
Scab

Diseases characterized by an overgrowth of tissue in a limited area are commonly called scab. The hyperplastic scablike lesions correspond to the necrotic or dead areas of leaf spots and cankers. Diseases called scab caused by *Elsinoë* or its anamorph, *Sphaceloma*, are treated under Spot Anthracnose.

Cladosporium

► Blotch Diseases.

Cladosporium bruneo-atrum Possible cause of russetting of citrus fruit hitherto attributed solely to citrus mite.

Cladosporium carpophilum (Syn. *Fusicladium carpophilum*), apparently a different strain from peach scab fungus. Almond Scab. Water-soaked symptoms on young shoots turn brown; leaves turn black, drop prematurely; circular, olivaceous spots coalesce on fruit.

Cladosporium carpophilum Peach Scab, general on peach, widespread on apricot, nectarine, cherry, and plum. The form on cherry and European plum has been attributed to *Venturia cerasae* (*Cladosporium cerasi*). Small, round, olive black spots appear on infected fruits about 6 weeks after petals have fallen. These are usually on upperside of fruit, and cracking may follow. Twigs show nearly circular yellow-brown blotches with gray or bluish borders; cambium may be killed and twig die. Leaf spots are brown,

scattered, with tissue drying and falling out, leaving circular holes.

Control The brown-rot spray schedule should also control scab, a sulfur spray 4 to 6 weeks after petal fall being especially important. A fungicide can be combined with an insecticide spray for curculio.

Cladosporium caryigenum Pecan Scab, Leaf Spot, general on pecan, and hickory. Scab is perhaps the most important limiting factor in pecan production in the Southeast. All varieties are somewhat susceptible, even those, like Stuart, that have been quite resistant in the past. Crop losses may reach 75 to 95 %.

The fungus attacks rapidly growing tissue in leaves, shoots, and nuts; mature growth seems to be immune. On Schley and other highly susceptible varieties, primary infection shows in elongated olive brown lesions on veins and underside of leaves. With secondary infection leaves appear almost black, as a result of coalescing of spots; defoliation follows. On more resistant varieties, such as Moore and Stuart, infection is of ten delayed until the leaves are nearly mature, and so scab spots are confined to nuts. Nut lesions are small, black, circular, slightly raised at first, then sunken. Spots may be so close together that the entire surface turns black; the nuts drop prematurely or remain attached to shoots indefinitely. Infection is correlated with spring and early summer rainfall, continuous moisture for 6 to 8 hours being required for the spores to germinate and enter the host. First lesions appear in 1 or 2 weeks.

Control Knock off old shucks and leaf stems before trees leaf out in spring. When they are wet after a rain, a slight jarring of branches will make such diseased material drop. Prune off low limbs for better air circulation. Four protectant sprays are required in Georgia, five in Florida.

Cladosporium cladosporioides f. sp. **pisicola** (formerly *Cladosporium pisicola*). Pea Scab, Black Spot of pea. Dark spots covered with velvety mold are formed in moist weather on leaves, stems, where black streaks may develop into cankers and pods may be distorted. The fungus is seed-borne, and lives in soil in plant refuse.

Cladosporium coreopsidis Reported on coreopsis in Wisconsin, causing stunting and suppression of flowering.

Cladosporium cucumerinum Cucumber Scab, general on cucumber in greenhouses, an important transit and storage decay of muskmelon, sometimes serious on late-planted squash. The disease was first noted in New York in 1887. Leaves with water-soaked spots may wilt, stems have slight cankers, but most injury is to the fruit. First symptoms, while cucumbers are still small, are gray, slightly sunken spots, sometimes exuding a gummy substance. They darken with age, and the collapsed tissue forms a pronounced cavity, lined with a dark green velvety layer of greenish mycelium, short conidophores, and dark, one-to two-celled spores. On leaves, these fruiting fascicles are extruded through stomata. The disease becomes epidemic after mid-summer, when night temperatures are cold or with heavy dews and fog.

Control Resistant cucumber varieties include Maine No. 2, Wisconsin SR 10, SR 6, and Highmoor. A long rotation is advised.

Cladosporium pisicola (see ► *Cladosporium cladosporioides* f. sp. *pisicola*). Pea Scab, Black Spot of pea.

