

All that is known about Black Spot

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If you have ever kept gasterias and/or aloes you will no doubt be acquainted with black spot. Even if you have no personal experience of it, you may well have heard of it in discussion and you may have noted that whilst some people may claim to know what causes it and what should be done to get rid of, or prevent it, facts do tend to conflict and undermine ones confidence in perceived knowledge. Much of what is said is based on (incomplete) empirical evidence; very little science is evident. The proposed causes of black spot range widely. The following is a distillation of views presented by a variety of sources.

Stress is sometimes cited as a factor contributing to black spot. Given that stress weakens a plant and therefore makes it less resistant to pathogens, this seems to be a reasonable line of approach and it may contribute to an explanation of why some plants may be subject to black spot in opposing conditions, hot-dry and cold-damp, both of which can be stressful to the plant, particularly in prolonged periods. However, it does not explain what is causing black spot, only what might be facilitating its development.

Cultural conditions are sometimes proposed as causes of black spot-too much sun and lack of ventilation can result in surface tissues being damaged, feeding with a high nitrogen fertilizer and over watering can result in soft tissue, which is more vulnerable to pathogens, but there is often a lack of consistency in the results with only a few plants being affected. Other growers in the same area experiencing about the same cultivation conditions have indicated that they do not experience black spot.

It is known that deficiencies in soil can cause blemishes in plants ipso fact black spot is caused by soil deficiency. This is speculation. Others have pointed out that gasterias which have not been repotted for many years must have depleted nutrients, but they show no signs of black spot, whereas plants in much fresher compost and, therefore, with nutrients have developed black spot.

Glasshouses do not have uniform conditions throughout. Corners, particularly right angled corners, can be damper than the center, the north side can be damper than the south (opposite way in the southern hemisphere) and under the staging, particularly on the north side, can be much damper and at a lower temperature than above staging and above suspended shelving. You can easily verify this for yourself by installing a series of maximum and minimum thermometers at various points in your glasshouse and recording and comparing the temperatures at different locations at the same time. Air at higher temperatures holds more moisture than air at lower temperatures, consequently plants under the staging are likely to experience more condensation than those at the higher, hotter levels. In one glasshouse a difference of more than 10 Fahrenheit was found between under the staging and on suspended shelving on the north side. Furthermore, condensation lingered longer by two to three hours in the corners compared with the sides and southern end. It also lingered longer on the north side. In the evenings the reverse occurred. Condensation formed in the corners and at the north end two or three hours before it became evident at the south end and sides.

Dampness is frequently proposed as a cause of black spot and claims made that removal of plants to a dryer part of the glasshouse is a reliable preventative measure. A contrast has also been drawn between winter, when it is much damper and the development of black spot has been observed, and summer, when it is much dryer and the development of black spot has not been observed. Unfortunately there is conflicting evidence as some growers have seen the development of black spot in the dry conditions of summer but not in damp winters. One *Gasteria disticha* in its younger days when grown on the staging in the center of the glasshouse suffered from black spot. In its old age, when it became a large clump and remained in old compost in a tray under the staging for a long time, with less light, cooler conditions, higher

humidity and low nutrients, it was free of black spot.

Another popular proposed cause is fungus and, apparently less frequently, bacteria. Perhaps these should be considered together with dampness because fungus and bacteria are known to flourish in damp conditions. However, many gasterias, which are inevitably kept in damp conditions in winter when rain, cloud cover and short days maintain a high atmospheric humidity for long periods without any significant sun, do not develop black spot, whereas plants in the summer with long day length and clear sunny skies and much lower humidity do.

The suggestion has been put forward that some gasterias are naturally prone to the development of black spot and others are not, but reports from different people do not support an agreed list of species which are, and which are not, prone to it. Furthermore, some cultivators have found that only one plant of a species has developed black spot whilst others of the same species have not. Perhaps even more revealing is the observation that, where a large plant has been split into several individuals, observation of their progress over a number of years has revealed that only one or two have developed black spot, the majority of the same clone having remained free from it. Black spot does not seem to be contagious and rampant.

Does black spot occur in habitat? One visitor, who has made several excursions to South Africa, reported that he had rarely seen black spot on the *Gasteria* species he had observed west of the Eastern Cape and then north to the Orange River. In one year a few black spots were observed on *Gasteria pillansii* in the Hells Kloof area when it had been exceptionally dry for several months. On another occasion, in the same area in an exceptionally wet year, leaves of *G. pillansii* were highly turgid, some were splitting and some showed signs of rot, but black spot was seen only occasionally

In the search for more authoritative information David Cumming, who has made many field trips in South Africa, was contacted. He says that black spot "appears to be widespread and common, especially in the Eastern Cape. *Astrolobas* seem the most 'infected' followed by gasterias. It seems to me to be stress related, just as many diseases are in humans, which leads me to think that it may be an opportunistic pathogen rather than a primary cause of disease. In cultivation many of my gasterias that were more neglected than others displayed black spot, but on now receiving better care have recovered."

