Eggs are laid on the plant surface**,** host larvae ingest the eggs during feeding, hatched larva start feed on its contents.

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19. *Nasonia vitripennis* (hymenoptera, pteromalidae)

a. **Relation to Host:** pupal endoparasitoid
b. **Hosts:** last larval instar of flesh fly (pre-pupa)
c. **Stage of parasitism:** larva
d. **Habitat***:* adult is aerial, larva occur in the body of the host.
e. **Mode of feeding & life cycle:** (gregarious parasitoid), eggs are laid in the host, pupation in the host pupa.

Bioassay التقييم الحيوي للمبيدات

- يمكن تعريف التقييم الحيوي بالنسبة للمبيدات هو تقدير مدي استجابة الفرد من الكائنات الحية (الآفة) عند تعرضها لمبيد معين تحت ظروف معينة يقل فيها تأثير كل العوامل الأخرى فيما عدا تلك العوامل المتعلقة بتأثير المبيد المختبر مثل التركيز و الوقت.

- أهم أغراض الاختبار الحيوي-: Bioassay

1) استكشاف المركبات الكيميائية كمبيدات Screening حيث يتم استعمال الحشرات لمعرفة مدي قوة سمية أحد المواد الكيماوية الجديدة كمبيدات و عادة ما يستخدم مبيد قياسي للمقارنة به مع استخدام افراد علي درجة عالية من الحساسية في هذا الاختبار.

2) استعمال الحشرات الحساسة كأداة بدلا من الطرق الطبيعية أو المواد الكيماوية في تقدير متبقيات المبيدات Residue analysis وذلك حيث يشمل تغير بسيط في كمية المبيد الفرق ما بين 5-10% نسبة موت للحساسية العالية لحشرة الاختبار .

3) تقدير مدي حساسية أو تحمل الحشرات للمبيدات نظرا لظهور ظاهرة التحمل Toleranceوالمقاومة Resistance للمبيدات في الحشرات نتيجة تكرار استخدامها ضد الحشرات الزراعية و الطبية فغالبا ما تستخدم الاختبارات الحيوية لتقدير مستوي الحساسية أثناء برامج المكافحة لتوضيح اتجاه السلالات الموجودة بالحقل و اختبار أنسب المبيدات بالتركيزات المناسبة ضدها.

4) المفاضلة بين كفاءة المبيدات و مقارنة كفائتها.

5) يمكن الاستفادة من الاختبارات الحيوية في دراسة انتقال العوامل الوراثية الخاصة بالمناعة أو المقاومة و التعبير عنها بطريقة كيميائية أو فسيولوجية .

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العوامل المتغيرة المؤثرة علي نتائج الاختبارات الحيوية:

- استجابة الكائن الي المختبر لتأثير المبيد يمكن تقديرها بطرق مختلفة حسب الغرض من الاختبار.

- فاذا كان التاثير السام للمادة يقلل النمو مثلا أو يخفض التكاثر باستمرار فان هذه الاستجابة تعتبر متغيرا مستمرا Continuous response اما اذا كان الغرض من دراسة تأثير المادة هو تقدير عدد الافراد الميتة فان هذه الاستجابة تعتبر تغييرا غير مستمرا نظرا لعدم وجود جزء من الفرد وبمعني أن يموت الفرد أو يعيش ولا شي بينهما و هذا النوع من الاستجابة هو المستعمل غالبا في اختبارات المبيدات الحشرية و

الاكاروسية و الفطرية وسميت هذه الاستجابة Quantal response أي ان حدوثها من عدمه يعتمد علي شدة المؤثر .

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العوامل المؤثرة علي درجة الاستجابة:

1. كمية المبيد المسبب للتأثير.
2. مدة تعرض الكائن الحي المختبر للمبيد.
3. درجة الحرارة و الظروف البيئية.
4. حالة الكائن المختبر كالجنس و العمر و التغذية.

 و لنجاح الاختبار الحيوي تثبت جميع العوامل السابقة فيما عدا العامل المراد اختبار تأثيره وهو في الغالب تركيز المبيد أو فترة تعرضه. و كما أن التاثير السام للمادة الكيماوية يتناسب مع جميع هذه العوامل .