Fusarium

► **Rots.**

Fusarium heterosporum Head Scab of tall fescue.

Spilocaea (Fusicladium)

► **Leaf Spots.**

Fusicladium dendriticum (see ► *Spilocaea pomi*). Conidial stage of the apple-scab fungus.

► *Venturia inaequalis*.

Fusicladium eriobotryae (see ► *Spilocaea pyracanthae*). Loquat Scab, widespread on leaves, stems, fruit of loquat.

Fusicladium photinicola (see ► *Spilocaea photinicola*). Christmasberry Scab on *Photinia arbutifolia*.

Fusicladium pyracanthae (see ► *Spilocaea photinicola*). Pyracantha Scab, widespread on leaves and fruit.

Fusicladium saliciperdum (Syn. **Venturia chlorospora**) (see ► *Pollaccia saliciperda*). Willow Scab, Blight, first noticed on willow in Connecticut in 1927, apparently introduced from Europe.

Pollaccia saliciperda (formerly *Fusicladium saliciperdum* (Syn. *Venturia chlorospora*). Willow Scab, Blight, first noticed on willow in Connecticut in 1927, apparently introduced from Europe. Repeated defoliation has killed thousands of trees in the Northeast. Young leaves are attacked and of ten killed in spring, almost within a few hours, and from the leaf blades the fungus enters twigs, kills back young shoots, and causes cankers. Olive green felty spore masses are formed on the long veins on underside of leaves. Overwintering is as dormant mycelium in twigs infected the previous spring. Another fungus, *Physalospora miyabeana*, is found with the scab fungus, and the two together form the disease complex known as willow blight. *Physalospora* usually attacks later in the season than *Fusicladium* and causes cankers on larger stems.

Control Prune heavily to remove diseased parts. Spray with bordeaux with excess lime.

Spilocaea photinicola (formerly *Fusicladium photinicola*). Christmasberry Scab on *Photinia arbutifolia*. Brown velvety spots appear on leaves, flower stalks, and green berries; the berries being disfigured when mature. Prune in winter to remove dead wood and foliage. Spray before blossoming with bordeaux mixture.

Spilocaea pomi formerly *Fusicladium dendriticum*). Conidial stage of the apple-scab fungus. ▶ *Venturia inaequalis*.

Spilocaea pyracanthae (formerly *Fusicladium eriobotryae*). Loquat Scab, widespread on leaves, stems, fruit of loquat. This is similar to pear and apple scab. Dark velvety spots cause more or less deformation of fruit, but the disease is seldom important.

Spilocaea pyracanthae (formerly *Fusicladium pyracantha*). Pyracantha Scab, widespread on leaves and fruit. The unsightly black scabs spoil the appearance of bright berries. The fungus winters in the mycelial state in attached leaves. Frequent spraying with Bordeaux mixture controls scab but causes some defoliation.

Spongospora

Plasmodiophoromycetes, Plasmodiophorales

Spores in a hollow sphere with several openings; zoosporangia formed; zoospores anteriorly biflagellate; sexual fusion of myxamoebae.

Spongospora subterranea Powdery Scab of potatoes, Canker, Spongy Scab. Indigenous to South America and introduced into Europe more than a century ago, potato scab was not noticed in North America before 1913, in Maine. Ordinarily not important, it causes economic loss in some seasons. Slightly raised pimples appear on tubers when they are less than an inch in diameter; they are varying shades of brown on the surface, faintly purple underneath. The epidermis, not growing as fast as the pimple, breaks and curls back over the pustule, which, by this time, is a brown powdery mass of spore balls and decomposed plant tissue. The lesions are often “corked off,” but under favorable conditions large, depressed cankers may form. The fungus winters on stored tubers or in soil, remaining viable for many years. In the presence of a potato tuber and enough moisture, each spore in the ball germinates by swarmspores, which stay grouped together in a plasmodium,

dissolving cuticle and killing cells. When the food supply diminishes, the plasmodium again breaks up into spore balls.

Control Avoid low soggy ground; if such soil must be used, acidify it with sulfur as for common scab.

