PROJECT SUMMARY

Tea tree - pesticide efficacy and residue data

The Australian tea tree *(Melaleuca alternifolia)* oil industry is one of many new and emerging rural industries bringing opportunity, diversity and resilience to rural Australia. Originally a 1980s cottage industry, it now produces over 700 metric tonnes of pure Australian tea tree oil per annum with an estimated farm-gate value of $28 million in 2014, 85 to 90 per cent of which is exported to more than 20 countries worldwide.

Integrating pest and disease management into a whole-of-farm model where plant health is at the forefront is vital to ensure continued growth and expansion of the industry without dramatically increasing the use of pesticides and the risk of developing resistance to these.

This fact sheet summarises findings from RIRDC *project Integrated pest & disease management in the tea tree oil industry* to do with efficacy and residue data for a topical fungicide and foliar and ground-applied insecticides.

For more information on this research contact RIRDC (**www.rirdc.gov.au**) or the Australian Tea Tree Industry Association (**www.attia.org.au**).

Pesticide use in australian tea tree production

The Australian tea tree oil industry has an excellent track-record in the use and management of pesticides to deal with known pests. While it has an adequate array of permitted or registered pesticides to ensure integrated pest and disease management practices are feasible, some new threats have emerged that need to be assessed and suitable strategies to combat them developed.

New challenges to the tea tree industry come from exotic pests such as myrtle rust (*Puccinia psidii*), from endemic pests such as *Elsinoe* spp., the pitted apple beetle and other *Geloptera* species and from dieback in tea trees immediately post-harvest in far-north Queensland (charcoal rot caused by *Macrophomina phaseolina*). When either new challenges are identified or existing issues become economically damaging due to changing climatic conditions or resistance to the existing suite of pesticides, options for the industry need to be investigated.

Pesticide efficacy and residue data

Control of *Elsinoe* spp. by topical fungicide azoxystrobin

Little is known of the aetiology of the pest fungus *Elsinoe* spp. Which in recent years has caused significant damage and loss of production in some areas of New South Wales, principally in the coastal regions but also on some inland plantations. A new pathotype, *Elsinoe australis*, has been detected and which was reported in January 2012 to be causing black scab on jojoba in New South Wales and Queensland. This may be relevant to the increased severity and incidence of the pest in tea tree plantations recently.

A tea tree plant suffering from the fungus *Elsinoe* spp.

Experimental application of fungicides has identified two (Amistar ™ (active ingredient: azoxystrobin) and copper oxychloride) that exhibit good control of the pest if detected early and treated promptly.

A summary of the azoxystrobin data is shown in Table 1. Efficacy in controlling *Elsinoe* spp. was excellent and no residue was detected in tea tree oil after 47 and 71 days. Azoxystrobin can therefore be used for the management and control of fungal pests such as *Elsinoe* spp. With a withholding period not exceeding 47 days when these data are presented to the Australian Pesticide and Veterinary Medicines Authority (APVMA) in support of a renewed minor use permit (MUP). A full report from Agrifoods, including calibration, standards, sample preparation and results is available and will be provided to APVMA when an MUP is applied for in late 2015.

Table 1: Azoxystrobin data in tea tree oil

Date received	Agrifood Sample Number	Material	Description	Application date	Sampling date	Application rate	Trial period (days)	Azoxystrobin result (mg/kg)
01 June 2015	S2015-15001	Oil	Amistar – Martin Bros	14 Mar 2015	22 Mar 2015	0 mLs/ha	8	<0.010
01 June 2015	S2015-15002	Oil	Amistar – Martin Bros	14 Mar 2015	30 Apr 2015	400 mLs/ha	47	<0.010
01 June 2015	S2015-15003	Oil	Amistar – Martin Bros	14 Mar 2015	24 May 2015	400 mLs/ha	71	<0.010

Control of beetles by foliage and soil applied insecticide imidacloprid

The pitted apple beetle (*Geloptera porosa*) as well as other *Geloptera* spp. have become a significant pest of tea tree crops in the Port Macquarie area. Very little is known about the lifecycle of the pest. It is suspected that the larval stage of the beetle feeds on the roots of the tea tree stumps.

The pest was first noticed in high numbers in the 2010/11 season. The adult stage of the beetle attacks early coppice regrowth and can have a devastating effect on yields if left untreated (losses greater than 50 per cent). Where numbers are high, severe damage can occur within 24 hours of the pest first being noticed. This makes pest monitoring very difficult and successful control requires near-daily attention.

