



7.22b Celery stalkworm; larva; actual size 25 mm.



8.1a Bacterial leaf spot (peppery leaf spot); lesions on Brussels sprouts.



8.1b Bacterial leaf spot (peppery leaf spot); lesions on a cauliflower leaf.



8.2a Black rot; leaf symptoms (V-shaped, yellow lesions) on cabbage.



8.2b Black rot; advanced (dry) lesions along leaf margins of cabbage.



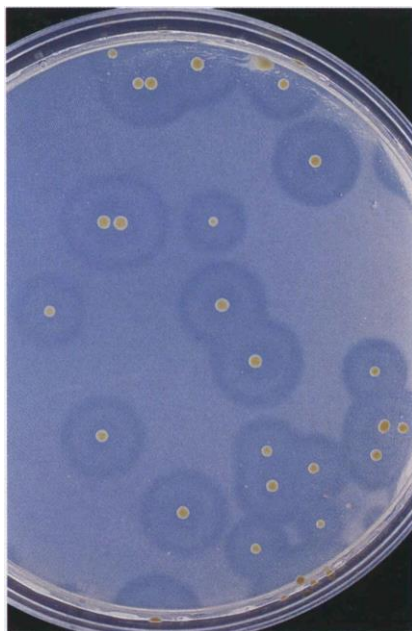
8.2c Black rot; bacteria enter leaf in guttation droplets from hydathodes.



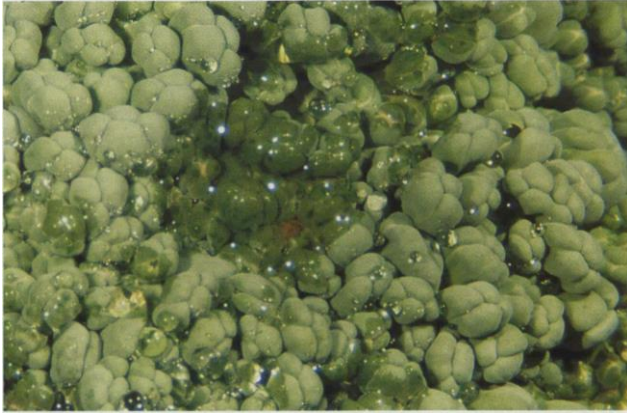
8.2d Black rot; blackened veins on a broccoli leaf.



8.2e Black rot; discoloration of vascular tissues in rutabaga stem.



8.2f Black rot: yellow colonies of *Xanthomonas campestris* from seed wash.



8.3a Head rot; early symptoms on broccoli; note water film on waxy florets from surfactant activity of bacteria.



8.3b Head rot; advanced decay on broccoli head.



8.3c Head rot; severe symptoms on cabbage.



8.4a Scab; corky lesions on rutabaga root.



8.4b Scab; raised corky lesions on rutabaga roots.



8.4c Scab; lesions on a white radish root.



8.5a Alternaria leaf spot; black spot symptoms on cauliflower foliage and head.



8.5b Alternaria leaf spot; gray spot symptoms on Brussels sprouts.



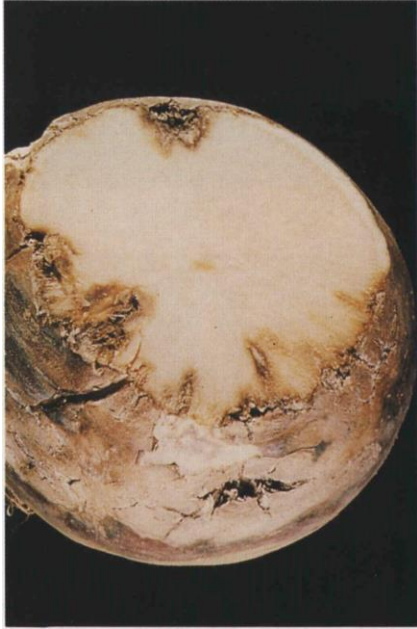
8.6a Blackleg; leaf lesions on cabbage.



