

TINGID BUG

❖ Description

- *Elasmognathus nepalensis*
- Adult bugs are black and look like a cross
- Tingid bugs have reticulated wings
- Body size is about 4.5 x 3.0mm.
- The thoracic vertebrae expands to both sides, forming 2 tumors



Juvenile and adult bugs of Tingid bugs

❖ Damage

- Tingid bugs attack flower stalks and fruits, causing drop.
- When attacked by bugs, black pepper fruits will grow abnormally
- Sucking young leaves, causing leaves to be necrotic in patches
- Injecting and sucking the buds, causing the buds to fall off



The buds are damaged by Tingid bug



Young fruit is damaged by Tingid bug



Young leaves are damaged by Tingid bugs

❖ Life cycle

- Tingid bugs lay eggs on flower stalks and fruits.
- Tingid bug undergoes 5 molts to develop and has many sharp spines.
- The egg and larval stages of Tingid bugs last for an average of 10-19 days
- The life cycle of Tingid bugs is 27 days



Juvenile and adult of Tingid bugs

❖ Spread

- Tingid bugs move from one plant to another to spread and damage

TINGID BUG

❖ Monitoring and evaluation

- Usually appears during the flowering and fruiting period of black pepper plants
- Appears most in the beginning and middle of the rainy season

❖ Damage classification (based on area or number of damaged tops, leaves, flower clusters, fruit bunches/plant)

Level 1: from 1 to ten%

Level 3: from >10% to 20%

Level 5: from >20% to 30%

Level 7: from >30% to 40%

Level 9: from >40%

Note: Grade 1-≤3: Lightly; Level >3-<7: Moderate; Level 7: Heavy



Preventive measures

❖ Cultivation measures

- Regularly inspect the garden especially early in the morning for early detection.
- Collect damaged parts and destroy.
- Weeding to destroy bugs' habitat.
- Plant the appropriate density, create airy canopy.

❖ Biological measures

- Maintain natural enemies such as ladybugs, spiders, parasitic wasps...
- Use bio-pesticides from Neem and white mushrooms *Beauveria bassiana* effective in preventing and reducing the number of bugs.

❖ Chemical measures

- Use one of the chemicals with active ingredients according to the instructions on the package: Fenobucarb, Buprofezin +Fenobucarb, or Cartap
- Pay attention to spray carefully on foliage and underside of black pepper leaves



Parasitic *Beauveria bassiana*



Cross trap spider

RẦY THÁNH GIÁ

❖ Mô tả

- *Elasmognathus nepalensis*
- Bọ xít lưới trưởng thành của có màu đen nhìn giống như hình thánh giá
- Bọ xít lưới với cánh có hình lưới
- Kích thước cơ thể khoảng 4,5 x 3,0mm.
- Đốt ngực phát triển rộng ra 2 bên tạo thành 2 khối u.



Sâu non và trưởng thành của rầy thánh giá

❖ Triệu chứng gây hại

- Bọ xít lưới tấn công vào cuống hoa và trái gây rụng cuống.
- Khi bị bọ xít tấn công trái hồ tiêu sẽ phát triển không bình thường
- Chích hút lá non làm lá thường bị hoại tử từng mảng
- Chích hút gié bông, gié quả âm rụng gié bông, gié quả



Ghé bông bị rầy thánh giá gây hại



Quả non bị rầy thánh giá gây hại



Lá non bị rầy thánh giá gây hại

❖ Vòng đời

- Bọ xít lưới đẻ trứng vào cuống hoa, trái.
- Ấu trùng bọ xít lưới trải qua 5 lần lột xác để phát triển và cơ thể có nhiều gai nhọn.
- Giai đoạn trứng và ấu trùng bọ xít lưới kéo dài trung bình từ 10-19 ngày
- Vòng đời của rầy thánh giá là 27 ngày

❖ Lây lan

- Rầy di chuyển từ cây này sang cây khác để lây lan và gây hại



Sâu non và trưởng thành của rầy thánh giá

RÀY THÁNH GIÁ

❖ Theo dõi và đánh giá

- Thường xuất hiện vào giai đoạn cây tiêu ra hoa và đậu quả
- Xuất hiện nhiều nhất vào đầu và giữa mùa mưa

❖ Phân cấp hại (tính trên diện tích hoặc số ngọn non, lá, chum quả bị hại/cây)

