Controlling bulb mites in Pleione

Mites, and in particular the Oncidium mite (*Brevipalpus oncidii*) can cause a lot of damage to *Pleione* pseudobulbs. Over the growing season they multiply and burrow into the soft tissue of the bulb, typically in places where they can't be easily seen, such as below the level of the mix or between a new growth and the bulb. In mild cases the result is a corky scab while more advanced infestations can lead to the near complete destruction of the bulb and the failure of new growths in the spring (see pictures below). As if this wasn't alarming enough, the mites are also vectors of virus so their movement around your collection is also leading to the spread of incurable diseases.

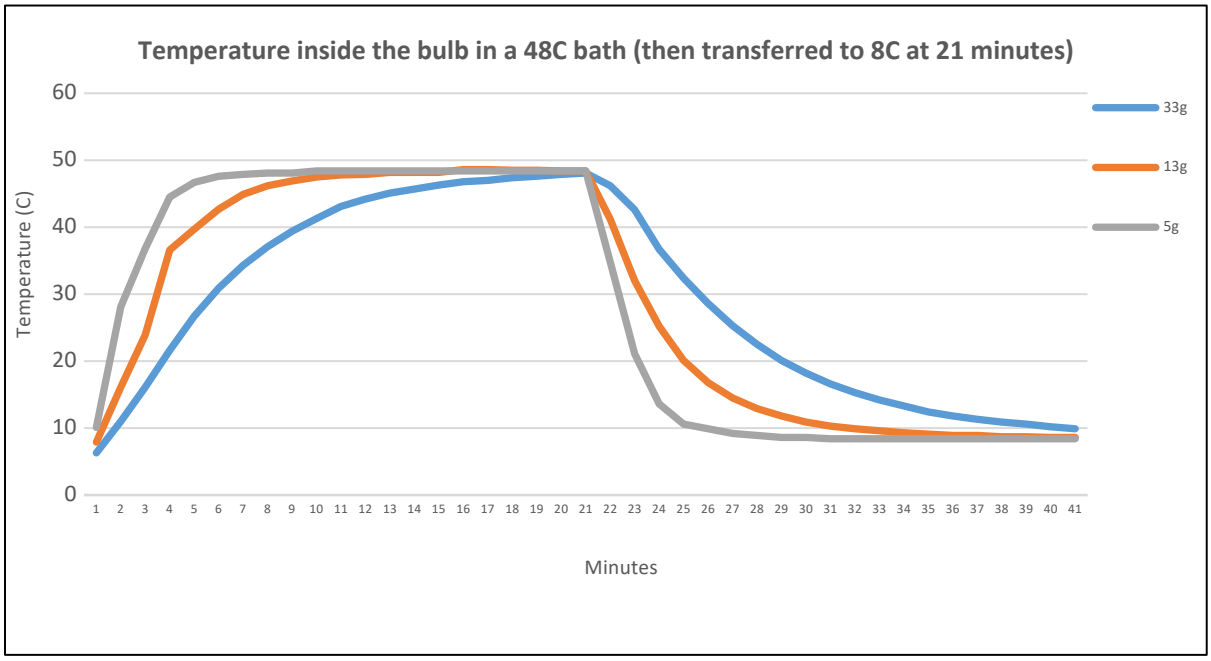
Chemical approaches

There are chemical treatments for mite control but they are not typically recommended for the amateur grower. Mites are particularly hard to kill with chemicals and commercial systemic agaricides are generally regarded as too toxic for sale to the public. Also, *Brevipalpus'* habit of burrowing into the bulb, together with the corky scab tissue that covers their colonies makes it hard to access them with chemical dips or soil drenches. I've tried a few alternatives over the years, including Neem and spraying oils, but none of them worked well enough to merit recommendation for eradication. The exception to this is sulphur which is described below. Spraying oil does reduce desiccation in hot water treated bulbs so can be useful to improve survival after winter storage.

