

Ground Pearl Management in Turf



Ground Pearl Global Distribution

Table 1. Summary of ground pearl species that significantly impact agricultural production
From Ben-Dov (2005) and Morales *et al.* (2016)

Species	Distribution	Host families impacted	Notes
<i>Dimargarodes meridionalis</i>	USA	Poaceae, Vitaceae	Serious pest of lawns, golf courses and turf farms in Arizona and California. Infests grape vineyards in California
→ <i>Eumargarodes laingi</i>	Australia, USA	Poaceae	Serious pest of sugarcane and turf
<i>Eurhizococcus brasiliensis</i>	Brazil	Compositae, Cruciferae, Cucurbitaceae, Euphorbiaceae, Fabaceae, Juglandaceae, Labiatae, Malvaceae, Myrtaceae, Onagraceae, Oxalidaceae, Phytolaccaceae, Portulacaceae, Punicaceae, Rosaceae, Rubiaceae, Salicaceae, Umbelliferae, Vitaceae	Recorded pest of lucerne
<i>Margarodes capensis</i>	South Africa	Vitaceae	Pest of grapevine
<i>Margarodes prieskaensis</i>	South Africa	Vitaceae	Pest of grapevine
<i>Margarodes salisburyensis</i>	Zimbabwe	Poaceae	Reported pest of maize, sugarcane and pasture grass
<i>Margarodes vitis</i>	Argentina, Brazil, Chile, Uruguay, Paraguay and Venezuela	Cactaceae, Malvaceae, Vitaceae	Pest of grapevine
<i>Neomargarodes niger</i>	China, India, Pakistan	Fabaceae, Poaceae	Reported to damage groundnuts in China
<i>Porphyrophora tritici</i>	Armenia, Turkey, Syria and Iran	Poaceae	Pest of wheat and barley

Ground Pearl Species present in Australia

The four species recorded in Australia are as follows:

- **Pink ground pearl (*Eumargarodes laingi*)**
- **White ground pearl (*Margarodes australis*)**
- **Brown ground pearl (*Margarodes williamsi*)**
- **Yellow ground pearl (*Margarodes* sp. nr. *sinensis*)**

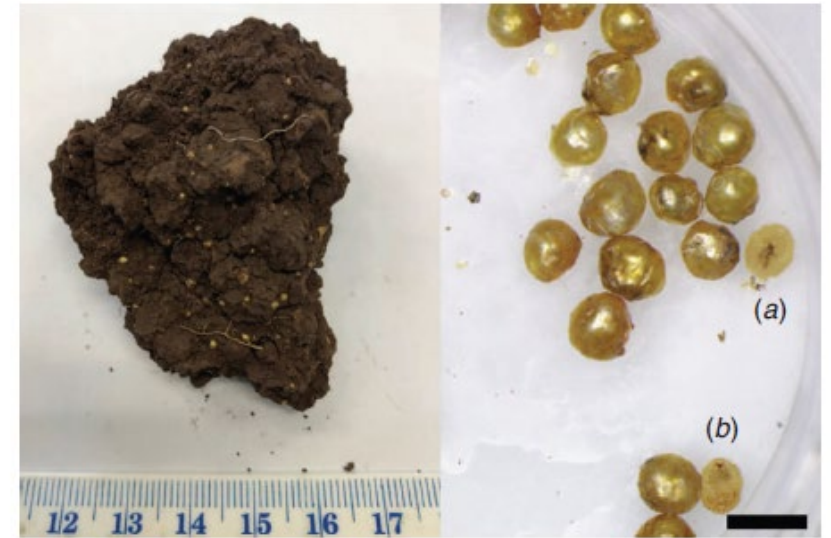


Fig. 1. Cysts of the white ground pearl (*Margarodes australis*): left, in soil (photo courtesy of S. Buck, Queensland DAF); and right, on a Petri dish (scale bar represents 1 mm). On the Petri dish, *M. australis* adult can be seen in dorsal ('a') and ventral ('b') view.



