AgNOVA TECHNOLOGIES

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FRUITION®

Garden Citrus Gall Wasp Trap

Surround®

Crop Protectant

Summary

- Citrus gall wasp is a major pest of commercial citrus orchards and home gardens
- Monitor trees for new galls from June onwards
- In spring
  - » prune out galled shoots
  - » use Fruition® Garden Citrus Gall Wasp Traps to monitor for wasp emergence
  - » apply Surround® WP Crop Protectant which acts as a repellent

Figure 1. Surround on citrus leaves

Figure 2. Gall with emergence holes

Citrus Gall Wasp

Citrus gall wasp (CGW, *Bruchophagus fellis*) is a tiny black insect that is native to Australia. Its natural host is the Australian finger lime but CGW has become a major pest of commercial citrus growing and in the home garden situation throughout Australia. The main source of infection is thought to be from the transport of infected nursery stock into commercial growing areas and retail nurseries.

In September–December each year, the female wasp lays eggs in the new green shoots of the spring growth flush over a 5–7 day period. After 2–3 weeks, the eggs hatch and the larvae burrow into this new growth and feed inside the stem over the following 9–10 months, before entering a short pupal stage. The tree reacts to this burrowing by forming characteristic woody growths, or galls, over the tunnels. New galls become visible from around April onwards. Galls can weaken trees, reduce fruit production, and cause branch dieback.

In the following spring, coinciding with the spring growth flush, pupae hatch and adult wasps emerge. Adults live for 3–14 days and, within a few days, they mate and female wasps lay up to 100 eggs, completing the life cycle. As a general guide, adults can emerge in Queensland from September onwards, while in southern Australia emergence occurs a little later, around October. Emergence can occur over an 8–10 week period. Adult CGW do not fly very far from their emergence site, mainly laying eggs in the tree from which they have emerged. However, wasps can spread over considerable distances by wind or by the transportation of cuttings or nursery stock.

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A Citrus Gall Wasp Management Program

Control of CGW requires an integrated management approach that employs a number of different control techniques including:

- monitoring trees for new galls from around June onwards
- pruning out galled shoots in spring, just prior to the expected emergence timing
- using Fruition Garden Citrus Gall Wasp Traps to monitor wasp emergence in the spring
- applying Surround WP Crop Protectant that forms a barrier film which acts as a repellent for CGW.

Any pruned shoots should be mulched, buried deeper than 1 metre, or burned to avoid spreading the infestation. Neighbouring properties should be encouraged to monitor for pest presence and control any infestations they may have to help reduce spread of the pest. The best time to target the insect directly is as the wasp emerges, through egg laying and the initial hatching of the larvae. It is exceedingly difficult to control once in the gall. To be able to determine when emergence occurs with some accuracy is important in being able to manage this pest.

Figure 3. CGW on a Fruition Garden Citrus Gall Wasp Trap

Monitoring Citrus Gall Wasp using the Fruition Garden Citrus Gall Wasp Trap and Lure

Originally developed for the home garden market, Fruition Garden Citrus Gall Wasp Traps are specifically designed to attract and trap CGW using a unique combination of trap colour and shape, and a novel, patented blend of attractant lures. The patented attractant lures in Fruition Garden Citrus Gall Wasp Traps were developed by researchers at the University of Adelaide, Citrus SA and by AgNova Technologies Pty Ltd. Fruition Garden Citrus Gall Wasp Traps have been tested under Australian conditions and compared to the commonly used CGW traps available in most hardware stores.

Fruition Garden Citrus Gall Wasp Traps can be used to monitor for wasp emergence in the spring. CGW emergence is based on a measure of day degrees, generally from June 1st. In the northern citrus areas, emergence will occur earlier than in the southern areas, but it can vary each year. A tool to accurately indicate emergence is a valuable resource in the management of CGW. The patented lure system in Fruition Garden Citrus Gall Wasp Traps is designed to attract adult CGW to the trap, as seen in Figure 3. The sticky surface can trap the CGW for periods up to 6 weeks. The traps have been shown to capture significantly more CGW than commonly available traps because of the colour and shape of the trap and the unique lure, removing the adult wasps before they have the opportunity to mate and lay eggs. Other traps on the market rely only on the colour of the trap to attract CGW and do not contain effective lures for this species of insect.

Table 1 shows the mean number of adult CGW caught over time on Fruition Garden Citrus Gall Wasp Traps with lure or without lure, compared to those caught in a competitor home garden trap/lure system, the Go Natural* Insectrap. The data demonstrate that the colour, shape and size of the Fruition Garden Citrus Gall Wasp Trap alone, without lure, is six times more effective at capturing adult CGW (total number) than the Go Natural Insectrap. The addition of the patented blend of attractant lures increases the efficacy of the Fruition Garden Citrus Gall Wasp Trap, making it about 20 times more effective than the Go Natural Insectrap at trapping CGW adults.

Table 1. Mean number of adult CGW caught over time on Fruition Garden Citrus Gall Wasp Traps with or without lure, compared to a competitor home garden CGW trap/lure.

TRAP TYPE	NUMBER OF ADULT CGW						
	DAYS AFTER FIRST WASP EMERGENCE						
	1	3	5	12	25	39	TOTAL
Fruition Garden Citrus Gall Wasp Trap with lure	10	16	0	126	220	52	424
Fruition Garden Citrus Gall Wasp Trap without lure	10	10	12	28	34	34	132
Go Natural Insectrap	2	0	0	3	9	9	22

The combination of all the Fruition Garden Citrus Gall Wasp Trap features provides a good method for determining when the CGW has emerged and, due to the longevity of the sticky surface, can show the emergence pattern for approximately 6 weeks. This informs growers when to begin control measures targeting this emergence and egg lay, hence enabling more effective management of CGW.