Current management of the pest has involved repeated applications of methomyl or betacyfluthrin to kill the pests as soon as they are sighted. This is expensive and the number of sprays required to control the pest appears to be increasing.

The African black beetle (*Heteronychus arator*) has been a long-term pest of tea tree plantations at the establishment phase. Losses of seedlings soon after planting have been as high as 30 per cent. Infilling these losses can greatly add to establishment costs and is not always effective. Late-planted infills can remain stunted and never contribute to yield. At present, control methods are crude and rely on the observation of damage through regular monitoring over the first few months until the seedlings are large enough to withstand attack. Pest management normally involves the application of a registered insecticide either as a spray or delivered as a soil drench using a water cart. The effectiveness of these methods has never really been determined. The only other option is the use of chlorpyrifos baiting outside the plantation area, however, this is unlikely to be effective once the pests are already established within the field.

Three trials of Confidor and Confidor Guard (active ingredient: imidacloprid), systemic foliage-applied and ground-applied insecticides, respectively, to control the beetles were carried out. The assessment, through a series of trials at varying rates and two methods of application, can confirm the withholding period for imidacloprid which, if determined to be less than 24 weeks, will allow the product to be safely used immediately post-harvest or shortly after budburst. The trials were:

The small brown beetle, or pitted apple beetle (*Geloptera* spp.)

- **soil application:** soil application (Confidor Guard) over recently harvested stumps at three rates to determine uptake and resulting residues in the leaf and oil. This investigated the efficacy of imidacloprid against both adults and larvae of *Geloptera* spp.
  To stop or reduce the level of attack and/or disrupt larval development in the soil
- **foliar application:** foliar application at three rates on regrowth that is affected by *Geloptera* spp.
  To determine efficacy of imidacloprid as a knockdown and the level of ongoing protection from further attack by the pests
- **pre-plant application:** pre-plant application to investigate the use of both soil and foliar imidacloprid to determine if effective protection can be established for both *Geloptera* spp. and *Heteronychus arator* during or immediately after tea tree seedlings are planted. Method of application would be as a soil drench applied with water injection during planting or delivered by water car soon after. Replicated trials using two different rates of application will test each formulation for efficacy against pests and determine residues by sampling of leaf material over time.

Aerial view of a tea tree plantation

Samples from these trials (leaf and tea tree oil) were collected, distilled where applicable, or frozen and sent to Agrifoods. After a suitable methodology and calibration curve were developed, samples were analysed to determine the level of residue in both leaf and oil to determine uptake and residue levels in tea tree oil over varying periods of time.

A summary of the imidacloprid data is shown in Table 2. Efficacy in the Dowsett treatments was neither proven nor disproven due the lack of Catto beetle pressure after application. Efficacy in the Donnelly treatments was inconclusive with some losses to black beetle in the high rate treatment but not in the lower rate. Loss level was similar to untreated area but levels across the whole paddock were sporadic.

Critically, all treatments produced a leaf residue at the time of sampling, however, this was not carried through the distillation process, indicating that a relatively short withholding period may be set by APVMA when these data are presented in support of a renewed MUP.

A full report from Agrifoods, including calibration, standards, sample preparation, QC management and results is available and will be provided to the APVMA when an MUP is applied for in late 2015.