Lifecycle

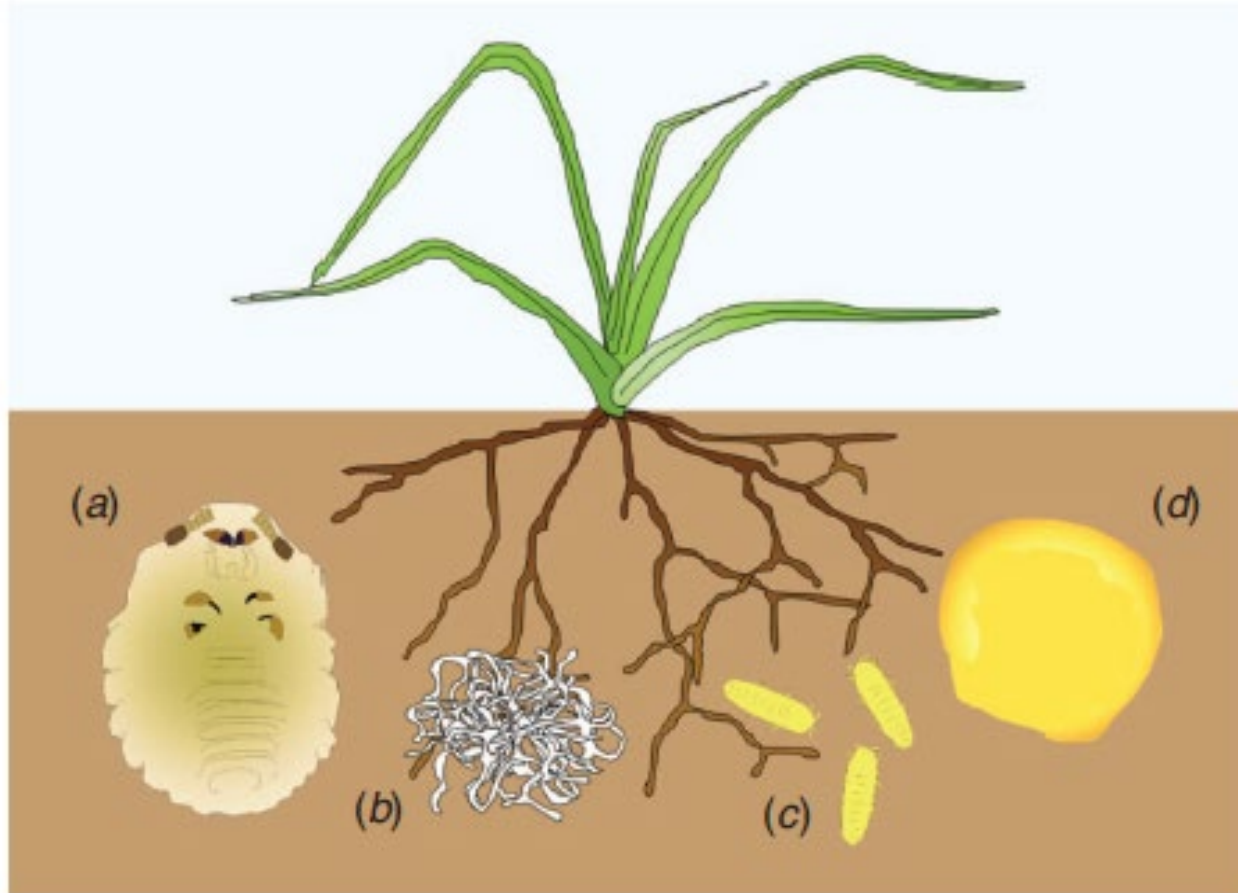


Fig. 3. Lifecycle of the white ground pearl, *Margarodes australis*: A, Mobile adult female; B, ovisac; C, crawling first instar nymph stage; D, second instar, sessile cyst.

Pink Ground Pearls have a 1 Year Lifecycle.
White Ground Pearls Lifecycle can extend for several years.

After hatching, ground pearls develop through two nymphal life stages before maturing into an adult

Extended period of time spent in the second-instar nymph.

In Australia, ground pearl adults emerge from cysts over an extended period from September to February, with the main emergence period November–December (Hitchcock 1965; Allsopp and McGill 1997; Samson and Harris 1998).

Optimal temperature for emergence of adults of some species is $\sim 25^{\circ}\text{C}$

Female then lay eggs without the need for fertilisation.