8.6b Blackleg; stem lesion on cabbage.



8.6c Blackleg; brown lesions on rutabaga root.



8.6d Blackleg; cutaway rutabaga root showing penetrating lesions.



8.8a Clubroot; galled cabbage roots.



8.8b Clubroot; severely galled roots of broccoli.



8.7 Black root; decayed areas on radish root.



8.8c Clubroot; galls on tap and lateral roots of rutabaga.



8.9 Damping-off (rhizoctonia); wilted cabbage seedlings (foreground) in a propagation tray.



8.10a Downy mildew; diseased broccoli plants showing dying leaves.



8.10b Downy mildew; sporulation of *Peronospora parasitica* on a broccoli leaf.



8.10c Downy mildew; lesions on a rutabaga leaf.



8.10d Downy mildew; brown lesions on cauliflower curd.



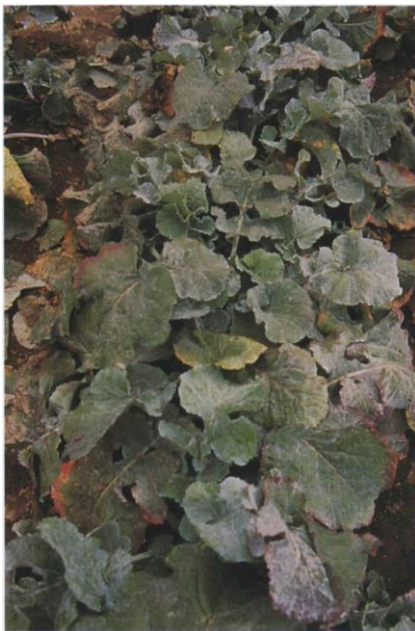
8.10e Downy mildew; black lesions on radish roots.



8.11a Fusarium wilt (yellows); diseased cabbage plant.



8.11b Fusarium wilt (yellows); discoloration of xylem in infected stem (cutaway) of a cabbage plant.



8.12 Powdery mildew; affected rutabaga plants.



8.13a *Rhizoctonia* wirestem; constriction of cauliflower stem.



8.13b *Rhizoctonia* wirestem; soil line canker on stem of a young broccoli plant.



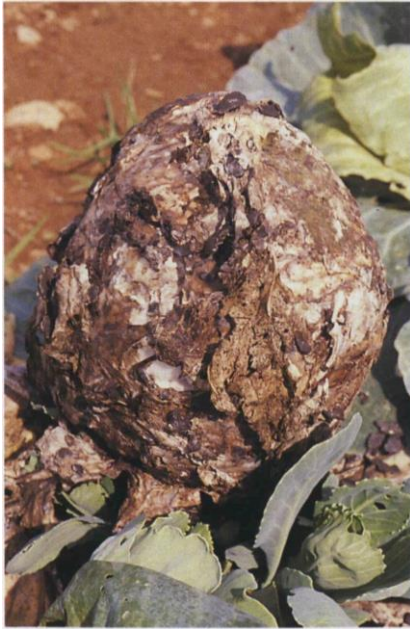
8.13c Rhizoctonia root rot (crater rot); lesion on a rutabaga root.



8.13d Rhizoctonia root rot; dark lesion with secondary bacterial decay (upper lesion) on rutabaga root.



8.13e Rhizoctonia head rot; dark brown, firm decay, with small sclerotia (bottom).



8.14 Sclerotinia rot; white, cottony mycelium and black sclerotia.



8.15 White rust; sori (white lesions) on a horseradish leaf.



8.16a Turnip mosaic; severely affected rutabaga plants.



8.16b Turnip mosaic; characteristic foliar mottling and wrinkling in rutabaga.



8.16c Turnip mosaic; healthy (left) and diseased rutabaga roots.



