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Rural Industries Research and Development Corporation

RIRDC Completed Projects in 2007 - 2008 and Research in Progress as at June 2008

RIRDC Publication No. 08/069

TEA TREE OIL

RIRDC Innovation for rural Australia

Australian Government

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RIRDC R&D Projects completed in 2007-08 and Research in Progress as at June 2008 - Tea Tree Oil
Publication No 08/069

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In submitting this report, the researcher has agreed to RIRDC publishing this material in its edited form.

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Foreword

RIRDC produces Research in Progress summaries of continuing projects and those completed during 2007-2008. Our intention is to:

- give stakeholders early access to the results of ongoing and completed work to inform their decisions, and
- to inform researchers of results to shape research directions.

The complete report on all programs is on our website at http://www.rirdc.gov.au

This program aims to support the continued development of an environmentally sustainable and profitable Australian tea tree oil industry that has established international leadership in marketing, value-adding, product reliability and production.

There are four program objectives. These are:

- Enhancing production systems to maintain the competitiveness of Australian growers
- Identifying regulatory regimes and market barriers, and enhancing the ability of industry to meet safety standards
- Demonstrating proof of concept/efficacy for innovative applications of tea tree oil
- Fostering communication that increases understanding and thereby encourages greater use of tea tree oil.

This report is an addition to RIRDC's diverse range of over 1800 research publications, which are available for viewing, downloading or purchasing online through our website: www.rirdc.gov.au. Purchases can also be made by phoning 1300 634 313.

Peter O'Brien
Managing Director
Rural Industries Research and Development Corporation

Contents

Completed Projects - TTO- Demonstrating proof of concept/efficacy for innovative applications of tea tree oil

Project Title	**Pilot study of tea tree oil in the decolonisation of MRSA positive wounds**
RIRDC Project No.:	PRJ-000822
Start Date:	1/9/2005
Finish Date:	30/5/2008
Researcher:	Christine Carson
Organisation:	University of Western Australia
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Objectives	To determine if tea tree oil (TTO) can eliminate methicillin-resistant *Staphylococcus aureus* (MRSA) from colonized wounds. To determine if TTO is a beneficial treatment for wounds.
Background	Scientific data on tea tree oil's antibacterial and anti-inflammatory properties are widely available and lend support to its use as a wound care product. In contrast, data on the specific benefits of tea tree oil in wound care are very limited despite its widespread use for this purpose since the 1920s. This study sought to address this knowledge void by determining the effect of tea tree oil in two important areas: (i) its ability to eliminate MRSA from wounds and (ii) its influence on wound healing.
Research	An uncontrolled, non-randomised, open pilot study design was used to evaluate the efficacy of tea tree oil as means of decolonising MRSA from wounds and to gain preliminary data on the effects of tea tree oil on wound healing. Participants with acute or chronic wounds suspected of being colonised but not infected with MRSA were recruited. Of these, 14 were subsequently confirmed to have wounds colonised with MRSA. Tea tree oil was applied in the form of a wound irrigant during the wound cleansing steps at each dressing change. Wound size and MRSA status were determined at enrolment and during weeks 4 and 12.
Outcomes	Two key findings arose from this study. Firstly, when applied during the wound cleansing step as a wound irrigant, 3.3% tea tree oil was unable to decolonise methicillin-resistant *Staphylococcus aureus* from wounds. Secondly, wounds to which this tea tree oil irrigant was applied began to heal; most wounds (8/14) were smaller after the tea tree oil product was used and this included chronic wounds. This is despite 12 participants being withdrawn from the study prematurely, mostly due to the commencement of antibiotics. An additional finding from this small study was that tea tree oil appeared safe to use and was well-tolerated on open wounds, including some large wounds. Furthermore, there were no irritant or allergic reactions to the tea tree oil product.
Implications	The application of tea tree oil as a wound irrigant did not eliminate MRSA from any wounds but may have promoted wound healing in more than half of the 14 confirmed MRSA positive participants. The failure of the tea tree oil irrigant to decolonise MRSA may have been due to the low concentration applied for too brief a period of time. The initiation of wound healing, particularly in chronic wounds is highly significant and deserves further investigation.
Publications	An abstract has been submitted for presentation at the 4th International Congress on Innovations in Nursing, to be held in Perth Western Australia, 27-29 May 2009. A journal manuscript is in preparation.