Ground Pearls Facts

- Ground pearls are a true bug (order Hemiptera) and, along with scale insects, belong to the superfamily Coccoidea.
- Most damaging to turf when they are in their cyst stage. The cysts are shiny spherical bodies typically less than 2 mm in diameter.
- The cysts represent the most encountered life stage because the adult and crawling nymphal stages are short-lived.
- The cyst comprises the liquid excreta produced by secreted waxes from internal glands – called the Test.
- Observations on the physical properties of the cyst suggest that its waxy component is highly saturated and has a very high melting point.
- Their feeding tube may be several times as long as the nymph itself and can be withdrawn inside the cyst when the nymph is not feeding.
- In Australia, ground pearls are mainly a pest of turf grass (Beehag *et al.* 2016) and sugarcane. White ground pearls (*Margarodes australis*) have recently been found in multiple unthrifty or dead pasture sites throughout southern and central Queensland (Thomson 2019).





Scarlet Trio Advanced

Insecticide



A Brief Introduction



Formulated in Australia



SPECIALTY PRODUCTS



Scarlet Trio Advanced

Insecticide

Product Overview



- ProForce Scarlet Trio Advanced is a unique insecticide formulation containing 116 g/L Clothianidin, 83 g/L Clofentezine and 13 g/L Abamectin.
- Scarlet Trio Advanced Insecticide is registered for the broad-spectrum control of Billbug, African Black Beetle, Argentinian Scarab, Argentine Stem Weevil, Couch Fly, Couch Mite, Ground Pearl and Mole Cricket in all recreational turf management situations.

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ProForce Scarlet Trio Advanced Insecticide – Use Rates

SITUATION	PEST	RATE	CRITICAL COMMENTS
Turf (Including Golf Courses, Sportsfields, and other sport and recreational turf areas)	Billbug (La Plata Weevil) (<i>Sphenophorus brunnipennis</i>)	3 L/ha	Monitor adult activity through late spring and early summer. Spray when numbers peak or when small larvae (4 mm) are found in the thatch or surface soil typically around late November to early December. Early application is essential to minimise damage to turf due to feeding. Ensure product placement as close to soil surface as possible. Preferably spray onto wet or dewy turf. Irrigate with at least 3 mm of water commencing within 1 hour of application. DO NOT irrigate to the point of run-off.
	Argentine Stem Weevil (<i>Listronotus bonariensis</i>), Argentinian Scarab (<i>Cyclocephala signaticollis</i>), Mole Cricket (<i>Gryllotalpa</i> spp.)		Monitor adult activity through spring and early summer. Spray when peak numbers (preventatively) or when first visual symptoms are observed (curatively) typically around late September to January. Early application is essential to minimise damage to turf due to feeding. Irrigate with at least 3 mm of water commencing within 1 hour of application. DO NOT irrigate to the point of run-off.
	African Black Beetle (<i>Heteronychus arator</i>)		Apply at peak egg hatch (African Black Beetle – late September through to mid-November), or when small larvae are present. Ensure product placement as close to soil surface as possible. Preferably spray onto wet or dewy turf. Irrigate with at least 3 mm water commencing within 1 hour of application. DO NOT irrigate to the point of run-off.
	Ground Pearl (<i>Margoroides</i> spp.)		Apply when adults or crawlers are detected generally from early spring to the end of summer. Apply in 400-800 L/ha. Irrigate with at least 3 mm of water commencing within 1 hour of application. DO NOT irrigate to the point of run-off.
	Couch Mite (<i>Aceria cynodoniensis</i>), Couch Fly (<i>Delia urbana</i>)		Apply product in an early curative situation (after first symptoms are apparent). Apply in 400-800 L of water per hectare. Best results are achieved if applied as populations begin to build rather than at the peak of population growth.

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Do not allow entry by the public into treated areas until the spray has dried.

Avoid spraying while bees are actively foraging. Avoid spray drift to flowering weeds or flowering crops in the vicinity of the treatment area.

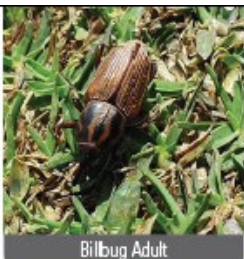
Avoid applying more than 2 sprays per season in turf.

Spray droplets used should be no smaller than a COARSE spray droplet size category.

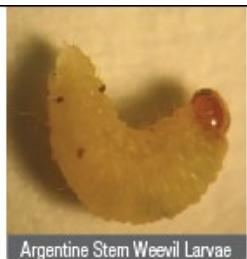
Mandatory downwind buffer zones –
Natural Aquatic Areas: 10m, Pollinator
Areas: 110m.



