



Bean blight

Xanthomonas axonopodis pv. *phaseoli*



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Brown spots with wide yellow halos caused by bean blight.



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Spots, some water-soaked, others brown, on the pods. Roughly circular and joining together.

SUMMARY: Bean blight is caused by a bacteria, *Xanthomonas axonopodis* pv. *phaseoli*. Key signs of the disease are spots on leaves, stems and pods. Seeds become infected internally and on the outside. The bacteria spread over short-distances in wind-blown rain, surface water run-off, and by people, machinery and insects moving through the crop. Long-distance spread is via infected seeds. The bacteria survive in plant debris, volunteer bean plants, weeds and seeds. Priority measures for management involve use of disease-free (ideally certified or approved) seed, rotations (2-3 years) with maize, avoiding entry to fields when foliage is wet, and removing volunteer plants and weeds.

KEY SIGNS

Common bacterial blight is a serious disease which attacks the foliage and pods of various kinds of beans. The main host is the common bean (snap or French bean), *Phaseolus vulgaris*, but other *Phaseolus* and *Vigna* beans are susceptible.

Plants grown from infected seed develop spots on the cotyledons (the first leaves) which then produce spores to infect other leaves. The first symptom is small angular spots that look water-soaked, expanding as large brown dead areas. The spots often have bright yellow haloes. In very susceptible varieties the spots continue to expand and the leaves appear burnt and become torn. Dark streaks occur on the stems, becoming lighter as they age.

On pods, the spots are water-soaked at first, becoming red-brown and sunken, mostly circular. A yellow liquid containing bacteria seeps out of the spots when plants are wet and humidity is high. In severe cases, the pods shrivel and die.

MANAGEMENT

Prevention – what to do before signs are seen

Cultural approaches: Ideally, use seed that is certified free from bacterial infection, or purchase from an approved source.

For smallholders who save their own seed:

- Carefully select plants for seed that do not show symptoms of disease. Choose only those plants without marks on the leaves or pods.
- If most plants show symptoms, do not use them as a source of seed; obtain seeds from a reliable retailer.
- If a thermometer is available, treat seed with hot water: 20 minutes at 52°C. Afterwards, surface sterilise the seed using sodium hypochlorite to kill bacteria on the seed surface. DO NOT treat all the seed with this method; try it out on some of the seed first, and always use a thermometer to measure temperature.

Remove weeds, volunteer (those that have grown without being planted) beans and other legume crops from the field before planting. Do not plant new crops next to those that have the disease.

Use maize as an intercrop; it reduces spread of the bacterium between bean plants.

Test different varieties or mixtures of different varieties for tolerance or resistance, but note high resistance to this disease is not reported.

Remove weeds as they develop. Weeding is important, not only to eliminate sources of the bacterium, but also to improve aeration so that the leaves dry out as rapidly as possible after rains or heavy dews.

Control – what to do after signs are seen

Cultural approaches: Use a 2-3-year rotation between crops of beans on the same land if bean blight is established in the field, e.g. use rotations with maize.

Avoid workers and machinery passing through diseased crops and then those that are disease-free, particularly in wet weather.

After harvest, collect and burn or plough back the diseased crop. It is likely that the bacterium survives only a few months in soil in the absence of a host.

Chemical approaches: Copper fungicides can be used to slow disease development, however this may not be a practical recommendation for smallholders, unless they wish to establish disease-free seed lots. To obtain maximum benefit from the use of fungicide, cultural control methods should also be applied.

CAUSE

Common bacterial blight is caused by *Xanthomonas axonopodis* pv. *phaseoli*. There are different strains of the bacterium; one is sufficiently genetically distinct and more aggressive to be considered a separate subspecies.

An important feature of this disease is that the bacteria are in or on the seed – it is seed-borne. Once inside the plant – though natural openings and wounds – the bacteria move through the vascular system to the leaves, stems and pods, and into the seeds. Seeds can also be infected from the spots that develop on the pods. Seeds can also become contaminated with bacteria if they come into contact with plant debris at harvest or when handled by people.

Wet weather and temperatures between 28-32°C favour disease development.

Spread of the bacteria occurs by wind-blown rain, rain-splash, surface water run-off, insects (beetles, grasshoppers and whiteflies) and by people and machinery moving through the crop.

Seed is also important in the survival of the bacterium: it can remain alive for more than 30 years. Bacteria also survive on plant debris and both on and in soil, where they can last for 6-18 months, and on other hosts, such as mung bean (*Vigna radiata*), Phasey bean (*Macroptilium lathyroides*) and Lablab (*Lablab purpureus*). The bacterium can also survive on the surfaces of plants without causing signs of disease.

IMPACT

This is a very important disease of common bean in temperate, sub-tropical and tropical countries. It is widespread throughout the bean growing areas of Africa. Surveys have shown that seed lots are often contaminated with the bacterium: in Uganda, just 0.2% seed infection can start an epidemic. Exact losses are difficult to determine because bean blight often occurs together with halo blight (*Pseudomonas syringae* pv. *phaseolicola*), another bacterial disease. Nevertheless, in North and South America, the Caribbean and Africa there are documented instances of the disease affecting crops grown for seed with yield losses of between 20 and 40%. It is a constraint to production in the Caribbean, and East Africa, in Ethiopia, Kenya and Uganda in particular.

DISTRIBUTION

Common bacterial blight is found worldwide in temperate, sub-tropical and tropical countries. It is present throughout Asia, North and South America, Central America and the Caribbean, Europe and in more than 20 African countries.

FURTHER READING

Allen DJ, Ampofo KO, Wortmann CS (1996) Pests, Diseases, and nutritional disorders of the common bean in Africa: A field guide. (http://books.google.com.co/books?id=kHoxVIEFW7AC&printsec=frontcover&hl=en&source=gbs_v2_summary_r&cad=0-v=onepage&q&f=false).

Hortanswers. (University of Illinois Extension) (<http://urbanext.illinois.edu/hortanswers/detailproblem.cfm?PathogenID=129>).

Persley D, Cooke T, House S (2010) Diseases of vegetable crops in Australia. CSIRO Publishing, Collingwood, Victoria 3066, Australia.

Xanthomonas axonopodis pv. *phaseoli*. CABI Crop Production Compendium. (<http://www.cabi.org/isc/datasheet/56962>).

Xanthomonas axonopodis pv. *phaseoli*. Data sheets on quarantine pests. EPPO quarantine pest. Prepared by CABI and EPPO for the EU. (https://www.eppo.int/QUARANTINE/bacteria/Xanthomonas_phaseoli/XANTPH_ds.pdf).