8.17 Black speck; symptoms on a cauliflower curd.



8.18 Brown bead; discolored florets on a broccoli head.



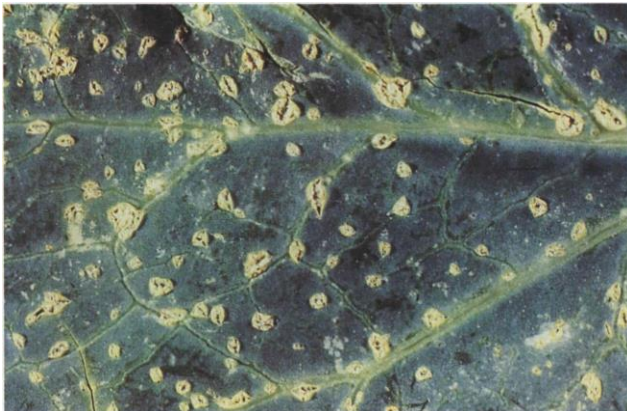
8.19 Growth cracks; cracks in rutabaga roots are frequently invaded by soft rot bacteria.



8.20 Hollow stem; elliptical cavities and discoloration in broccoli stems.



8.21a Intumescence; small, wart-like protuberances on cabbage leaves.



8.21b Intumescence (edema); lesions on a cabbage leaf.



8.21c Intumescence (thrips pustule); damage from thrips feeding on cabbage head.



8.22a Tipburn; internal leaves of cabbage desiccate to a thin, papery consistency.



8.22b Tipburn; internal browning of Brussels sprouts.



8.23a Boron deficiency; stem cavities and curd discoloration on cauliflower.



8.23b Boron deficiency; brown discoloration of stem cavity on cauliflower.



8.23c Boron deficiency; water core symptom in a rutabaga root.



8.23d Boron deficiency; severe brown heart symptom in a rutabaga root.



8.24 Magnesium deficiency; leaf chlorosis of broccoli.



8.25a Molybdenum deficiency; whiptail symptom on cauliflower leaf.



8.25b Molybdenum deficiency; cupped leaves and blotchy chlorosis and necrosis on cabbage.



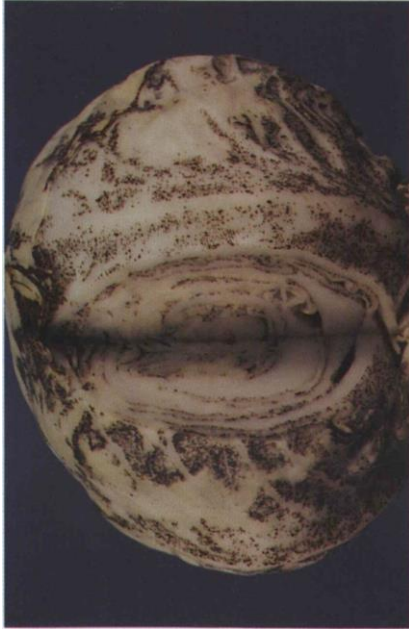
8.26 Sulfur deficiency; blotchy interveinal chlorosis and reflexed leaves of cauliflower.



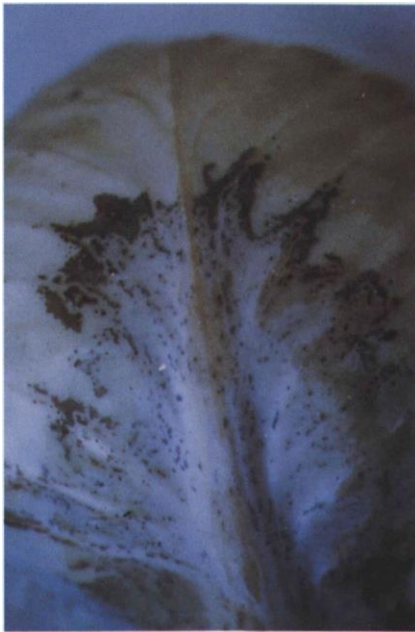
8.27 Black midrib; large, ill-defined spots at base of midrib on outer leaves of cabbage.



8.28a Black speck (type I); sharply sunken, pin-point spots on outer leaves of cabbage .