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Billbug Adult



Argentine Stem Weevil Larvae



Mole Cricket



African Black Beetle Larvae



Ground Pearl



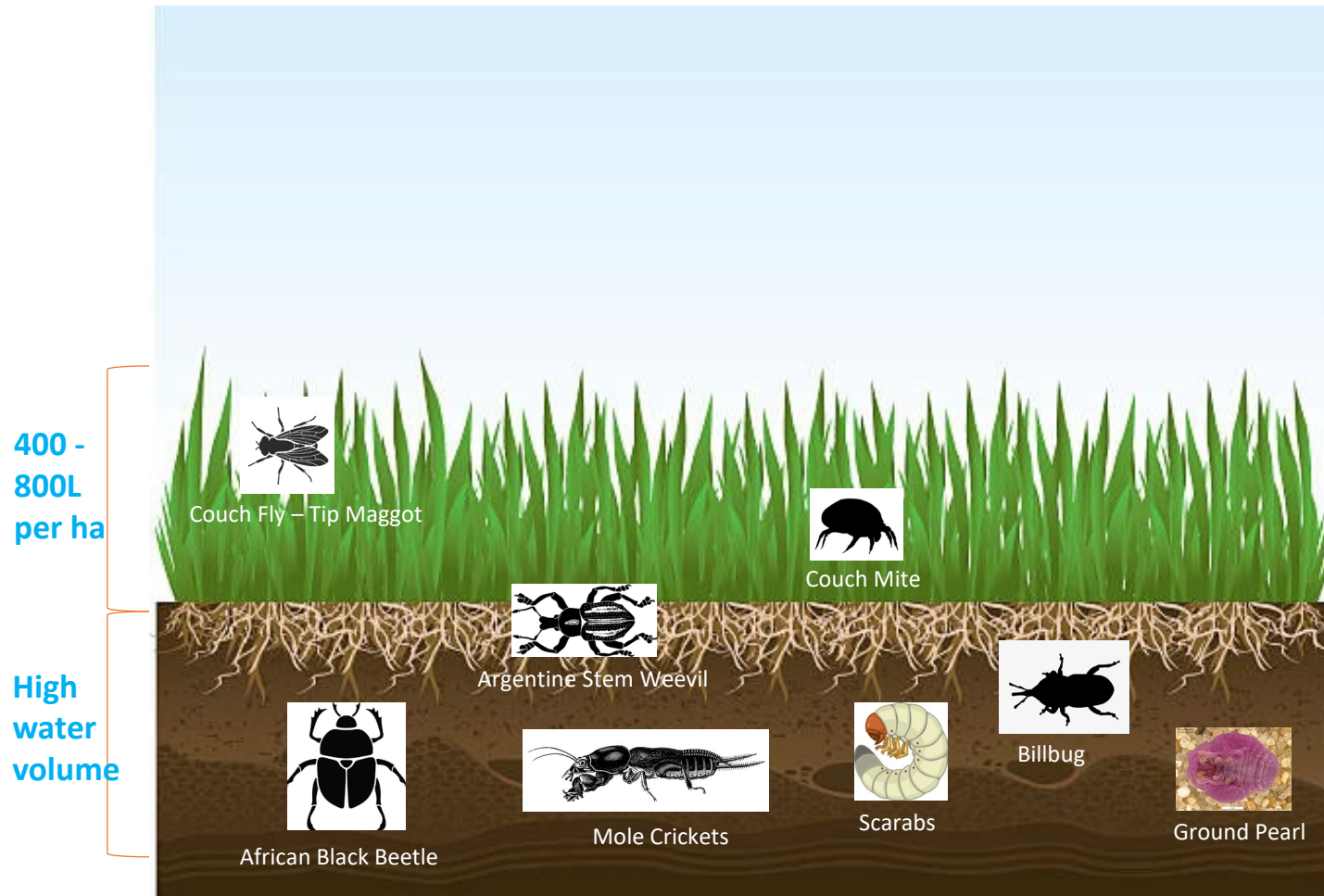
Couch Fly Adult

ProForce Scarlet Trio Advanced Insecticide



Product Placement to Maximise Performance

- **Foliar targeted applications:** (Mites, Couch Fly): Apply in 400-800L of water per hectare. Use of an acidifying & spreader surfactant (eg. Manta Ray) will maximise tank stability and improve coverage. Soil borne insects won't be controlled if the product is used as a foliar application.
- **Soil Targeted applications:** (Ground Pearl, African Black Beetle, Argentinian Scarab, Billbug, Argentinian Stem Weevil, Mole Cricket): Apply in a water volume >400L per hectare and irrigate with at least 3 mm of water commencing within 1 hour of application. Foliage based insects won't be controlled when the product is washed into the soil. Use of a soil surfactant (eg. HydroForce) will assist in maximising soil movement and coverage of the insecticide.
- **General Protection Application:** Apply as a foliar (400-800L/ha) and then irrigate in after 8 – 12 hours.





