

## **Calcium Deficiency---More Black Tips**

Do some of the leaves on the new growths of your catts turn black and fall off? Or perhaps some of the newly emerging growths themselves turn black and die before ever producing a leaf? Do you get frustrated because your regular disease control program fails to solve the problem? Do you then start using different chemical control programs, all of which also fail to stop the rot? If so, it is highly likely that the problem is physiological, not pathological. And the most likely cause is a deficiency of calcium. Among other things, calcium is essential for cell division and cell wall production. Soooo.....if calcium deficiency is going to occur, almost invariably it will be in rapidly dividing tissue, just as occurs in newly emerging growths or in new leaves. The mature bulbs and leaves may have adequate calcium and be in perfect condition. However, unlike some other essential elements, calcium is immobile and cannot be translocated from the older growths into the new growths to compensate for any deficiency. Once calcium is deposited in the cell wall it stays there. Calcium must therefore be available whenever any part of the plant is in active growth or a deficiency will occur in those parts.

### **Symptoms**

Calcium deficiency is the most common mineral deficiency of orchids yet my experience is that it is mostly overlooked even by experienced growers. The symptoms of calcium deficiency are most commonly seen in cattleyas, less so in paphiopedilums, sometimes in other genera, and generally occur during periods of rapid growth in spring and summer. I shall concentrate here on the effects in cattleyas but the principles apply to other commonly grown genera.

Some cattleya clones are highly susceptible and are repeatedly affected. All, or almost all, of the newly emerging leaves may simultaneously turn black. Other clones never show any visible symptoms. Sometimes one plant of a single clone may show symptoms while another identical clone is symptomless. The first signs of the problem generally start with a blackening of the newly emerging leaf or flower sheath. In its early stages the lesion is quite soft and watery. It progresses from the tip towards the leaf base and may be preceded by a yellow halo. Both the flower sheath and the adjacent leaf are often concurrently affected. The entire leaf may turn black and drop off. Often, the outer flower sheath will be totally black but the inner sheath is unaffected. This is a sure sign that the cause of the problem is physiological, not pathological, for any self-respecting fungus or bacterium would have no respect for your longed-for flowers. Once the leaf falls off, the pseudobulb is left standing, uninfected, but unable to contribute to the growth of the plant. The blackening of the leaf may start back from the tip particularly where the halves of the expanding leaf remain stuck together and may occur as a similar type of lesion on both halves of the leaf. In some cases, the entire newly emerging growth turns black and dies but the parent pseudobulb remains unaffected. This is quite different to the situation caused by fungal or bacterial infection. In these cases, the infection, if left untreated, will continue to spread from the leaf into the pseudobulb or adjacent pseudobulbs and will eventually progress into the rhizome and kill the plant. Where the deficiency is not as acute, the new growth may not blacken but may be quite stunted compared with the previous pseudobulb.

## **Causes**

The real cause is rapid plant growth in the absence of adequate calcium ions. What are the factors that promote rapid growth? Warm, sunny, moist, humid conditions (as occur in spring and summer) and a plentiful supply of all essential nutrients.

Unfortunately, most commercial fertilizers do not contain any calcium. Heavy fertilizing programs designed to encourage rapid growth are therefore more likely to produce symptoms of calcium deficiency than is the case where little or no fertilizer is used. Unless a conscious effort is made to supply an additional source of calcium in the fertilizer mix, most of the calcium available to the plant comes from water. Town water does contain calcium but the levels can be insufficient for some cattleya clones particularly if they are otherwise heavily fertilised. Rainwater has no calcium content. If rapid plant growth is occurring during periods when rain (rather than town water) is the main source of water, calcium deficiency can, and does, occur. Because the weather at such times is generally hot, humid and favourable for the establishment of pathogens and the lesions resemble those caused by pathogens, the real cause of the problem is often overlooked.

## **Treatment**

The deficiency can be remedied by supplying the plant with calcium either in powdered or liquid form. If the problem is confined to a few, readily identifiable plants, powdered limestone, or preferably powdered dolomite (which also supplies magnesium) can be sprinkled onto the potting medium. This is best done in late winter and mid-summer before the main flushes of growth occur. Some paph growers circumvent the problem by incorporating shell-grit or limestone chips into the potting medium. For 100 and 200mm pots, a full teaspoon and tablespoon respectively of dolomite is sufficient. Powdered gypsum, which will not alter the pH of the medium, may also be suitable but I have not had any experience in its use. In more extensive collections or where the occurrence of calcium deficiency is more prevalent, the simplest solution is to apply calcium nitrate as a foliar spray, either alone or mixed with other foliar fertilizer. During periods of active growth, weekly applications are recommended. Remember, calcium nitrate is also a readily available source of nitrogen and you may need to adjust the overall nitrogen content of your fertilizer to compensate for the additional nitrogen supplied by the calcium nitrate.

## **Verification**

There are multiple causes of black rots of orchids. How then can you be sure that your problem is physiological and not pathological? A comparatively simple way is to use a sacrificial test plant. Take a catt that you do not want but that has at least one new growth. Use a sharp piece of clean wire (or similar) to scratch two areas of about a centimetre square on opposite halves of the new leaf. Now cut the black lesion from your affected plant (using sterile secateurs, of course!!!) and squeeze the black juice from the lesion onto one of the scratched areas of the test plant. Leave the other scratched area as an untreated comparison. Record what you did. Preferably, repeat the procedure on another leaf of the test plant but using the juice from the black lesion from another one or two affected plants. To avoid cross-contamination, wash your hands between each operation. The scratched areas on the test plant will turn brown or black within a few hours. That is a natural response to cell damage. However, if the juice you rubbed into the scratched area contained pathogenic bacteria, the test lesion will not only turn black, it will spread rapidly and within a couple of days the

entire leaf will be infected. Fungal infection will progress at a bit slower rate but the end result will be the same...a badly infected leaf. If after 3 or 4 days the scratched area shows no sign of infection, the juice you squeezed on did not contain any pathogens. In all likelihood, the disorder you were testing is the result of calcium deficiency. You may need to repeat the procedure a few times to convince yourself that you are not dealing with some super bug but rather, a simple case of lack of calcium. Remember, orchids, like orchid growers, need a ready supply of calcium.

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