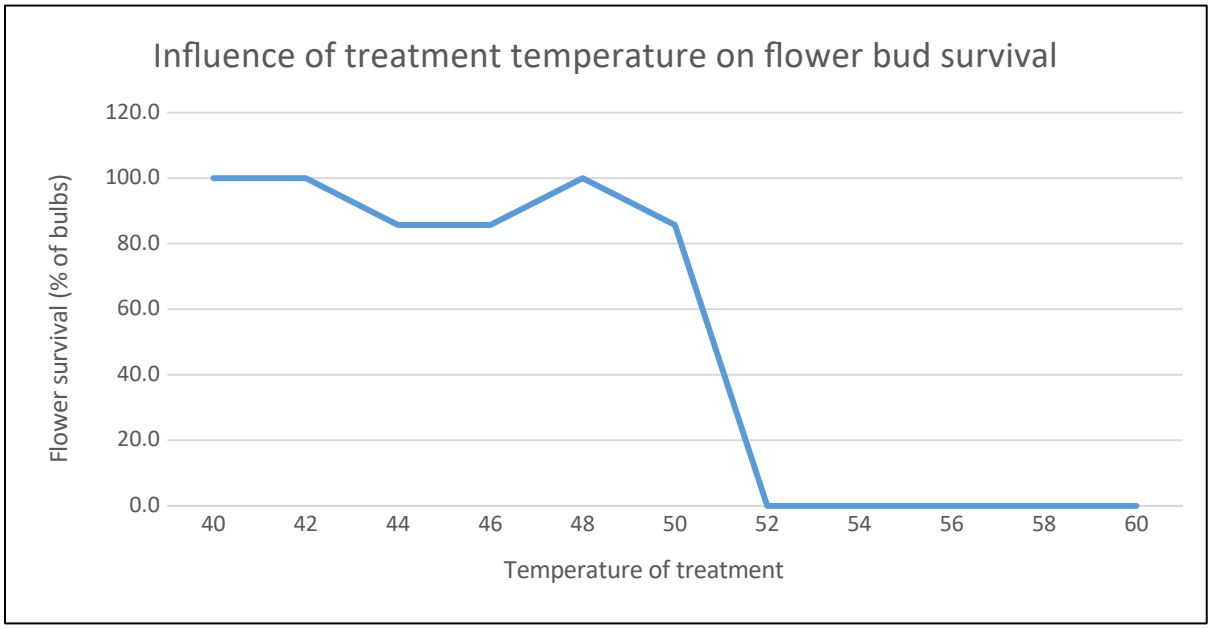
Hot water treatment of Pleione bulbs

Daffodil bulbs have a similar problem with nematode infestation which can limit where the bulbs can be sold. In response, the bulb industry uses various methods for treating bulbs, one of which is based on hot water treatment. I decided to see if something similar could be used on Pleione pseudobulbs to control mites. The first step was to see what temperatures kill mites. I obtained an old controlled-temperature water bath, which enabled me to accurately heat water to different temperatures. By removing small sections of infested bulbs and floating them in small metal cups on the water it was possible to see (with the aid of a microscope) what temperatures they could tolerate. The mites died quickly at, or above 44°C providing they were in contact with the metal dish. However, by riding on the top of the excised tissue they survived much longer, indicating that Pleione bulb tissue is a particularly good insulator. At 48°C this effect was much less obvious and most of the mites were dead within a few minutes.

So the trick is to get the bulb to between 46-48C for at least as long as it takes to kill a mite (5 minutes should be enough). However, as mentioned above, bulb tissue acts as a good insulator, so it was necessary to see how long it took to heat a bulb right through? This rather depends on the size of the bulb of course, so I drilled out 3 bulbs; one large (33g), one of medium size (13g) and one small (5g), inserted a temperature probe into each and monitored the internal temperature of the bulb after being placed in a 48°C bath for 21 minutes then transferred to an 8°C bath for a further 20 minutes (see below). The take-home message is that a full 20 minutes is required if large bulbs are to be heated to the core. Similarly, a full 20 minutes is required to cool these bulbs back down again, after the treatment. Cooling is critical because bulbs removed from a hot bath sweat and can rapidly dehydrate, particularly since the hot water seems to strip away some of their natural wax layer.