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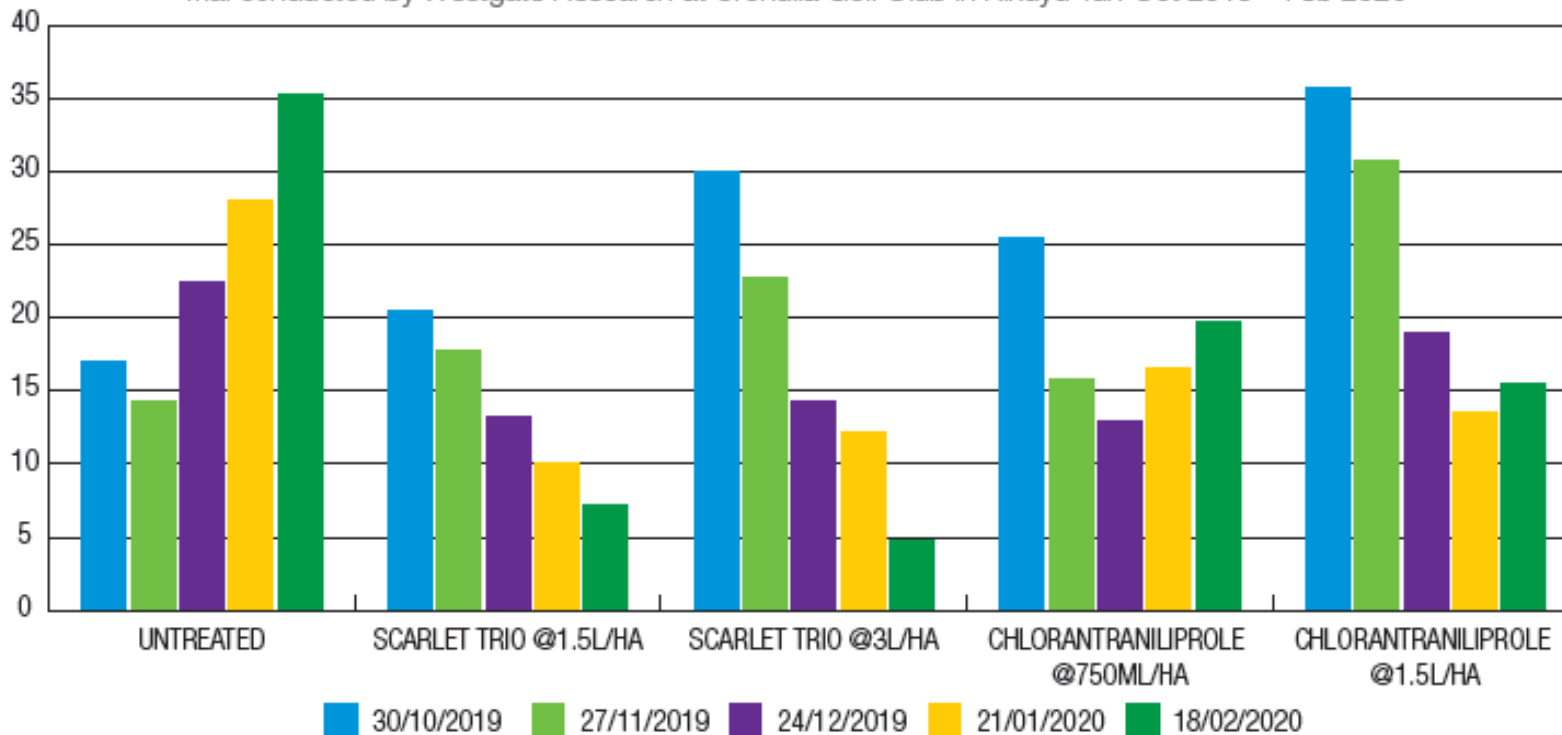
Insecticide