Earnst van Jaarsveld indicated that black spot is caused by a fungal disease, by a *Montagnella* species, which is common all over South Africa. As a preventative measure he sprays every 3 to 6 months with copper oxichloride or Captan, but notwithstanding regular spraying some plants still get some spots.

A study of *Montagnella* was carried out in South Africa some years ago, but it was never published. The report of the study must be lurking somewhere on the shelves of a university or botanical garden, but all attempts to locate it (and the author) have failed. Unfortunately not all important information is published for the benefit of a wider audience.

Doug McClymont of Zimbabwe was also consulted. "My experience has been with aloes and as a semi-hobby, not as a full time researcher, so I have no replicated experiments to quote, all my recommendations coming from personal observation and a suck it and see philosophy!

"The black spots I have dealt with have proved to be a mine field in many ways. Perhaps some of my general observations may be of use. The black spots on aloes generally develop in high humidity conditions, overcast, temp minimum > 18°C, rain every day etc, but also when there has been a significant insect (especially Mirid) attack and even more confusing only on senescing leaves on some cultivars?! We get two main types of leaf spot, but their epidemiology has never been researched. The two types are: *Montagnella maxima* Mass. and *Placoasterella rehmi* (P. Henn) Theiss & Syd. Certainly I have experience that these are not controlled by systemic fungicides such as benzimidazoles or triazoles as I have an excellent granule mix of cyproconazole and disulphoton that ensures season long control of rust and all sucking pest and, surprisingly, including mirids who just eat the waxy cuticle of the leaves. I definitely get

markedly less black spot with this annual treatment, but I am sure that this does not actually control the black spot per se, but the mirids who injure the leaf. These injuries are then colonized by the black spot organisms. So, no injuries less black spots. However, insects or not, under very moist conditions the spots come booming back and the only success I have had is with copper oxychloride or cupric hydroxide sprays. Wettable sulphur does have an effect, but not as good as the copper. The senescing effect is marked and I am sure triggered by some metabolic change. The lower leaves senesce and the black spot overwhelms them irrespective of spraying which is a real pain when trying to exhibit a show entry. I am sure there is some relationship there, perhaps extra ethylene production in the leaf on senescence, which is perfect for the spot, I don't know.

"What I do know is keep the insects off, spray regularly with copper in very wet conditions and the black spot is markedly less. In drought seasons it may disappear almost completely. I am afraid I haven't really answered your queries and I don't have any rigorous scientific replicated data to supply, but I trust my observations over the last 23 years on aloes may be of some help."

In an attempt to obtain some scientific evidence the Plant Pathology Division of the Royal Horticultural Society was contacted.

Leaves of *Gasteria disticha* with black spot on both sides, samples of the roots and the soil in which they were growing were sent to them to see if they could establish the cause of the black spot. They carefully examined the material and concluded that the spots were not the result of cultural practice such as the amount of sunlight, watering and feeding. They incubated areas of tissue around the black spots, but were unable to isolate any fungal or bacterial pathogens; they did add that the isolation of bacterial and fungal pathogens was difficult. They also carried out a search of the literature for diseases in Europe, but were unable to find any information on *Montagnella* species, presumably because it is not a factor in Europe. The best suggestion they could offer was to use the fungicide mancozeb, which is available in garden centers as Bio Dithane 945, as it had proved effective in controlling leaf spotting in a wide range of plants.

It is worth bearing in mind that for some people black spot does not develop on their plants, notwithstanding their cultural conditions may not be quite up to the standards conceived as being ideal for the prevention of black spot. "I find black spot to be rare in my greenhouse in spite of damp conditions in winter and poor air flow because vents have to be kept closed to isolate the interior from the low outside temperatures." "I never get Black Spot and grow all my *Gasteria* in shade."

So where does all this leave us? The conflicting information from growers does suggest that there is no one set of conditions under which black spot develops. The causes of black spot appear not to have been finally established, but many perceive that fungi are the culprits though fungicides seem to do no more than control them; they do not eliminate them. Stress would also seem to be an important factor. Good husbandry may be the best preventative measure, which means growing plants hard in the growing season with plenty of moving air, good light, but not necessarily full sun, adequate water and nutrients for growth and repotting as dictated by growth. This should result in a "hard" plant which is better protected from insects and any pathogens the damp, dormant period can throw at it. It should help considerably to keep the floor, staging etc clean at all times and the plants dry during dormancy and during dull, cold, damp weather. From hereon you are on your own. Conditions do vary from year to year so these alone could influence the occurrence of black spot more than the removal of a plant from one position to another in the same glasshouse. Careful observation over a number of year will be necessary to come to any reliable conclusions.

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1. A number of growers in different countries.
2. David Cumming, South Africa.

3. Ernst van Jaarsveld of the National Botanic Gardens, South Africa.
4. Doug McClymont, Zimbabwe.
5. Dr A. J. Jackson, Plant Pathologist, Royal Horticultural Society.