The next question of course was “what does this do to the bulb?” Groups of 7 medium sized bulbs were treated at different temperatures, ranging from 40°C up to 60°C, all for 20 minutes, followed by a 20 minute cool down period in cold water. The bulbs were then stored for winter, planted in spring and the number of bulbs with normal flowers counted. The results for the flowers are graphed below. The obvious point is that you cannot exceed a treatment temperature of 50°C. Above that temperature all the flowers abort. Shoots appeared to survive until 54°C was reached, at which point the bulb was effectively cooked. It should also be noted that no mites were seen to survive treatments above 46°C.



In summary

It appears that you can kill the mites hiding inside your bulbs using hot water treatment, but you do need to have the right equipment for the job. The difference between 48 and 52°C is the loss of flowers the following season and the difference between 50 and 54°C is life and death. My preferred treatment temperature range is 46-47°C. Note that only precise thermostats control water temperature over less than a 1°C range, so it’s best to stay well inside the safety margin if you don’t want to abort the flowers. A period of at least 20 minutes at 47°C is recommended to kill mites throughout the bulb and the bulb must then be cooled off again in cold water for a further 20 minutes to remove the heat. After that, they can be safely stored throughout winter in a cool, dry place. I also dip them in a dilute solution of spraying oil (the commercial name of which is Conqueror oil in New Zealand) at the end of the cooling step to compensate for the loss of surface waxes during treatment and as an extra precaution against possible storage infestations. Also, before you treat your bulbs you should always grade them and discard any with obvious disease or infestation, unless you really want to keep them. I’ve found that you can cut infested sections out of the

bulbs and treat them anyway. They didn't seem to be too set back by this rather brutal approach, even when half the bulb was removed. I don't know how resistant mite eggs are to the treatment but it is clear that the mite numbers are now very low in my collection so I can only assume I'm hitting most of the eggs as well. One final comment, a friend just mentioned that you can use a sous vide precision cooker to get the necessary temperature control in a suitable water pot. They generally contain a thermostat with a controlling range of approximately 1°C which is quite adequate for this purpose.

Sulphur treatment

Having said that chemical treatments are generally not recommended for mite control in Pleione bulbs, the notable exception is sulphur. Mites, as a group, appear to be particularly sensitive to elemental sulphur. In some crops (such as grapes) sulphur is used to control mites but I haven't heard of it being used specifically target Brevipalpus in orchids (but I'm happy to be corrected on that). Fortunately sulphur is readily available in several different formulations and it's generally regarded as having a low toxicity. Please note, however, that it is not benign either, so wear gloves and a mask, especially when handling the powder. My favourite formulations are 'Kumulus®', a wettable powder formulation used mainly to control mildew fungus in grapes and other crops, and 'Flowers of Sulphur', used as a nutritional source of elemental sulphur but also as a general antibiotic for treating things like infections in horse's hooves. Lime sulphur is to be avoided as it's quite corrosive and can damage the bulb.

Sulphur is a contact agaricide, meaning it needs to be in touch with a mite to be effective. It will not, therefore, influence mites burrowing deep within a bulb (only hot water treatment will do that). To get the best effect from sulphur it needs to be present when the mites are moving around, particularly when they are preparing to invade developing tissues. I do this by dipping cleaned bulbs in a Kumulus® solution prior to planting to protect them from hatching mites in spring, followed by drenches of Kumulus® or Flowers of Sulphur twice during the growing season (once after flowering and again as the new bulbs start to swell at the end of summer). The idea is that the sulphur is present when the mites are most vulnerable and when young tissues (shoots, roots and swelling bulbs) are most susceptible to attack. I haven't seen any adverse effect on the growth of the plant with this approach and the mite levels are dramatically less than before.

Final comments

Bulb mite infestations can be devastating in a Pleione collection. Frankly, if you detect mites (typically through the symptoms illustrated above) you have to act, or you risk losing everything over a few short seasons. Fortunately there are ways to fight back. Lift your bulbs once they go dormant, rinse away the growing medium and throw out any bulbs with the significant lesions. If they are particularly precious, cut away the lesion but avoid damaging

new growths if you can. Hot water treat the bulbs if possible to reduce mite numbers within the bulbs and/or treat with sulphur at least three times in the season to kill any crawlers before they attack new growths. It may take a few seasons to get back to the where you were before, but it is quite possible. Good luck.

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