Completed Projects - TTO- Demonstrating proof of concept/efficacy for innovative applications of tea tree oil

Project Title	**Effects of tea tree oil on biofilm formation**
RIRDC Project No.:	PRJ-000451
Start Date:	30/7/2005
Finish Date:	28/2/2008
Researcher:	Kate Hammer
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Objectives	Investigate the effects of tea tree oil on the formation of biofilm by several different micro-organisms
Background	Biofilms occur wherever sufficient water, nutrients and microorganisms occur and can fix themselves to any available surface. Some settings where biofilms are problematic include food manufacturing equipment, external surfaces of marine vessels and fixings, sewage treatment plants, air-conditioning units and cooling towers, prosthetic devices used in human and animal health, medical equipment such as endoscopes and colonoscopes and dental irrigation units. There is a need for safe and effective biocides for biofilm prevention and destruction. There is also interest in natural compounds for this purpose. Tea tree oil has proven activity against free-living microorganisms but its activity against microorganisms within biofilm is unknown.
Research	The ability of tea tree oil to inhibit the formation of microbial biofilm, and its effects on existing biofilm were investigated. The Gram positive bacterium *Staphylococcus epidermidis*, the Gram negative bacteria *Pseudomonas aeruginosa, Stenotrophomonas maltophilia* and *Vibrio harveyi* and the yeast *Candida albicans* were investigated. Experiments were also conducted to investigate the mechanism(s) by which biofilm formation was inhibited.
Outcomes	Tea tree oil significantly inhibited the formation of biofilm by all test organisms. The concentrations that inhibited the formation of biofilm were similar to those required to inhibit the growth of free-living organisms, suggesting that inhibition of biofilm formation was a function of reduced growth. Further investigation of the mechanisms of biofilm inhibition confirmed that this was the case. Tea tree oil was also able to compromise the viability of biofilms formed in the absence of tea tree oil, at concentrations at and above growth inhibitory concentrations. Results showed that tea tree oil severely affected the viability of the organisms within the biofilm but had less of an effect on the overall structure or biomass remaining after treatment, as evidenced by crystal violet staining.
Implications	The results of this work suggests that tea tree oil may be useful as an active ingredient in anti-biofilm products. With appropriate product development, this may represent another potential market for tea tree oil. The wide spectrum of applications in industrial and medical situations renders this a massive opportunity to broaden markets for tea tree oil.
Publications	Carson CF, Hammer KA, Riley TV. Effects of tea tree (*Melaleuca alternifolia*) oil on biofilm formation by *Pseudomonas aeruginosa* and *Staphylococcus epidermidis*. (Oral presentation). In Program and abstracts of the Australian Society for Microbiology Annual Scientific Meeting and Exhibition, 2-6 July 2006, Gold Coast, Australia. Abstr. PP19.1

Completed Projects - TTO- Demonstrating proof of concept/efficacy for innovative applications of tea tree oil

Project Title	Anticancer activity of tea tree oil
RIRDC Project No.:	PRJ-000009
Start Date:	18/5/2007 8:00:00 AM
Finish Date:	30/6/2008 5:00:00 PM
Researcher:	Thomas Riley
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Objectives	1. To examine the in-vitro anticancer efficacy of TTO and its components against human cancer and normal cell lines by evaluating cytotoxicity, and induction of apoptosis and necrosis. Promising components found with in vitro testing will be further analysed. 2. In-vivo testing of TTO and its components using mouse mesothelioma and mouse melanoma systems. This will involve growth of subcutaneous tumours in mice which are treated by topical application and direct injection into the tumour. Systemic delivery of the agents by intra-peritoneal injection may also be investigated.
Background	Cancer is the second leading cause of death worldwide. Malignant mesothelioma and malignant melanoma represent cancers that have a poor prognosis and respond poorly to chemotherapy. Although more than 60% of anticancer agents currently in use are derived from natural resources, toxic side effects and resistance to these and other synthetic drugs necessitates the search for novel agents. Tea Tree Oil (TTO), the essential oil from the Australian native Melaleuca alternifolia has demonstrated a variety of beneficial efficacies including antimicrobial, antifungal, antiviral and anti-inflammatory. Amongst the activities listed above, anti-cancerous efficacy has also been identified. A single study demonstrated Terpinen-4-ol and TTO in vitro anticancer activity. Accordingly, further study of the potential anticancer activity of TTO and its major components is warranted. Currently, no investigation of TTO or terpinen-4-ol has been conducted in vivo studies and before in vitro data can be translated clinically, in vivo studies must be completed.
Research	The aims of this study were to examine the in vitro anticancer efficacy of TTO and its components against cancer and normal cell lines and to examine the in vivo efficacy of TTO as a potential antitumor agent using mouse mesothelioma and mouse melanoma systems.
Outcomes	Our data demonstrate that TTO has in vitro activity against tumour cells, specifically by significantly reducing viability of malignant mesothelioma and melanoma cells compared with normal cells This study has demonstrated that TTO and terpinen-4-ol induces their mechanism of action through necrosis a form of cell death often seen with cell injury by inhibiting the cells normal growth cycle. TTO reduces in vivo tumour growth in mice with subcutaneous malignant mesothelioma and melanoma tumour and induces tumour regression in the mesothelioma tumour mouse model.
Implications	Implications This study has elucidated some in vitro mechanisms of action of TTO and terpinen-4-ol against tumour cells and has demonstrated in vivo anti-tumour activity of TTO against murine subcutaneous tumours. These data have not previously been reported. Further studies must work towards a formulation of TTO which is both growth inhibitory and induces tumour regression that is well tolerated. The in vivo mechanisms of action need to be thoroughly investigated specifically examining possible direct and indirect effects of TTO.