Cấp 1: từ 1 đến 10%

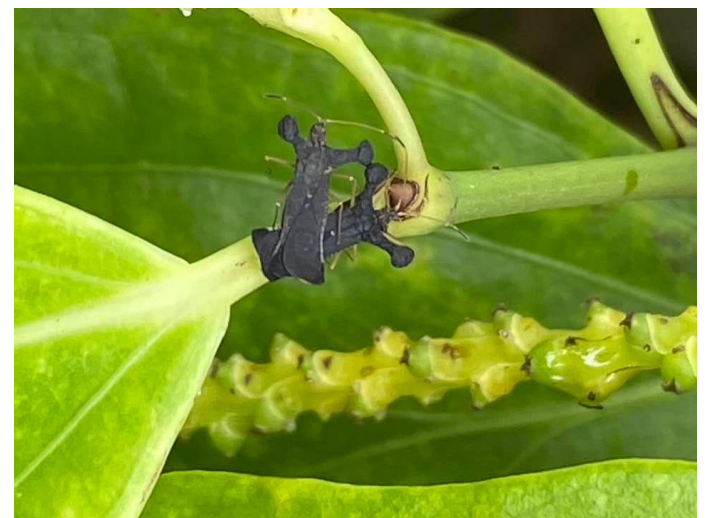
Cấp 3: từ >10% đến 20%

Cấp 5: từ >20% đến 30%

Cấp 7: từ >30% đến 40%

Cấp 9: từ >40%

Ghi chú: Cấp 1-≤3: nhẹ; Cấp >3-<7: Trung bình; Cấp ≥7: nặng



Biện pháp phòng trừ

❖ Biện pháp canh tác

- Thường xuyên kiểm tra vườn nhất là vào buổi sáng sớm để phát hiện sớm.
- Thu gom các bộ phận bị hại, đem tiêu hủy.
- Làm cỏ để phá bỏ nơi trú ngụ của bọ xít lưới.
- Trồng mật độ thích hợp, tạo hình thông thoáng.

❖ Biện pháp sinh học

- Duy trì kẻ thù tự nhiên như: Bọ rùa, nhện, ong ký sinh ...
- Sử dụng các chế phẩm sinh học từ cây Neem và nấm trắng *Beauveria bassiana* có tác dụng phòng trừ và giảm mật số bọ xít.

❖ Biện pháp hóa học

- Sử dụng một trong các loại thuốc có hoạt chất theo hướng dẫn trên bao bì sau: Fenobucarb, Buprofezin + Fenobucarb, hoặc Cartap



Nấm khí sinh *Beauveria bassiana*



Nhện bẫy rầy thánh giá

VI.

PEST AND DISEASE MANAGEMENT

3. STEM BORER

❖ Description

- *Lophobaris piperis*
- Adults are dark brown.
- The head has a long proboscis that curves downward perpendicular. Dimensions 4.6 - 5 mm long including faucet, 2 mm wide.
- Larval 6.0 - 6.5 mm long, ivory white. dorsally curved. The pupae are the same size or slightly larger than the adults, and are ivory- white when newly pupated

❖ Damage

- The young borers dig into the shoots and flowers, causing the shoots to wilt.
- The upper part of the black pepper stem is broken and the plant dies.
- Borers on fruit can cause fruit drop or poor development..



Black pepper leaves are damaged by stem borers



Pupae and adult larvae of stem borers

Young stem borer in black pepper stems



Stem borers damage fruits, branches and stems of black pepper plants



Grow from larvae to pupa

❖ Life cycle

- The female stem borer lays about 200 eggs during her adult life, but only lays 1-2 eggs at a time.
- Egg stage lasts from 3-6 days
- After 5 molts within 35 days, the larvae becomes pupate
- The pupal stage usually lasts 1 week
- The pupae mature in 2-3 days



Pupae and adult larvae of stem borers

VI.

PEST AND DISEASE MANAGEMENT

❖ Monitoring and evaluation

- Larvae thrive in the rainy season and less in the dry season.
- Adult borers thrive at the end of the rainy season when the plants bear fruit.
- Borers usually appear in the morning and evening, they often hide in the trunk at noon to avoid the sun..



