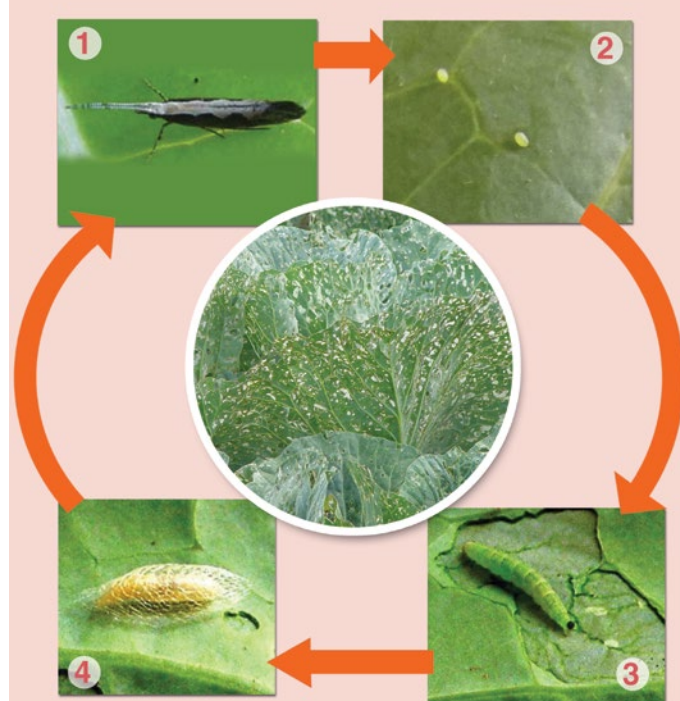


Managing insect pests and disease in the cabbage family

Insect Pests

Diamondback moth (DBM)



Larva (1), Pupa (2), Adult (3) of diamondback moth (DBM), and damage to cabbage plant (4)

Aphids



Cabbage aphid damage (1), damage to cabbage (2) and damage to kale plants (3)

Webworms



Larva and adult of cabbage moth, *Crociodolomia binotalis* (1 and 2), *Hellula undalis* larvae causing damage on cabbage (4 and 5)

Sawflies



Sawfly larvae (1 and 2), sawfly adult (3) and damage by sawfly larvae on raddish (4)

Cutworms



Larva (1) and adult (2) of the cutworm *Agrotis* sp.

Start with healthy seeds

- choose varieties which are suited to your area
- plant disease-resistant varieties if available
- use seeds which are certified disease-free

Manage the nursery well

- place seedbeds in land away from old cabbage fields
- rotate crops and avoid land where cabbages/rape/cauliflower were grown in the past two years
- use recommended seeding rate – do not crowd them
- do not overwater and avoid watering late in the afternoon
- apply straw mulch to conserve moisture in the soil – it also reduces aphid infestation and can prevent the spread of some plant disease