Ground Pearl



ProForce Scarlet Trio Advanced Insecticide – Field Research Performance

Ground Pearl Adult Presence following treatment with Scarlet Trio Insecticide.
Trial conducted by Westgate Research at Cronulla Golf Club in Kikuyu Turf Oct 2019 – Feb 2020



Field Trial Conducted by Independent Field Trial Contractor – Westgate Labs. Trial was applied as mid-season applications on the 30th of October 2019. Repeat applications of ProForce Scarlet Trio Insecticide applications were applied at monthly intervals. Trial Location: Cronulla Golf Club.

Application Notes

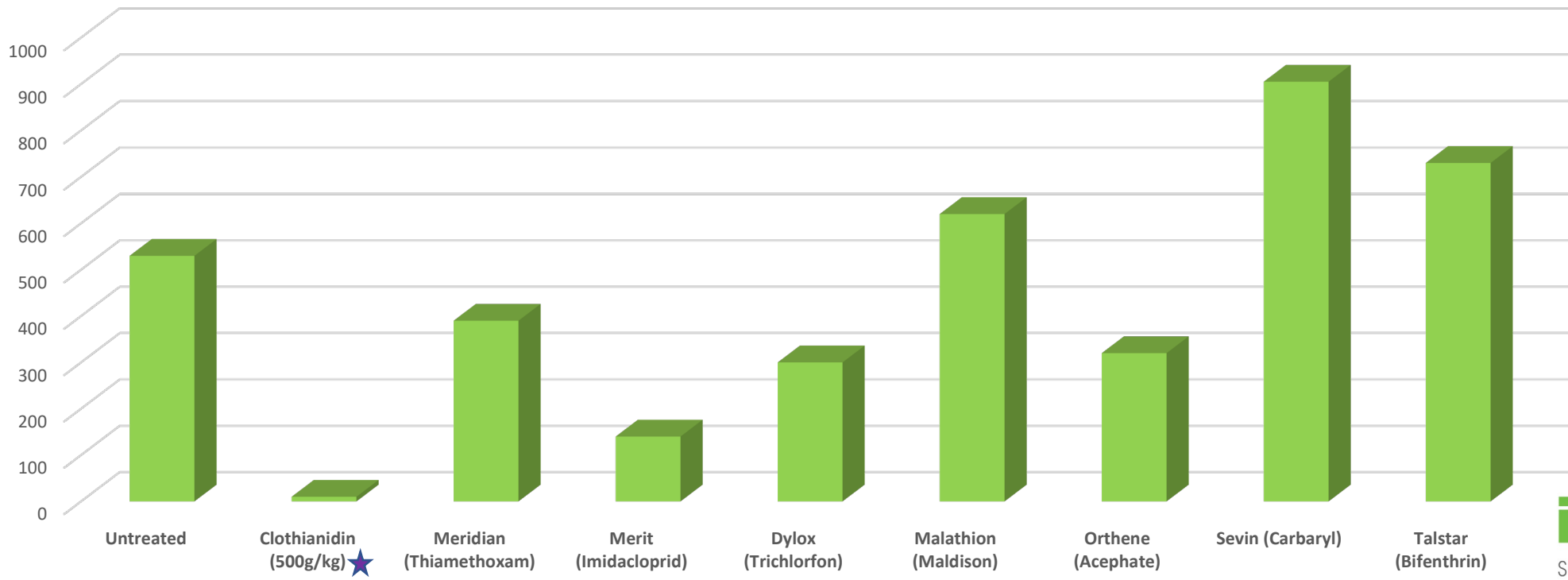
- Best control is achieved when insecticides are aimed at earlier nymphal stages (Spring).
- Only 2 applications of Scarlet Trio can be used during each Season (e.g. 2 in Spring, 2 in Summer, 2 in Autumn). Need to alternate with Meridian & other insecticides during season to maintain population.
- Best results are achieved up to 9 months following the application programme.
- Conflicting Data on use of horticultural Oil & Soil surfactant addition. Some trials have shown that this enhances control.