Completed Projects - TTO- Demonstrating proof of concept/efficacy for innovative applications of tea tree oil

Project Title	Fabrication of Electronic Materials from the Australian Essential Oils
RIRDC Project No.:	PRJ-000795
Start Date:	1/7/2006
Finish Date:	30/4/2008
Researcher:	Mohan Jacob
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Objectives	The main objective of this project is to find a non-medical application for essential oils and hence encourage Australian farmers to produce more essential oils. The project aims to: 1. Fabricate high quality Plasma Polymerised thin films from Australian essential oils (limonene, á-pinene, Tea Tree, Lavender and Eucalyptus oils) 2. Study the electrical and optical properties of the polymer thin films and find suitable applications and iii)Test the polymer thin films as a protective/anticorrosive layer in devices.
Background	The total polymer industry around the world will be worth billions of dollars and employ millions of people. Most of the commercially available polymers are made out of chemicals and are not biodegradable, and are hazardous to the environment. Synthetic polymers are hazardous to the environment and could contain carcinogenic materials. Bio-based polymers will in the future lead towards a healthy and environmentally friendly life. This innovative research will have immediate impact on the economic and social background of Australian farmers by transforming the essential oil industry via development of novel applications for high value added products. During the last few years research funding agencies realised the relevance of organic semiconductors to replace the conventional semiconducting material – Silicon. This particular project is investigating the fabrication of polymer thin films, which will be of use to the Electronic Industry. This work was to fabricate polymer material from agricultural products for the implementation in electronic products. The project outcomes will benefit the Electronic Industry and Agricultural Industries.
Research	Several essential oils, such as Tea Tree Oil, Sandal Wood Oil, Eucalyptus Oil, Alpha-Pinene, d-Limonene, Lavender Oil (a separate PhD project) and five different major components of Tea Tree Oil, were tested. With the exception of Sandal wood oil, all other oils investigated were successfully polymerised. The thin film thickness, surface profile and surface roughness, optical, electrical and chemical properties of the fabricated polymer thin film were studied. Several samples were deposited under varying deposition conditions such as input RF power, pressure, time and dopants. The investigations showed the properties of the fabricated polymer thin films could be tailored to suit different optical and electrical applications. Polymer thin films fabricated from the Tea Tree Oil were also investigated to understand the biocompatibility of the material. All the fabricated thin films were transparent to the optical wavelengths and the film thickness varied from 200nm to 2000nm. The film thickness could be varied by changing the deposition conditions to cater the requirement for a given application. Over all, the refractive index varied from 1.53 to 1.7 in the wavelength range 200 nm to 1000nm. The refractive index is above that of the glass surface. The material could be used in many lens applications. The

surface profile shows that the fabricated polymer thin films are very smooth (roughness around 1 nm or smaller), uniform and defect free. In terms of surface properties and smoothness, the materials fabricated from Tea Tree Oil and its components were found to be superior to that of alpha-pinene and d-Limonene. The hardness of the material varied from material to material ranging from 0.11 to 0.65 for the samples fabricated under the normal deposition conditions, with Terpene-4-ol exhibiting the highest hardness. The hardness of the material can be varied by changing the input RF power. Materials fabricated at low RF power were very soft whilst the ones manufactured at high RF power were hard. Therefore, materials of different hardness could be fabricated from the essential oil to meet the demands of a particular application. The chemical properties of the monomer and polymer were studied. The polymer thin films show very consistent and stable material properties. There was no inconsistency observed in terms of chemical, optical or electrical properties between the samples fabricated based on monomers from different sources. The electrical properties were studied especially by looking at the energy gap. All the materials investigated exhibited energy gap in the range 2.6 to 3.1eV.