Streptomyces

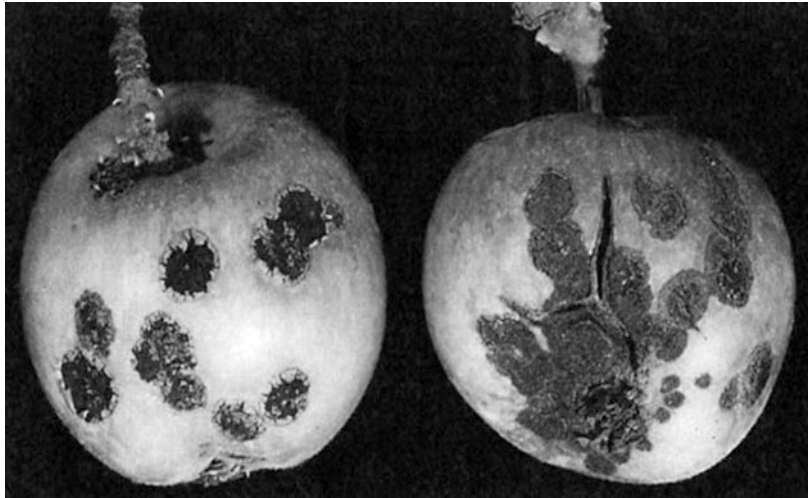
▶ Rots.

Streptomyces acidiscabies Acid Scab on beet, carrot, radish, parsley and turnip.

Streptomyces scabies (Syn. *Actinomyces scabies*). Common Scab of potatoes, Beet Scab, Corky Scab, Actinomycosis, general on potatoes, widespread on beets, also reported on carrot, parsnip, radish, rutabaga, and turnip. This disease may have been in America as long as potatoes have been grown, but the causal organism was not described until 1890. Scabby potatoes, by lowering the market grade, mean an annual loss of several million dollars. Chief symptoms are the tuber lesions, starting as minute brown specks and progressing to scabs that are warty or with corky ridges, or are pitted and depressed with the skin cracking open. Such potatoes can be eaten, but have poor customer appeal and are wasteful because of the deep peeling required. On beets, the scabs are similar but more bulging. The pathogen can be found even in virgin soil. It invades young tubers and may sometimes be seen as a grayish coating on freshly dug potatoes. It is most destructive in soils with pH 5.7 and over, with its activity sharply limited in soils slightly more acid. Although its optimum temperature is 72° to 86 °F, the fungus can withstand great extremes of temperature and moisture and can pass through the digestive tract of animals, returning to the field in manure.

Control Seed tubers have been treated with formalin, but the organism is so prevalent in potato soils that such treatment may have little result. Soils already slightly acid may be further acidified with sulfur. Enough sulfur to acidify highly alkaline soil would be too expensive and too injurious to potatoes. Alkaline materials – lime, wood ashes, and manure – should not be

Fig. 1 Apple scab on leaf and fruit



applied to potato soil. Somewhat resistant varieties include Menominee, Ontario, Cayuga, and Seneca.

Venturia

Ascomycetes, Pleosporales, Venturiaceae

Perithecia setose, often only near apex, papillate; paraphyses absent; spores unequally two-celled, olive.

Venturia cerasi On cherry and European plum, perhaps a strain of the peach scab fungus but not infecting peach.

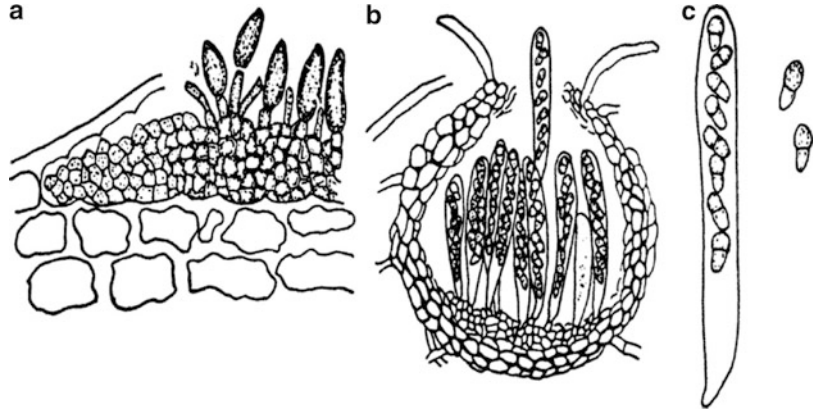
Venturia inaequalis (Anamorph, *Spilocaea pomi*). Apple Scab, Scurf, Black Spot, general on apple except in far South, widespread on crabapple; reported also on mountain-ash and hawthorn, but probably other species of *Fusicladium* infect these hosts. Scab is the world's top-ranking apple disease and is probably coextensive with the host. In this country it takes a fourth or more of the crop in a favorable scab year, the average national loss running around 8 %, or over 10 million bushels. Scab is somewhat less important in the South and in irrigated sections of Washington, but it is important in the humid coastal areas (Fig. 1). The pathogen was first described and named by Fries in Sweden in