Use of the Fruition Garden Citrus Gall Wasp Trap

Traps should be deployed before adults begin to emerge from galls. In Queensland, this can be around mid-late September and in southern states, around mid-October. Traps do not have to be placed into every tree but rather, in those trees that represent particular areas of the orchard. Areas to target include those where galls are present and areas where there are high levels of new growth. Following the assembly instructions, position the Fruition Garden Citrus Gall Wasp Trap on a branch just inside the canopy of the tree.

Monitor each trap once per day and record when emergence occurs, as well as any peak periods of emergence activity. Emerged wasps will then be laying eggs in 2–3 days, with the eggs hatching in 7 days. Knowing the time for these activities allows for more prescriptive CGW control measures to be employed.

Managing Citrus Gall Wasp with Surround

Along with the development of the Fruition Garden Citrus Gall Wasp Trap, AgNova in conjunction with TKI, HIA and NSW DPI, have developed and registered the use of Surround WP Crop Protectant as an effective management tool for CGW. Surround contains calcined kaolin that forms a barrier film, which acts as a repellent for CGW adults. This calcined kaolin, the approved active ingredient of Surround, has been through two years of rigorous review by the APVMA and is the only registered kaolin in Australia. Surround repels CGW adults at the crucial point of their life cycle – when they are about to lay eggs into the new green shoots of the spring growth flush.

When applied to the branches of citrus trees, Surround provides an unattractive surface for the CGW adults to lay eggs. The coating confuses the wasps by camouflaging the crop and making the host less desirable to oviposition and feeding. The Surround particles stick to adult CGW landing on the crop, coating them and causing them to become agitated and stimulated to move onto more attractive plants. The particles stick to the wasp's wings, legs and body, causing them to preen excessively, expending energy to remove the particles rather than lay eggs.

Trials with two applications of Surround 11 days apart, timed to coincide with CGW egg lay, provided a significant reduction in the ensuing year's gall weight, with a 96% reduction in galls the year after application (Figure 4). The number of galls was also significantly reduced.

Surround, being an inert material, provides a chemical-free tool to manage CGW, and also has the better known benefit of sunburn protection for the developing fruit. In addition, Surround assists in understanding spray coverage as the spray pattern is highly visible, enabling accurate calibration of spray equipment.

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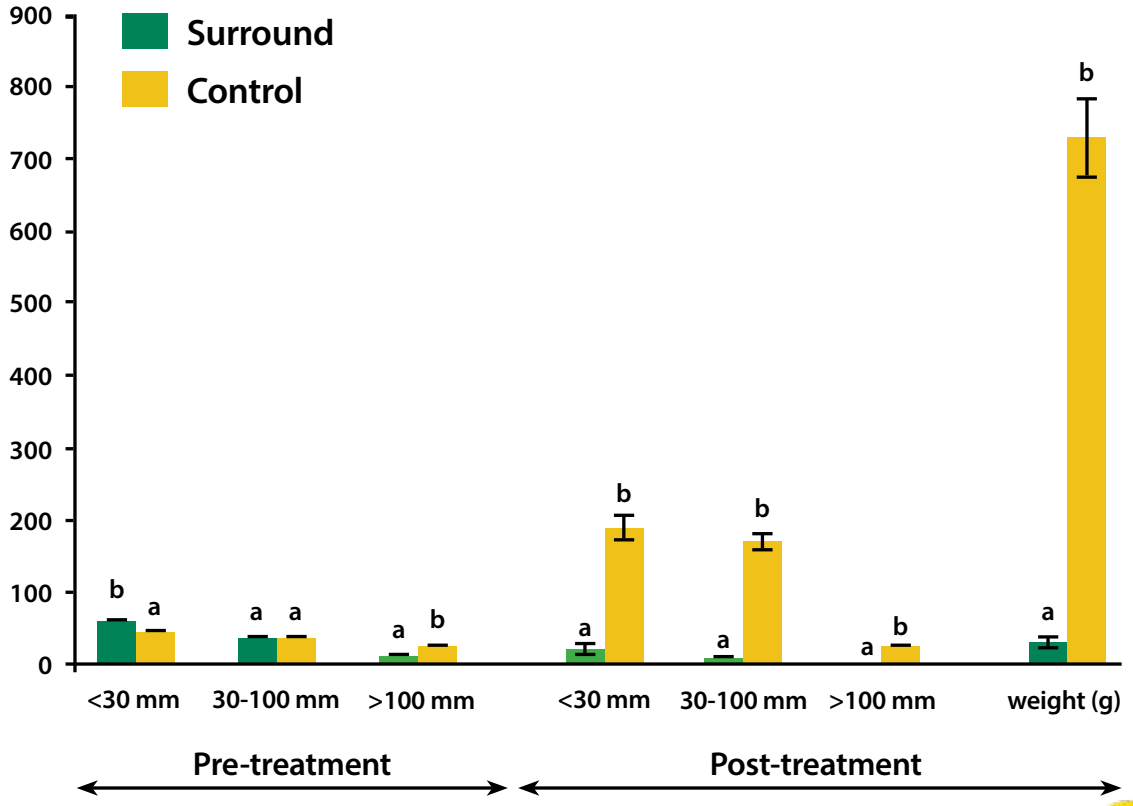

Figure 4. Gall incidence and weight in Surround-treated and untreated trees, Buronga, NSW.

Conclusion

Management of CGW requires an integrated approach including timely monitoring of CGW emergence via Fruition Garden Citrus Gall Wasp Traps and the strategic application of Surround to repel CGW adults, deterring egg lay.

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