- الإعداد للاختبار الحيوي:

1) تجميع الحشرات أو الكائن المختبر بحيث تكون متجانسة مع توفر سلالة علي درجة عالية من الحساسية بالعمل للمقارنة بين السلالات.
2) تحضير محاليل المبيدات باستخدام المذيب المناسب مثل الاسيتون.
3) إيجاد وسيلة للتخدير في حالة الحشرات الدقيقة مثل الاثير.
4) عمل اختبارات أولية Pilot tests لاختبار أنسب التركيزات.
5) إعداد عدد مناسب للحشرات لعمل تكررات منها و عادة ما يشتمل كل مكررة 20 حشرة و في حالة الحيوانات 5-10 حيوانات. كلما زاد عدد المكررات كانت النتائج أقرب من الواقع.
6) إعداد مجموعة من الحشرات أو الكائن المختبر بدون معاملة .(Control)

- طرق قياس سمية المبيدات و تسجيل النتائج:

o تتوقف الطريقة المستخدمة علي حسب نوع و صورة لمبيد المستخدم و نوع الحشرة المعاملة و سلوكها و طرق غذائها وكل الطرق تتفق في أن عدد ثابت من الحشرات يعرض لكل تركيز في مكررات لحساب نسبة الموت أو الاستجابة كالصدمات مع

تصحيح النتائج عند لمقارنة اذ مات أي فرد في مجموعة Control باستخدام معادلة أبوت للتصحيح وهي كالتالي:

- النسبة المئوية للموت المصححة = م – م1 /100- م1 * 100
- حيث م = النسبة المئوية للوفاة في الاختبار.
- م1 = النسبة المئوية للوفاة في .Control

- أهم طرق معاملة الحشرات المستخدمة ما يأتي :

1) المعاملة السطحية Topical application

وهي أكثر الطرق استعمالا لسهولة ودقة النتائج كما يمكن عن طريقها تحديد الجرعة التي تصل للفرد الواحد أو لوحدة الوزن من جسم الحشرة التي تقاس عادة بالميكروجرام / مليجرام وتستخدم لذلك أجهزة قياس حجمية دقيقة (0.1 – 1.0 ميكرو لتر) مثل الماصات الدقيقة أو جهاز ال Micro applicator الذي قد يكون يدوي التشغيل أو نصف آلي أو آلي.

حيث يعطي حجما من المحلول المبيد يحتوي علي الجرعة المطلوبة وعادة ما يوضع المبيد علي المنطقة الصدرية لجسم الحشرة.

2) الحقن Injection

وهي طريقة تحقق دخول كل كمية المبيد دخل الجسم ولكنها غير منفصلة فقد تضر الحشرة .

- أهم طرق معاملة الحشرات المستخدمة ما يأتي :

3) خلط المبيد مع المادة الغذائية كما في آفات الحبوب المخزونة و اليرقات.

4) تغذية أو سقي الحشرات بالمبيد مع وجود مادة جاذبة كالسكر كما في حالة الذباب.

5) الرش الدقيق المباشر للحشرات أو للأسطح التي تتعرض لها الحشرات بعد ذلك و يستعمل لذلك أجهزة خاصة مثل ال. Poter tower

6) التعريض لمتبقي المبيد الموجود علي صورة فيلم بأطباق بتري أو ورق ترشيح وفي هذه الحالة يكون تعريض الحشرات إما غير مستمر أي لفترة قصيرة أو مستمر طوال فترة الاختبار أو بعد الفترة المحددة.

7) الغمر Dipping وهي غير مفضلة وتستعمل الحشرات المائية و طفيليات الحيوان كالقمل.

Efficacy of some insecticides on field populations of *Culex pipiens* (Linnaeus) from Egypt

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https://doi.org/10.1016/j.jobaz.2012.07.005

Test insects

Four populations of the mosquito, Cx. pipiens were used dur-ing this study. A laboratory colony (control) was used as abaseline in insecticide and biochemical assays; it was kindly provided by the Research Institute of Medical Entomology, Ministry of Health and Population, Dokki, Giza. This colony was started from egg rafts obtained from colony cultured in the laboratory for several years free from insecticides.

Four populations of Cx. pipiens larvae were collected from their drainages in Sharkia, Assiut, Menofia and Gharbia Gov- ernorates during the late season of 2005 and 2006. These field populations were exposed regularly to insecticidal applications to cotton fields according to the routine schedule program set annually by the Central Administration for Pest Control, Min- istry of Agriculture. This routine schedule was as follows:

every year at the beginning of July a mix of cascade (insect growth regulator) and chlorpyrifos was applied for 15 days; kendo (pyrethroids) for 21 days; chlorpyrifos (organophos- phate) for 15 days followed finally by thiodicarb (carbamate).