8.28b Black speck (type II, senescent black speck); a severely affected cabbage head .



8.29 Gray speck; grayish discoloration at the base of a cabbage leaf.



8.30 Necrotic spot (type I); dark, sharply defined, sunken lesions on cabbage.



8.31 Vein streaking; superficial brown-black lesions on midrib of cabbage leaf.



8.32a Black blotching; frost induced, superficial spots with pin-point dark centers.



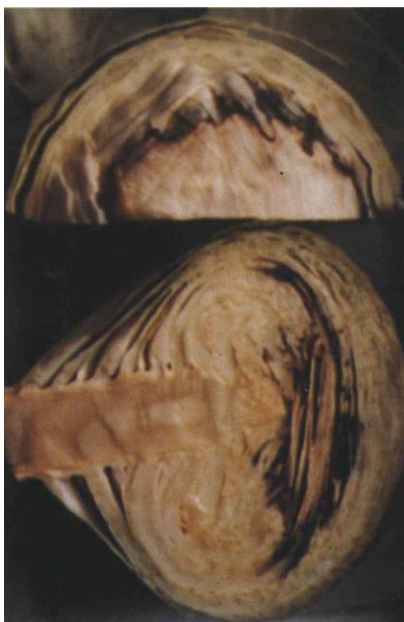
8.32b Black spot; frost-induced areas of interveinal necrosis on cabbage; appears in storage.



8.32c Epidermal detachment; loosened epidermis on top leaves of cabbage from repeated freezing in the field.



8.32d Frost blemishing; large, white blemishes on exposed head leaves of cabbage.



8.32e Redheart; inner leaves affected by extended period of freezing in field or storage.



8.38 Alfalfa looper; larva; note wide lateral line.



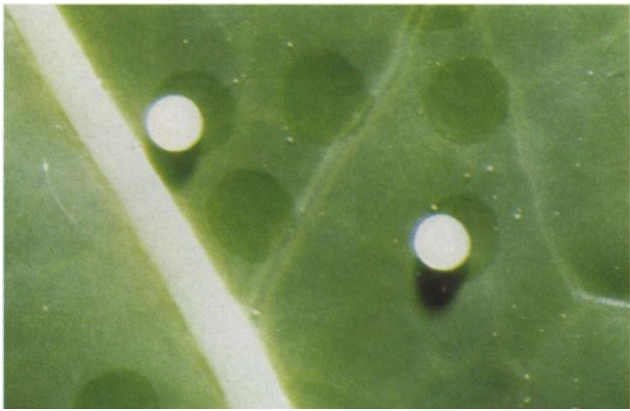
8.39a Cabbage aphid; infested Brussels sprouts.



8.39b Aphids; nymphs on cabbage.



8.40a Cabbage looper; injury to cabbage leaves.



8.40b Cabbage looper; eggs.



8.40c Cabbage looper; larva (top view).



8.40d Cabbage looper; larva (side view); note narrow lateral line.



8.40e Cabbage looper; pupae.



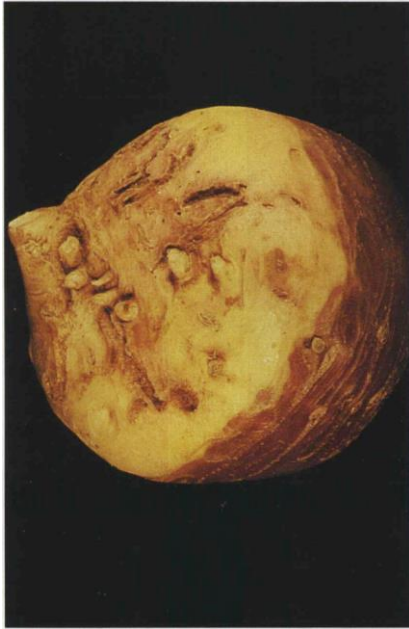
8.40f Cabbage looper; adult moth; wingspan \pm 38 mm.



8.41a Cabbage maggot; larval feeding damage to radish root.