The bio-compatibility study of the material was carried out. The results of this study are very interesting and the material clearly showed the biocompatibility. In few mice sinus formation was observed even though it was not critical.

Outcomes

1) Several essential oils were tested to understand the feasibility of polymerising the material and to develop strategies to fabricate polymer thin films.
2) Thin films of a wide range of thickness were fabricated, which ranges from 200nm to 2000nm.
3) The optical properties of the essential oil based polymer thin films were studied; refractive indexes of the developed materials are above that of glass.
4) The chemical properties were studied to understand the stability of the material especially in terms of the variation of the contents from different sources. The properties were not affected by the slight variations in the base material properties.
5) The band gap of the material shows that the material could be classified in the semiconducting range.
6) The biocompatibility study shows that the material could be used in bio-medical applications.
7) The properties of the material were not altered with time and hence could be used in many protective layer coating applications.
8) As a result of this work, we have established new collaborative work with RMIT, Swinburne and ANSTO.

Implications

This study proved that it is possible to polymerise essential oils and the fabricated materials could be the potential candidates for many electronics and bio-medical applications. A more detailed study is essential to understand the polymerisation process and the feasibility of implementation in many practical applications especially biomedical applications. Already we have established the basic facility and infrastructure to pursue the advanced and systematic research in this area. If we get additional funds to support a research assistant and a PhD student, we could advance further in this area.

Publications	Two papers are published in Journals in 2007. New findings and the fabricated material properties will be published without affecting the commercial prospects of the project and RIRD will be acknowledged. Easton, Jacob and Krupka, *"Non-destructive complex permittivity measurement of low permittivity thin film materials"*, Measurement Science and Technology, *vol.* 18 pp. 2869–2877 (2007). M.V. Jacob, C.D. Easton, G.S. Woods, C.C. Berndt, Fabrication of a novel organic polymer thin film, Thin Solid Films, doi:10.1016/j.tsf.2007.07.151 C. D. Easton and M. V. Jacob, "*Evaluation of the different methods used for determining the energy gap and optical band gap of amorphous polymer thin films"*, IUMRS-ICAM: 10th International Conference on Advanced Materials October 8-13, 2007.

Completed Projects - TTO- Demonstrating proof of concept/efficacy for innovative applications of tea tree oil

Project Title	Diagnostic tools for quality enhancement in Australian essential oil industry
RIRDC Project No.:	PRJ-000820
Start Date:	30/5/2006
Finish Date:	30/5/2007
Researcher:	William Foley
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Objectives	The project aims to exploit the recent discovery of genes that control the production of terpenes in *Melaleuca*. The discovery of these genes provides a means of identifying the genetic differences responsible for the chemotypic variation among species and the genotypes of *Melaleuca* plantation cultivars. This project will correlate variations in the terpene profiles of *Melaleuca* chemotypes with variations in the sequences of terpene synthase genes. With this information it will be possible to identify diagnostic genetic variation that can ultimately be converted into diagnostic assays for use by breeders.
Current Progress	We have completed the collection of *Melaleuca alternifolia* leaf samples, covering its natural distribution. The leaf oils have been analysed and the presence of individuals of all known chemotypes has been confirmed. RNA has been extracted from individuals representing all chemotypes, and the construction of cDNA libraries has commenced. DNA has been extracted from all samples collected, and has been tested for purity and quantity. We currently have consistent results in isolating four distinct terpene synthases from genomic DNA, covering up to 60% of the open reading frame with sufficient specificity to allow for direct sequencing. Furthermore, we have been able to apply recently obtained sequence information from *Eucalyptus* as well as publicly available *Melaleuca* sequence to isolating the mevalonate kinase and isopentenyl diphosphate isomerise genes responsible for upstream steps in the terpene biosynthesis pathway. Presently, population wide sequencing of close to 100 individuals is underway to ascertain variation in the sequences available, while further effort is being put into completing the sequence information of all genes to obtain 100% coverage. We are thus close to being able to correlate variations in gene sequences with variations in oil profiles to provide a diagnostic test of high value oils in *Melaleuca*.