Average number of Ground Pearl Live Cysts / 16cm³. 9 Months after treatment (without surfactant) Study: 2008 USA



Average number of Live Ground Pearl Cysts / 16cm³.
Assessments were undertaken 9 Months Following Treatment



★
Clothianidin is
a key Ground
pearl active in
Scarlet Trio



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Rating at 3MAT in trial were not significant.
At 9 MAT - Meridian performed better with surfactant addition.
Clothianidin performed better without surfactant in trial.

July 2018 | Juang Horng "JC" Chong, Ph.D. Golf
Course Management. Ground Pearls in Turf

Product No.	Year applied	Name	Active ingredient	Formulation	Class group	Application rate	
						Product	Active ingredient
1	2017	Acelepryn	chlorantraniliprole	1.67 pounds (L)	28	20 ounces (L)/acre	0.26 pound/acre 0.29 kilogram/hectare
2	2017	Arena	clothianidin	50% WDG	4-A	12.8 ounces WDG)/acre	0.4 pound/acre 0.49 kilogram/hectare
4	2017 & 2018	Zylam	dinotefuran	0.89 pound (L)	4-A	4.9 pints (L)/acre	0.54 pound/acre 0.605 kilogram/hectare
7	2017 & 2018	Divanem	abamectin	0.7 pound (L)	6	12.2 ounces (L)/acre	0.067 pound/acre 0.075 kilogram/hectare
8	2017 & 2018	Ference/ Mainspring	cyantraniliprole	1.67 pound (L)	28	20 ounces (L)/acre	0.261 pound/acre 0.292 kilogram/hectare
11	2017	Nimitz (nematicide)	fluensulfone	1.5% (G)	—	80 pounds (G)/acre	1.2 pounds/acre 1.344 kilograms/hectare

The assigned product number, name, active ingredient, formulation, class group, application rate for the product and active ingredient were applied in 2017. Product numbers listed appear in subsequent tables, which provide data on treatment sequences. Products 4 (Zylam), 7 (Divanem) and 8 (Ference) were, as such, tested again in 2018, both as a “second-year” repeat application series over the same plots treated in 2017 and were applied in 2018 to formerly nontreated plots.

This data shows that, at least under extreme desert heat conditions, ground pearls can be dramatically reduced in numbers on bermudagrass by performing closely timed applications of three systemic insecticide products, each applied once at the full label rate on non-encysted, egg-laying females.

The chemicals worked best when applied over two seasons. Thus, applying select insecticides in rotations while maintaining full label compliance for all products used appears to be an effective chemical treatment for turf with ground pearl infestations under desert conditions.

[Control of ground pearls using application sequences of different insecticides - Golfdom : Golfdom](#)

Control of ground pearls using application sequences of different insecticides

By David Kopec, Ph.D. | March 18, 2021



Figure 1 Damage caused by ground pearls on a bermudagrass putting green.

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TS No.	Product application order for each treatment sequence	Application order and dates									No. pearls/plot
		1st	2nd	3rd	4th	5th	6th	1st	2nd	3rd	
		May 24	June 2	June 6	June 9	June 12	June 15	May 21	May 25	May 29	
4	2018: Zylam/Avid/Ference	—	—	—	—	—	—	4	7	8	5.1
7	2018: Avid/Ference/Zylam	—	—	—	—	—	—	7	8	4	39
8	2018: Ference/Zylam /Avid	—	—	—	—	—	—	8	4	7	6
4 +	2017: Zylam/Avid/Ference/Nimitz/Acelepryn/Arena	4	7	8	11	1	2	—	—	—	1.6
4	2018: Zylam/Avid/Ference	—	—	—	—	—	—	4	7	8	
7 +	2017: Avid/Ference/Nimitz/Acelepryn/Arena/Zylam	7	8	11	1	2	4	—	—	—	0.5
7	2018: Avid/Ference/Zylam	—	—	—	—	—	—	7	8	4	
8 +	2017: Ference/Nimitz/Acelepryn/Arena/Zylam/Avid	8	11	1	2	4	7	—	—	—	1
8	2018: Ference/Zylam/Avid	—	—	—	—	—	—	8	4	7	
Mean of treated plots											8.7
Untreated controls											167
LSD value											3.9

The 2018 mean number of encysted pearl scales per plot for six treatment sequences (TS) on a highly infested bermudagrass green in Yuma, Ariz. Three TS follow effective treatments from 2017 on the same plots, and three repeat the best treatments on newly infested areas. Note: “—” no application on that date.

Arena = Clothianidin, Avid = Abamectin



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