The larvae were reared to the adult stage in insectary. Sharkia field population, which exhibited the highest resis- tant level to the insecticidal treatments, was selected to study

the development of resistance in the 3rd instar larvae of Cx.

pipiens to an organophosphorus insecticide (Chlorpyrifos) for 15 generations. The susceptibility of Sharkia population at parent as well as the successive generations of Cx. pipiens

was determined on the basis of LC50 values every three generations. The discriminating dose was the double of LC99 for the susceptible laboratory colony of the adult stage of Cx. pipiens

(Gunning et al., 1984).

Insecticides

Commercial formulations of insecticides used are chlorpyrifos (Dursban 48% EC), thiodicarb (Larvin 80% DF), lambda- cyhalothrin (Kendo) and flufenoxuron (Cascade 5% EC). These chemicals were kindly provided by plant protection institute.

Bioassays

For each insecticide five serial concentrations were used against both the 3rd instar larvae as well as the adult stage. Four replicates, 25 insects each were used for each concentration.

Insecticides used were flufenoxuron, chlorpyrifos, lambda-cyhalothrin and thiodicarb. Water and ethanol, insecticide solutions were made and stored at 4 °C for less than 2 months. The technique for measuring the susceptibility level of larvae was adapted according to the WHO technique (WHO, 1975). The late 3rd instar or early 4th instar larvae were used to avoid

pupation during exposure period. Test beakers of 500 ml capacity, each containing 249 ml tap water were prepared. In each, 1 ml of ethanol insecticide solution at the desired concen- tration was infiltrated under the water surface with a pipette. A batch of 20–25 larvae was introduced in each beaker after 30 min of preparing the insecticide mixture. Four replicates per concentration, and five concentrations giving between 20% and 100% mortality were used

for each bioassay. The test was run at the same temperature as that at which the larvae were reared. Larvae were left for 24 h and mortality was then recorded. Moribund larvae were considered dead. Larvae pupating during exposure period were excluded from calcula- tion. Tests in which pupation exceeded 10% were repeated.

The control tests were following the same procedure using the solvent only (water) and mortality never exceeded 4%.

Adult assays were adapted according to the WHO tech- nique (WHO, 1996) for the evaluation and testing of insecti- cides. The insecticide's suspension or solution concentration in water or acetone was adjusted and applied to the surface area of test tubes. The sprayed test tubes were stored in open shelves in a room kept at 25 °C, 50–55% relative humidity and constant darkness. Batches of 20 males and non-blood fed females were introduced into test tubes and allowed to alight and rest on the vertical treated surface for 30 min at the same temperature and relative humidity. After the expo- sure period the mosquitoes were removed and transferred for observation and mortality count after 24 h. Discriminating dose technique A discriminating dose technique was used for rapid monitoring of insecticide resistance in field-collected Cx. pipiens adults.

Cx. pipiens adults collected from Sharkia, Assiut, Menofia and Gharbia Governorates, had received four applications of different insecticides, and were subjected to the diagnostic con- centration assay. Thirty randomly selected adults from each population were tested with four replicates. Adults were placed in each vial (replicate) pretreated with the discriminating con- centration of each insecticide tested. Adult mortality was re- corded after 24 h. Percentage of mortality was calculated for each field populations and compared with that of the suscepti- ble laboratory colony.

To calculate the resistance percentages, the following for- mula was used according to McCutchen et al. (1989)

where MF, % mortality at discriminating concentration in field-collected adults; MS, % mortality (constant) at discrimi- nating concentration in susceptible adults.

Mortality counts

Mortality counts were made after 24 h. The dosage mortality data were subjected to log dose and probit analysis (LDP) according to Finney (1952). Mortality percentages were cor- rected according to Abbott's formula (Abbott, 1925). Levels of resistance of the field populations of the insects under inves- tigation were calculated as follows:

Resistance ratioðRRÞ ¼ LC50 or LC90 of the field populations LC50 or LC90 of the laboratory colony Efficacy of some insecticides on field populations of Culex pipiens (Linnaeus) from Egypt.

Resistance ratio= RRÞ ¼ LC50 or LC90 of the field populations/

LC50 or LC90 of the laboratory colony