Table 2: Imidacloprid data in leaf and tea tree oil

Date received	Agrifood Sample Number	Material	Description	Application rate	Application method	Water rate L/ha	Application date	Sampling date	Trial period	Imidacloprid result (mg/kg)
1-Jun-15	S2015-15049	Oil	Dowsett Confidor	500 mLs/ha	Soil drench to stumps post harvest	250	9-Sep-14	28-Apr-15	231	<0.010
1-Jun-15	S2015-15050	Oil	Dowsett Confidor	1000 mLs/ha	Soil drench to stumps post harvest	250	9-Sep-14	28-Apr-15	231	<0.010
1-Jun-15	S2015-15051	Oil	Donnelly Confidor	500 mLs/ha	Soil drench prior to planting	250	5-Sep-14	27-Apr-15	234	<0.010
1-Jun-15	S2015-15052	Oil	Donnelly Confidor	1000 mLs/ha	Soil drench prior to planting	250	5-Sep-14	27-Apr-15	234	<0.010
17-Jul-15	S2015-19157	Leaf	Dowsett Confidor	500 mLs/ha	Soil drench to stumps post harvest	250	9-Sep-14	18-Jun-15	282	<0.010
17-Jul-15	S2015-19158	Leaf	Dowsett Confidor	1000 mLs/ha	Soil drench to stumps post harvest	250	9-Sep-14	18-Jun-15	282	<0.010
17-Jul-15	S2015-19155	Leaf	Donnelly Confidor	500 mLs/ha	Soil drench prior to planting	250	5-Sep-14	18-Jun-15	286	0.012
17-Jul-15	S2015-19156	Leaf	Donnelly Confidor	1000 mLs/ha	Soil drench prior to planting	250	5-Sep-14	18-Jun-15	286	0.024
17-Jul-15	S2015-19165	Oil	Dowsett Confidor	500 mLs/ha	Soil drench to stumps post harvest	250	9-Sep-14	18-Jun-15	282	<0.010
21-Jul-15	S2015-19324	Oil	Dowsett Confidor	1000 mLs/ha	Soil drench to stumps post harvest	250	9-Sep-14	18-Jun-15	282	<0.010
17-Jul-15	S2015-19163	Oil	Donnelly Confidor	500 mLs/ha	Soil drench prior to planting	250	5-Sep-14	18-Jun-15	286	<0.010
17-Jul-15	S2015-19164	Oil	Donnelly Confidor	1000 mLs/ha	Soil drench prior to planting	250	5-Sep-14	18-Jun-15	286	<0.010
17-Jul-15	S2015-19159	Leaf	Donnelly Confidor Control	0 mLs/ha	Foliar spray	250	13-May-15	27-May-15	14	<0.010
17-Jul-15	S2015-19160	Leaf	Donnelly Confidor Control	200 mLs/ha	Foliar spray	250	13-May-15	27-May-15	14	0.50
17-Jul-15	S2015-19161	Leaf	Donnelly Confidor Control	300 mLs/ha	Foliar spray	250	13-May-15	27-May-15	14	0.58
17-Jul-15	S2015-19162	Leaf	Donnelly Confidor Control	400 mLs/ha	Foliar spray	250	13-May-15	27-May-15	14	0.61
17-Jul-15	S2015-19166	Oil	Dowsett Confidor Control	0 mLs/ha	Foliar spray	250	13-May-15	27-May-15	14	<0.010
17-Jul-15	S2015-19167	Oil	Donnelly Confidor	200 mLs/ha	Foliar spray	250	13-May-15	27-May-15	14	<0.010
17-Jul-15	S2015-19168	Oil	Donnelly Confidor	300 mLs/ha	Foliar spray	250	13-May-15	27-May-15	14	<0.010
17-Jul-15	S2015-19169	Oil	Donnelly Confidor	400 mLs/ha	Foliar spray	250	13-May-15	27-May-15	14	<0.010

Control of psyllids

There has been a significant impact of psyllids (*Trioza* spp.) or jumping plant lice on the growth and establishment of tea tree seedlings. Over recent seasons the time to first harvest after establishment has been longer than in previous seasons. Psyllid attack has been a significant factor and, of the insect pests of tea tree, the most difficult to control. The best chemical control currently available is beta-cyfluthrin; however, dimethoate and methomyl also give reasonable control. The limitations of these options are their withholding periods and the fact that they do not fit well in integrated pest management (IPM) programs due to their impact on beneficial species.

A preliminary screen was aimed at identifying newer chemistry that improves psyllid control, has low residue risk, and fits within a more effective IPM program. Active ingredients were applied to tea tree leaf that was heavily infected with psyllids. Branchlets were collected from the Casino area on 30 May 2014 and dip tested at Wollongbar Agricultural Institute by Craig Maddox from New South Wales Department of Primary Industries. The actives were tested at two rates (high and low commercial rates) and efficacy was assessed at 3 and 7 days after dipping.

The different active ingredients tested were: beta-cyfluthrin, imidacloprid, cyantraniliprole, flupyradifurone, sulfoxaflor, tolfenpyrad, chlorfenapyr, pyriproxyfen, and spinetoram. The actives that proved effective in the test were: beta-cyfluthrin, cyantraniliprole, flupyradifurone, sulfoxaflor, tolfenpyrad, chlorfenapyr, and spinetoram. There were some limitations with the method but the study gives a good starting point for further work.

More information

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