8.41b Cabbage maggot; above-ground symptoms on cabbage plant.



8.41c Cabbage maggot; larval feeding damage to rutabaga root.



8.41d Cabbage maggot; eggs at base of stem.



8.41e Cabbage maggot; larvae.



8.41f Cabbage maggot; pupae.



8.41g Cabbage maggot; adult flies.



8.42a Diamondback moth; larval feeding injury to cabbage leaves.



8.42b Diamondback moth; eggs and larval silk strands on leaf.



8.42c Diamondback moth; larva at leafmining stage.



8.42d Diamondback moth; intermediate and mature larvae.



8.42e Diamondback moth; cocoon and pupa.



8.42f Diamondback moth; adult moth; wingspan \pm 13 mm.



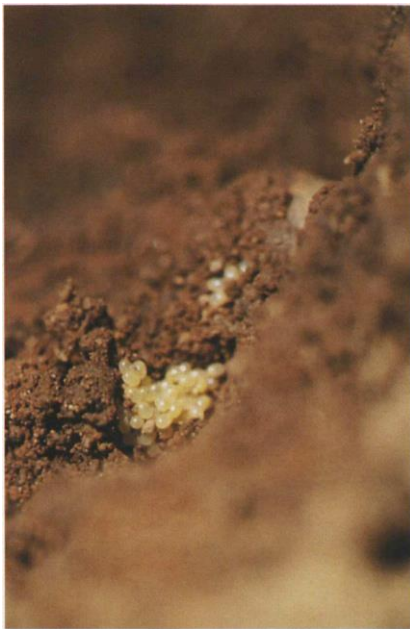
8.42g Diamondback moth; adult moth; note the pattern on its back.



8.43a European earwig; damage to cabbage head; note adult earwig and frass (black dots) on midrib.



8.43b European earwig; adults, male (left) and female; length 11-18 mm.



8.43c European earwig; eggs in soil.



8.43d European earwig; first instar nymph.



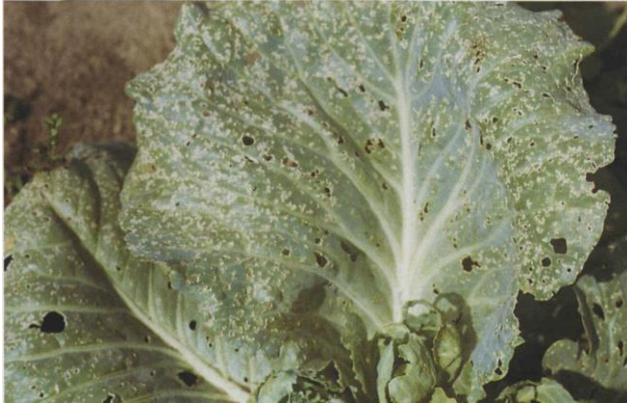
8.44a Crucifer flea beetle; adults on a broccoli cotyledon.



8.44b Striped flea beetle; adult; length \pm 2 mm.



8.44c Crucifer flea beetle; adults on rutabaga leaf.



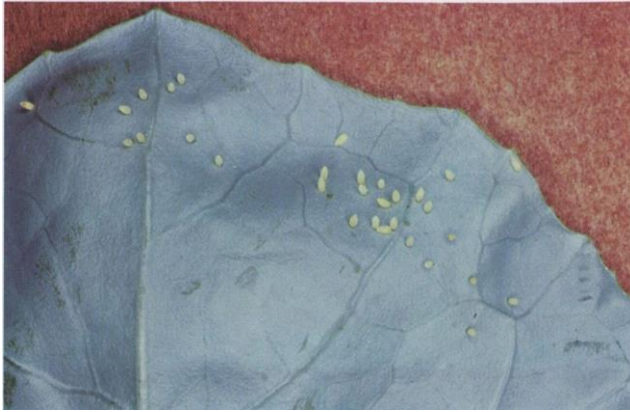
8.44d Crucifer flea beetle; adult feeding damage on cabbage leaves.