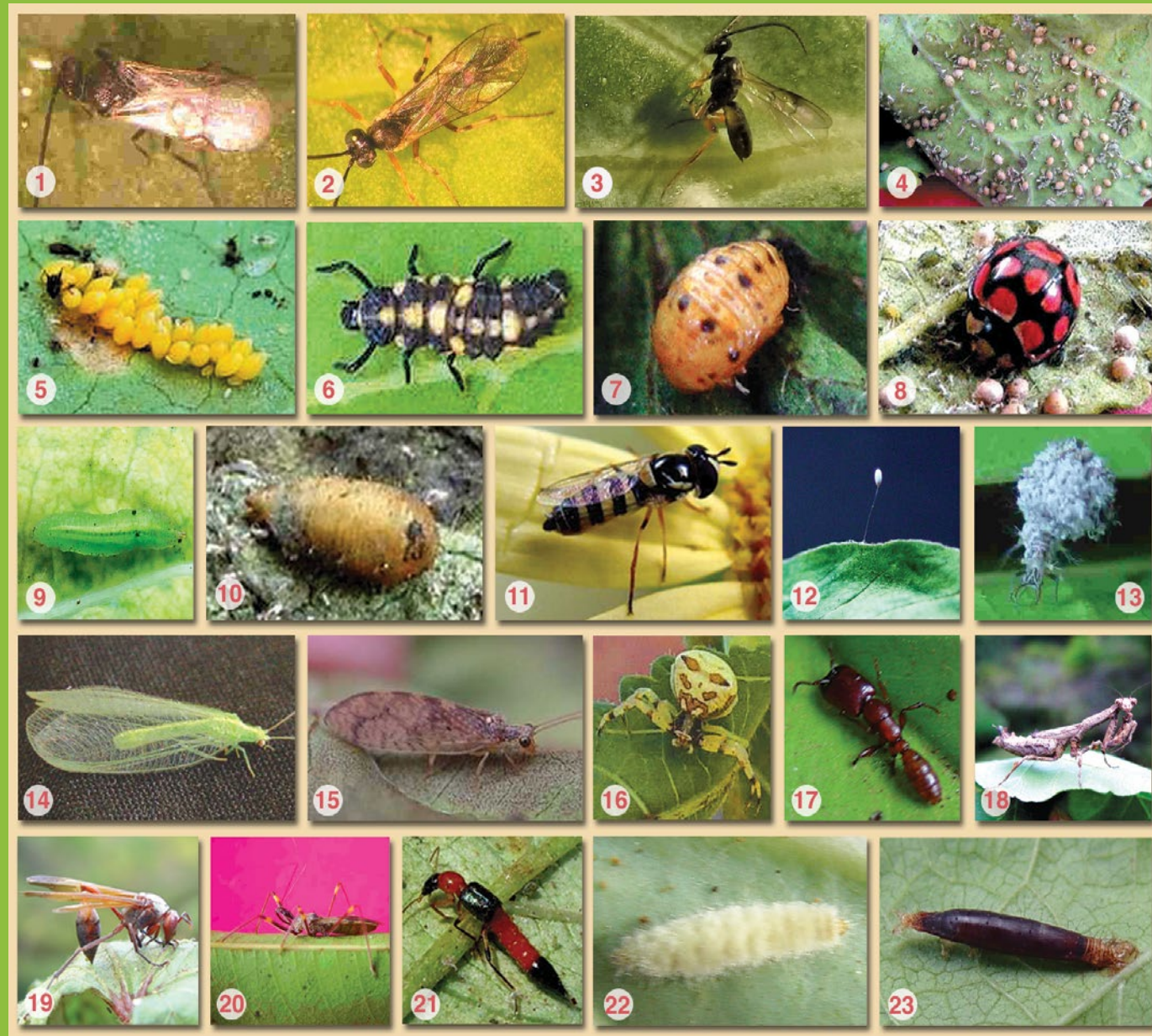
Look after your crop

- plough your land well before planting to expose caterpillars to the sun and predators
- keep the field free of weeds and 'volunteer plants' which grow in the wrong place
- avoid working the field in wet weather
- overhead irrigation helps to control insect pests by washing them off, but should be avoided in areas where black rot is common
- scout your crop regularly so you can spot problems early
- after harvest, clear fields quickly so that insect pests and diseases cannot build-up on leftovers

If you find insect pests or diseases

- handpick insects and remove diseased plants (if numbers are low)
- do not cut diseased plants, and if you cut one accidentally, wash the knife with soap and water
- if you spray, follow the instructions on the product label, use only the recommended dosage and observe pre-harvest intervals
- where possible, rotate different types of pesticides so that pests do not become resistant
- for aphids – spray only affected plants using soapy water or a selective insecticide
- for cutworms – spread ash around plants, on seedbeds or mixed with soil in the planting hole
- for clubroot – apply agricultural lime to raise soil pH to 7.2 and kill the disease by heating or 'solarising' the soil by covering it with a black plastic sheet on a hot day (31°C)

Natural enemies



Parasitic wasps: *Apanteles* sp. (1), *Diadegma mollipla* (2), *Cotesia vestalis* (3). **Parasitised aphids:** mummies (4). **Predators:** Ladybird beetle eggs, larva, pupa and adult (5–8), hoverfly larva, pupa and adult (9–11), Lacewing egg and larva (12 & 13), lacewing adults (14 & 15), spider (16), ant (17), praying mantis (18), wasp (19), assassin bug (20), rove beetle (21). **Diseases:** Diseased DBM larva (22), diseased caterpillar (23)

Encouraging natural enemies

- **Avoid or reduce use of pesticides** – pesticides kill natural enemies as well as pests. Use the least amount, spray only when necessary, and spray only the affected plants.
- **Use targeted pesticides** – pesticides kill useful insects and natural enemies as well as pests. If it is necessary to spray, choose a selective pesticide. Bt products such as Thuricide® can control aphepheru or gulugufe and other caterpillars.
- **Spray only the plants which are affected** – if you see aphids in the field spray only the plants which have been attacked. Spraying with soapy water, tephrosia or crude neem seed extracts can help reduce aphids, caterpillars and other pests.
- **Plant flowering plants** – flowers are sources of nectar and pollen for natural enemies.
- **Plant a variety of crops** – this provides food and shelter for a wide range of natural enemies.
- **Apply mulch in your crops** – mulch helps to protect natural enemies that live on the ground. Mulch also reduces the risk of aphids, black rot and leaf spots, and helps to keep soil moist.

Diseases

Bacterial diseases



Black rot (1–3), note v-shaped lesions on cabbage leaf (1), and blackening of water-conducting tissues of the stem (2), damaged stems of the kale plant (3), Soft rot (4), note slimy rot of the centre of the head

Clubroot



Symptoms on the leaves (left) and enlarged roots (right)

Fungal diseases



Alternaria leaf spot (1), *Cercospora* leaf spot (2) and *Mycosphaerella* ring spot (3), Powdery mildew on cabbage (4), Downy mildew: on upper (5) and lower (6) leaf surfaces



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