

SCALE AND ITS CONTROL by Denis Oliver

The armoured scale insects are some of the most successful plant-eating arthropods. They occur almost everywhere that perennial vascular plants are found, with the exception of a few oceanic islands. They adapt readily when introduced to new environments and in particular they like the artificial conditions provided by hothouse culture.

The Life Cycle . This is a *general* description of the life cycle, as there are numerous differences in behaviour between different species of scale. Some mature female scale insects produce eggs, which hatch soon after laying, while others are live-bearers that lay crawlers. Female live-bearers continue to breed for 20-50 days, depending on the species, temperature and other conditions. Within a few hours male and female crawlers exit a flap in the rear of the female's shell and move off in search of new sites to colonise. They usually settle within a few centimetres of the parent but are theoretically capable of covering up to 150 metres. They are also dispersed by the hands and clothing of nursery workers and by other mechanical means. The crawlers settle on a new site within a day or two, withdraw their legs, insert feeding stylets into the host and begin feeding, growing and secreting their protective cover. Once their feeding stylets are in place, the crawlers do not move again.

They now undergo several stages of metamorphosis, which culminate in sexual maturity. Then, in the case of the male, a small gnat exits its shell and searches for a female scale with which to mate. The male gnat is unable to feed and is relatively short-lived. The female is mated through a flap in the rear of her shell; she then proceeds to produce another generation of crawlers. Un-mated females die after a short time. During the growing stages there are short periods of feeding (each approx. three days), followed by longer non-feeding stages (each approx. eight days). These non-feeding stages must be kept in mind when attempting to control scale with systemic insecticides. The scale's hard shell also reduces the effectiveness of many surface-acting contact sprays.

Control Methods and Materials . Scale tends to colonise most heavily on the underside of leaves and towards leaf axils. Any control measure needs to take this factor into consideration, as well as the existence of the protective shell and the dormant phases of the life cycle as described above. Surface-acting (contact) sprays, such as white oil, carbaryl and pyrethrins, need to be applied so as to cover the entire plant, especially under the leaves and into the leaf axils.

The traditional spray is white oil (also known as summer oil) in one of its many forms. It works by smothering the insect, both in its adult and crawler stages. Once dry, white oil remains effective for 5-14 days, depending on any additives present and the frequency and volume of subsequent watering. The advantages of white oil include effectiveness, low toxicity to both the user and the environment, and low cost. Its main disadvantage is phyto-toxicity, as white oil will damage flower buds and may also damage sensitive leaves. This phyto-toxicity is caused by two factors, namely, (a) UV radiation, which causes the breakdown of the oil to phyto-toxic components, and (b) rapid uptake of oil by the leaves, which may cause cell membranes to rupture.

Some products now on the market contain stabilisers to retard breakdown by UV-radiation and 'safeners', which retard uptake of oil by the plant. One such product is D-C-Pron Plus, which is sold as Pest Oil®. To my knowledge it has not been tried on orchids, so it should be applied with caution, especially to the flowers. Newer topical insecticides, such as piprenol and permethrin (a synthetic pyrethrin), are effective against scale. White oil is useful when mixed with these insecticides, as it enhances their spread and adhesion to the leaves. Systemic sprays are effective against scale only in its feeding stages. Depending on the severity of infestation, repeat spraying may be necessary. It is questionable whether amateur growers should take the risk of handling and applying these potentially dangerous chemicals, especially when safer alternatives are available.

Growers with small collections often physically wipe scale from their plants' leaves. TAKE CARE! The scale infestation is invariably worse nearer the base of the leaf. Naturally, one tends to press harder where the pest is thickest. The base of the leaf usually has a pronounced V-profile and the chances of splitting the leaf at this point are quite high. This will not only damage the plant but will also release sap onto the cleaning cloth and the hands of the operator. Unless care is taken, virus could be transmitted from an infected plant to others.

Growers often use an aqueous solution of either white oil or methylated spirit to wipe orchid leaves. The methylated spirit is said to help break down the waxy scale shell but I believe that a single wipe would be unlikely to kill scale in this way. Although wiping with white oil or methylated spirits removes scale, it does not kill any virus particles released if the leaves are damaged. If you are cleaning leaves, use a fresh piece of disposable hand towel for each plant, and wash your hands thoroughly. Don't dip your cleaning materials or hands in any solutions that could be contaminated with virus. As an added precaution you could use disposable gloves, which are now very cheap and readily available in a range of sizes and colours. Ants are often mentioned in the context of spreading scale. They are certainly attracted to the secretions of scale insects but to my knowledge they play no part in its dispersal.

It has been suggested that a good way to rid plants of scale is to dip the entire plant in a solution of a suitable insecticide at re-potting time. This procedure certainly ensures good coverage, avoids physical leaf damage and reduces the chance of spray drift. However, unless infestation is minor, a follow-up spray may be necessary.

Many of us are using predatory mites to control red spider, so widespread use of insecticidal sprays is undesirable. If your collection is not large, it may be possible to wipe scale from the distal, more accessible parts of the leaves and to use a small hand-pump sprayer to treat the axils and leaf bases only. White oil would be the measure of choice here because of its low toxicity to predatory mites. Several species of insects that feed on scale are sold commercially. Various species of ladybirds, in both their larval and adult stages, consume scale insects. I recently introduced several containers of red chilochorus (*Chilochorus circumdatus*) into one of my cymbidium houses. If this treatment successfully controls scale, it will be excellent to use in combination with predatory mites, which control red spider.

Does Scale Transmit Virus from Plant to Plant? The answer to this question is unknown but I think it unlikely. It's far more likely that growers trying to eliminate scale transmit virus! Once the crawlers select a site, they stay there for life. When the crawlers mature and produces more crawlers, the only way that these offspring could be contaminated is if the virus particles were transferred from the digestive system of the parent to its reproductive system and thus to its progeny. This may be possible but seems unlikely. Once the crawlers have emerged they do not feed until they have permanently settled at a new site, so they are unlikely to pick up virus particles in their travels. The only other mobile phase is the adult male scale but they do not feed and so are also unlikely to transmit virus.