



Brook Road Allotment Association

BRAA Members General Information sheet



Clubroot

(Plasmodiophora Brassicae)

Clubroot is a serious disease of cabbage-family plants. However, even if your soil is infected, it is still possible to grow acceptable crops.

What is clubroot?

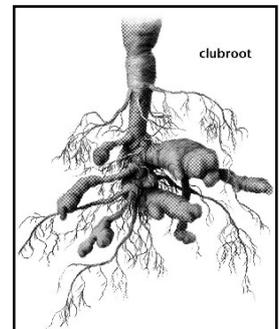
It is a fungal infection of the roots of cabbages and related plants. The roots are destroyed, crops fail to reach maturity and the soil is contaminated with spores that infest future crops. It is caused by the fungus *Plasmodiophora brassicae*. Clubroot lives for years in the soil as a very tough spore. When susceptible roots are near the spore it germinates and a 'zoospore' is released that can swim through the soil moisture to the plant root hairs. It infects the root cells and multiplies to form yet more zoospores. These either swim off through the soil to infect more roots or go deeper into the plant roots. Inside the roots they form amoeba-like cells called 'plasmodia'. They multiply greatly and release plant hormones that cause the galls to form. When the roots are highly galled, the plasmodia produce more spores that are released into the soil when the galls break up and decay.

What plants will clubroot attack?

Cabbages, cauliflowers, Brussels sprouts, radish, mustard, turnips, swedes, broccoli, kale, calabrese and kohlrabi are all susceptible. Chinese cabbage and other oriental cabbage family crops are especially vulnerable. Weeds such as shepherd's purse, hairy bitter cress and charlock will also support the disease. Wallflower, stock and alyssum can suffer from clubroot, too.

How do I recognise clubroot?

Swollen roots with 'finger and thumb' like projections are typical signs. The plants wilt, appear stunted and go grey/blue as their roots are destroyed. They typically recover from the wilting at night. Infected roots soon rot into foul-smelling mass, discharging spores into the soil. Galls vary from lumps covering the swollen bulbs on turnips and swedes to finger-like projections on fibrous-rooted brassicas. Some of the most spectacular galls occur on Chinese cabbage and other oriental greens.



Can it be mistaken for anything else?

Turnip gall weevil can also lead to root galls. Its main victims are cabbage and cauliflowers. It is not a common pest, but can occur locally. The galls are more hollowed and more rounded than clubroot swellings and you can often find a maggot inside. Transplants and seedlings may suffer from a check in growth, but the final crop is seldom diminished. There is usually no need to control this pest. However, if it is a problem in your garden, you should cover emerging seedlings or young transplants with insect-proof mesh. This will exclude the egg laying adults in late summer. Cabbage fly can also cause brassicas to wilt and develop a grey/blue hue. In this case, there are no root galls. In fact, there are often no roots at all, just a mass of maggots in the stump of the stem. Occasionally, hormone weed killers can have the same effect. Be careful with your lawn weed killers. Here, the galls are bunches of young roots growing together. Some soil bacteria - crown gall, for example - can have a similar effect.

Can plants be cured?

Once your plants are attacked, there is no cure. However, you can earth up the plants in the hope that new roots will be formed further up the stem. These roots may then escape infection at least long enough for the plants to produce a crop.

Can clubroot be prevented?

Wet and acid soil are the favoured conditions of clubroot. Improving drainage will help. Making raised beds is a good way of doing this. Use treated boards, for example, to make beds 1 - 1.5m wide and at least 15cm higher than surrounding soil. Acid soils can be made more alkaline and much less favourable to clubroot infection by the addition of lime or chalk. Lime is cheap, so this is the most economic way to keep down clubroot.

Are transplants at risk?

Transplants are just as vulnerable as seed-raised plants. Give them the best start by raising them in clubroot-free soil. Ideally, raise them in soil less compost, as this is almost certain to be free of the disease. The bigger the container the better. A 15cm pot is ideal, but can be expensive in compost if you have a lot of plants to grow. Plant out without disturbing the root ball and water well until the plants are established. Don't let the roots of transplants come into contact with infected soil while they are growing. If in doubt, stand the pots on a sheet of polythene.

Are there any chemicals to treat it?

If you use bare-root transplants, you can dip the roots prior to planting in thiophanatemethyl-based treatments. Protection is not total, but it can be helpful, especially if you lime and drain your plot as well. There are no organically acceptable clubroot-control chemicals.

Can the spores be killed?

One way to reduce the number of spores in the soil is to cultivate it finely in dry weather. Using a powered cultivator to turn the over soil repeatedly in spring is ideal, but hand tools could be used on a small scale. In hot weather, covering soil on vacant land with a clear polythene sheet can raise the temperature enough to kill spores in the soil. During a hot summer this may be worth a go.

Are there resistant varieties?

Some varieties of Swede, calabrese and Chinese cabbage are claimed to be resistant. In fact, these varieties are more tolerant, so the disease will multiply in their roots to some extent, but the plants will often crop well anyway. Examples are: Chinese cabbage 'Harmony', Calabrese 'Trixie', Kale 'Tall Green Curled' and Swede 'Marian'.

Will rotation help?

If you don't yet have clubroot, rotation will help reduce the chances of the disease becoming a problem. Leave as long as possible between cabbage-family crops. At Least six years is recommended. In most gardens it is difficult due to space restraints to leave more than 3-4 years between crops. If clubroot appears, it is best to keep growing brassicas in the same spot, so the disease doesn't spread around the garden. Lime and drain the area as well as you can. Start plants in pots to give them the best chances of survival. The spores can last at least 12 years in the soil. Clubroot-resistant varieties support the disease; so include them in the brassica part of your rotation. Clubroot can get into gardens on contaminated seed, but this is most unusual. The most common method of spread seems to be on infected transplants or tools contaminated from gardens with the disease. Don't borrow tools or buy soil-raised transplants from unknown sources. Another source of infection is contaminated manure. If you can, check that manure does not come from beasts fed on root crops or vegetable waste. Horse, poultry or pig manure is safest.

If my ground is infested, will I have to give up growing cabbage-family crops?

No, many gardeners keep growing brassicas in the presence of the disease. However, there is no single remedy.

What do I do with infected plants?

The plant tops are unlikely to be contaminated unless soiled with earth, and could be composted. The swollen roots are crammed with spores; lift these as soon as the crop is gathered and burn them thoroughly or consign them to the dustbin.