8.44e Crucifer flea beetle; late-season adult feeding causes cosmetic damage to broccoli head.



8.45a Imported cabbageworm; larval feeding damage to cabbage leaves.



8.45b Imported cabbageworm; eggs on cabbage leaf.



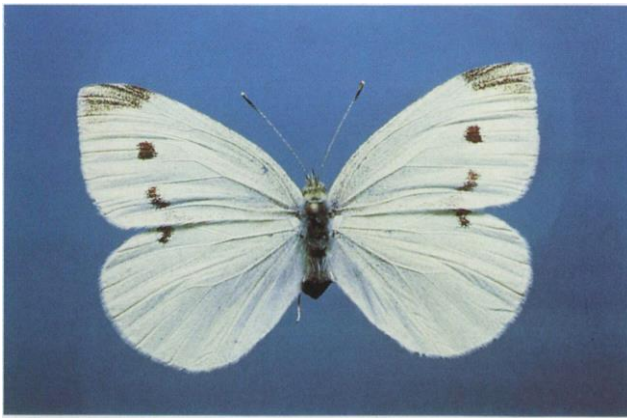
8.45c Imported cabbageworm; egg and newly hatched larva.



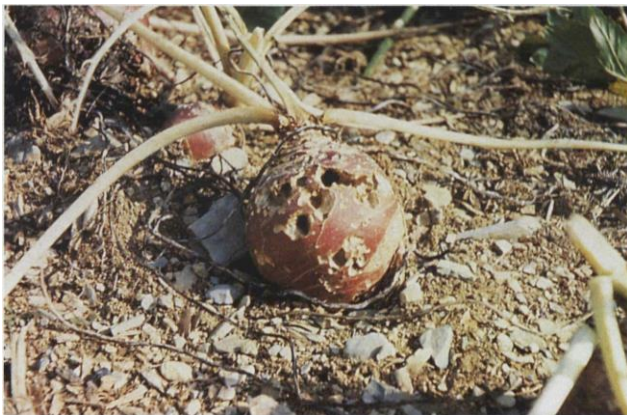
8.45d Imported cabbageworm; near-mature larva.



8.45e Imported cabbageworm; pupa, characteristically on underside of leaf.



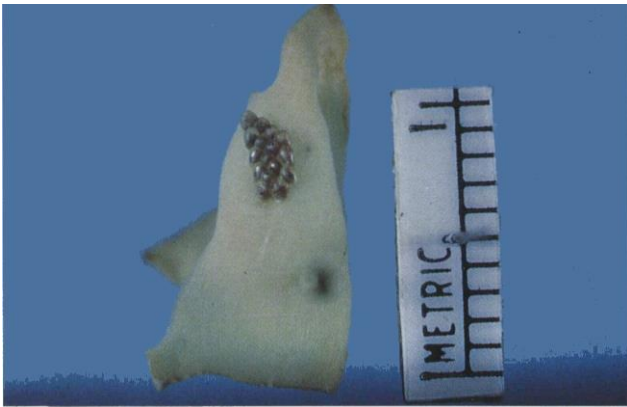
8.45f Imported cabbageworm; adult female butterfly; wingspan ± 50 mm.



8.46a Purple-backed cabbageworm; rutabaga root severely injured by larval feeding.



8.46b Purple-backed cabbageworm; cabbage leaves and head severely injured by larval feeding.



8.46c Purple-backed cabbage worm; egg mass on cabbage leaf.



8.46d Purple-backed cabbageworm; full-grown larva.



8.46e Purple-backed cabbageworm; pupa within cocoon.



8.46f Purple-backed cabbageworm; open cocoon showing the overwintering larva (contracted).



8.46g Purple-backed cabbageworm; adult moth; wingspan 22-28 mm.



8.47a Red turnip beetle; adult; length \pm 10 mm.



8.47b Red turnip beetle; larva feeding on a leaf.



8.47c Red turnip beetle; eggs (left) and pupae (right) on soil.