1819 and was recognized in New York and New Jersey in 1834, apparently having come here with some European imports.

Symptoms The first symptom of scab on leaves is a dull smoky area that changes to an olive-drab moldy spot, 1/4 inch or more in diameter, without a sharp outline. Sometimes the leaf is raised or domed in the vicinity of the spot; sometimes it turns brown and drops prematurely. Similar spots may be formed on blossom pedicel, calyx, and petals, followed by dropping of young fruit. Scabby lesions sometimes appear on twigs, but are less common. On fruits, spots are small, more or less raised, rounded, dark olive areas (see Fig. 1). As they increase in size, the cuticle ruptures to form a white rim around a dark, velvety center, and still later the center may be raised, corky, and tan in color, after dark mycelium and spores have disappeared. Lesions are usually most abundant near calyx end of fruit; if they are too numerous, the fruit splits.

Life History The fungus winters in dead fallen leaves, producing small, dark, flask-shaped perithecia and, toward spring, asci with eight brown ascospores, unequally two-celled, with the upper cell wider than the lower (Fig. 2). The ascospores mature about the time blossoms show pink, and are forcibly expelled during warm spring rains. Each ascus elongates, protrudes its tip through the mouth of the perithecium, and explodes its

Fig. 2 *Venturia inaequalis*, the apple-scab fungus. **A** one-celled dark conidia of *Fusicladium* stage; **B** perithecium with two-celled ascospores



spore content. When a spore, carried by wind, arrives on a young leaf or bud, it penetrates the cuticle with a germ tube and develops a layer of branching mycelium just under it. The scab spot is evident in about 10 days, when brown conidiopores bearing olive brown, one-celled, somewhat pointed spores appear on the surface. Secondary infection occurs when these conidia are carried to new infection courts.

The expulsion of ascospores proceeds in a series of discharges over a rather long period, up to 3 months, starting in February, on the West Coast, but a shorter period, beginning in April, in New York. Germination and infection take place from 41° to 79 °F. Length of wetting period necessary for primary infection decreases as the temperature rises – 13 to 18 h of continuous wetting at 43 °F and only 4 to 6 at 70 °F. Secondary infection from conidia continues all season in rainy periods and even in storage scab may show up on apples infected just before picking. *Control* No varieties are immune to scab. Resistance varies with the season and the part of the country. McIntosh apples are very susceptible; Baldwins are fairly resistant but may scab badly some years. There is more than one strain of the

fungus. Nitrogenous fertilizers increase yield of the fruit but also susceptibility to scab.

Protective spraying, having a chemical film on blossom, fruit, or foliage at all times when weather makes infection probable, is the only real answer to scab. This may mean more than a dozen applications in a wet year and a minimum of five any season, a program more suited to the commercial grower than to the amateur. Timing is all-important, and most states have a spray warning service that tells of imminent discharge of ascospores. Any spray schedule must be tailored for the locality, the season, and apple varieties grown. The apple grower gets this specific help from his county agents.

Venturia pyrina (Anamorph, *Fusicladium pyrorum*). Pear Scab, general on pear, also on quince, similar to apple scab. The pear species of *Venturia* overwinters in fallen leaves and also in affected twigs; the perithecia mature somewhat later than those of apple scab. Conidia are formed on pear twigs and washed to leaves and fruit.

Pear scab is not serious except on such varieties as Flemish Beauty, Winter Nelis, Seckel, Anjou, Bosc, and Duchess. Bartlett pears are rather resistant.