Monitor the damage of stem borers

❖ Classification of damage (calculated on the area or number of damaged trunks and branches/plant)

Level 1: from 1 to 10%

Level 3: from >10% to 20%

Level 5: from >20% to 30%

Level 7: from >30% to 40%

Level 9: from >40%

Note: Grade 1-≤3: Lightly; Level >3-<7: Moderate; Level 7: Heavy



Monitor the growth of the stem borer

Preventive measures

❖ Cultivation measures

- Sanitize the field to remove pests
- Prune leaves to keep the plant open
- Avoid wounding on trunk and branches
- Regularly check black pepper garden
- Catch and kill adult stem borers
- Immediately cut off the stem and branches that are bored
- Cut damaged stems and branches to kill all larvae and eggs
- Collect damaged parts, take them out of the garden and destroy



Ants eat pupae

❖ Biological measures

- Maintain natural enemies such as: Spiders, parasitic wasps, ants, ...
- *Beauvaria bassiana*, *Metarhizium Anisopliae* and *Spathiosus piperis* as a potential biocontrol agents
- Treat on plants in the morning when they are still wet to increase the effectiveness of the control



Parasite bees

❖ Chemical measures

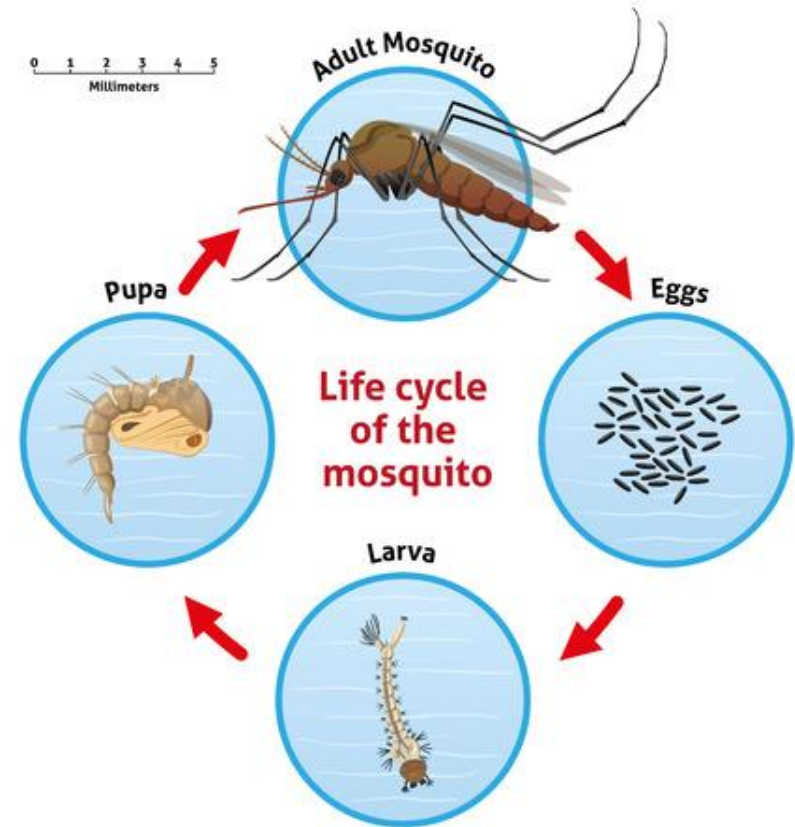
- Use one of the chemicals with active ingredients according to the instructions on the package such as: Abamectin, Amino acid, Dinofefefuranuran + Pymetrozine



Beauvaria bassiana

VI. PEST AND DISEASE MANAGEMENT

4. MOSQUITO BUGS (*Helopeltis theivora*)



5. BROWN SCALE



VII. HARVESTING, PROCESSING AND STORAGE

7.1. HARVESTING

- In the Southeast, pepper is harvested around January - March
- Central Highlands February - April
- Central Coast (Quang Tri..) June - July.

❖ Harvesting technique

- Pepper is harvested by hand and is picked about 2-3 times/crop.
- When the fruit cluster turns green yellow.
- Spread the canvas in rows, around the pepper base to avoid spillage
- Use your hands to separate each bunch of fruit.
- Clean leaves, impurities, collect in bags, transport to drying yard
- Black pepper: the fruit turns yellow, there are 1-2 ripe yellow and red fruits.
- White pepper: cluster of fruits must be old, bunches of ripe red fruits are scattered
- Red pepper: bunches of berries must be fully ripe and red



Harvesting and processing steps

❖ Black pepper

- Pepper is picked whole bunch of fruit, old fruit has ripe fruit or fruit has turned green to yellow.
- Do not collect green and young bunches except for the last harvest
- The bunch of fruits can be plucked right away or stacked 2 - 3.
- Sun drying for about 3-4 days on truss, cement yard covered with canvas.
- Dry layer 2-3 cm thick, stir 4-5 times/day.
- When the peppers turn from green or yellow to black and reach a moisture content of 11-12%



Pre processing black pepper

VII. HARVESTING, PROCESSING AND STORAGE

7.2. PEPPER PROCESSING

❖ White pepper

➤ From old ripe fruit

- The value is 1.3 - 1.5 times higher than black pepper. Export 15% of output in 2015
- Requirements: old ripe pepper, pepper cluster with more than 50% ripe fruit.
- Incubate 2-3 days, then peel off the shell, soak in a tank with water change for 7-10 days until the shell is mushy.
- Rub well and treat until the shell is gone, dry in 1-2 sun when the seeds have a moisture content of 12-13%.
- Packing, storage

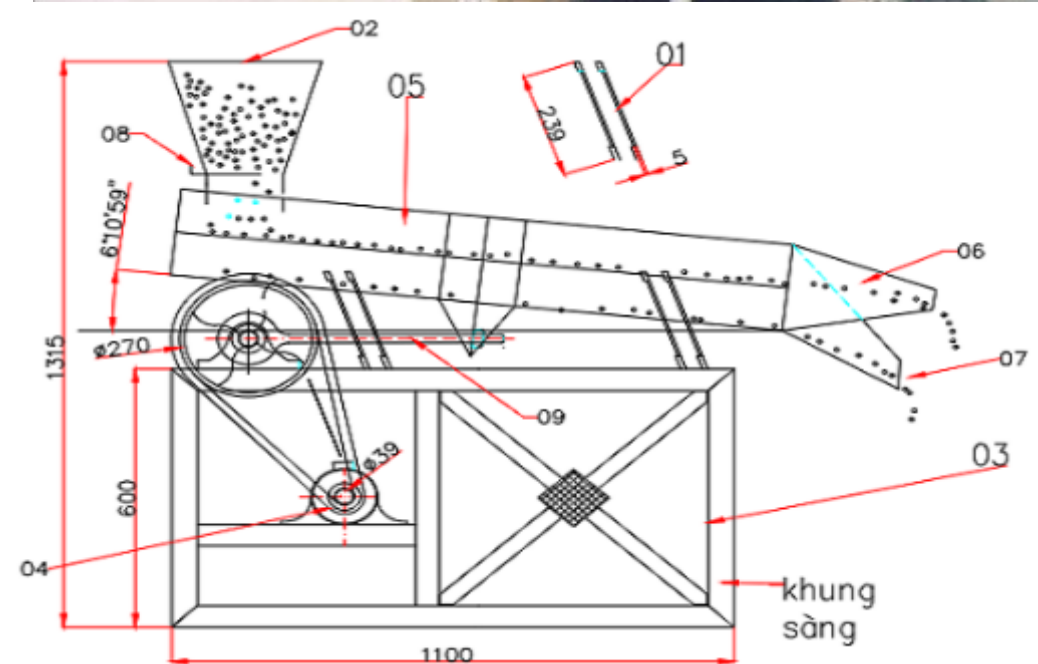


Processing white pepper from fresh fruits

❖ White pepper

➤ From black pepper

- Take the grain with a weight of more than 550 g/liter
- Soak in a tank with water changes for 7-10 days, change the water once every 2-3 days until the shells crumble.
- Rub well and treat until the shell is gone, dry in 1-2 sun when the seeds have a moisture content of 12-13%.



Pepper Peeling Machine

VII.

HARVESTING, PROCESSING AND STORAGE

7.3. PEPPER CORN STORAGE

- ❖ Warehouses, places to store pepper after preliminary processing must be dry, cool, clean, have enough area, not be leaked by rain.
- ❖ Packed in 2 layers, each bag is about 50-70 kg, inner nylon layer and outer fiber bag to prevent moisture absorption and reduce the quality of black pepper.
- ❖ The pepper bags are stored in cool, airy and dry warehouses. Shelves are placed at least 10-20cm away from the floor and walls.
- ❖ Periodically check