Completed Projects - TTO- Demonstrating proof of concept/efficacy for innovative applications of tea tree oil

Project Title	Allergy to Tea Tree Oil: Qualitative Aspects and Risk Assessment
RIRDC Project No.:	PRJ-000767
Start Date:	1/6/2006
Finish Date:	20/6/2007
Researcher:	Susi Freeman
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Objectives	This elicitation dose-response study was designed to explore the relationship between patch testing and use tests for non-oxidised tea tree oil (TTO), which was supplied by industry. In particular, it was aimed to find out if people with prior allergy to TTO could tolerate lower strength preparations of TTO.
Background	It is not known whether allergic reactions occur to TTO when it is present in cosmetic products in low concentrations, such as 1%. It is also not known whether those who are sensitised can safely use more dilute forms of TTO. Hence it was proposed that a study be performed to evaluate the safety profile of TTO by elicitation dose-response patch testing and use testing, in subjects who had previously been found to be allergic to TTO.
Research	Seventeen volunteers known to be allergic to TTO participated in the study with patch testing and repeat open application testing (ROAT).
Outcomes	A significant relationship was found between the dose to TTO applied and the likelihood of a skin reaction. It was found that only 7% (1/14) of sensitised individuals reacted to 2% non-oxidised TTO on ROAT.
Implications	This is the first study to compare results from patch testing and use testing of TTO. As some participants were known to react to oxidised TTO but not non-oxidised TTO, there remains the wider issue of the ready oxidation of TTO and how much oxidation products contribute to the allergic reactions attributed to TTO.

Research in Progress - TTO- Demonstrating proof of concept/efficacy for innovative applications of tea tree oil

Project Title	**Effects of tea tree oil on microbial adhesion**
RIRDC Project No.:	PRJ-000005
1/7	7/1/2007
Finish Date:	31/7/2008
Researcher:	Kate Hammer
Organisation:	University of Western Australia
Phone:	(08) 9346 1986
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Objectives	The aims of this research are to examine and characterise the ways in which tea tree oil may be interfering with the adhesion of microorganisms to different surfaces. Surfaces include biological surfaces such as human cells grown in vitro or abiotic surfaces such as polystyrene or glass. The broad aims of the project are as follows: 1. Examine the effects of tea tree oil on the adhesion of *Candida albicans* to polystyrene and human cell lines 2. Investigate the effects of tea tree oil on the adhesion of the bacteria *Escherichia coli* and *Staphylococcus aureus* to inert surfaces such as polystyrene or glass 3. Investigate mechanisms by which inhibition of adhesion may be occurring 4. Examine possible applications of the outcomes, such as the feasibility of tea tree oil-impregnated devices.
Current Progress	Experiments conducted to examine whether tea tree oil altered the adhesion of *Staphylococcus aureus* and *Escherichia coli* to polystyrene showed no changes for 38% of *S. aureus* isolates and 17% of *E. coli* isolates. All remaining isolates showed significantly decreased adhesion at one or more TTO concentration. However, reductions in adhesion were not always large and additional studies demonstrated that where adhesion was reduced there was usually a corresponding reduction in viability. Another series of experiments examining the effects of tea tree oil on the adhesion of *Candida albicans* to human HeLa 38 cells demonstrated that the numbers of HeLa 38 cells with *C. albicans* attached was reduced in the presence of tea tree oil, determined by flow cytometry. For the control the number of HeLa 38 cells with *C. albicans* adhered is expressed as 1.0 (normalised data), whilst for the 0.062% TTO treatment the value is 0.27. That is, in the presence of 0.062% TTO, adhesion was reduced by approximately two thirds, compared to the control. The effects of 0.03% and 0.016% tea tree oil were negligible. Experiments are currently being conducted with a second cell line, A549, to confirm these results.

Research in Progress - TTO- Demonstrating proof of concept/efficacy for innovative applications of tea tree oil

Project Title	**Improved tea tree varieties for a competitive market**
RIRDC Project No.:	PRJ-000500
Start Date:	1/7/2006
Finish Date:	1/7/2009
Researcher:	Trevor Olesen
Organisation:	New South Wales Department of Primary Industries for and on behalf of the State of NSW
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Email:	
Objectives	Release improved seed and clones to maximise profit and market access for Australian tea tree oil producers. In addition to increasing oil yield through selection and breeding, the project aims to investigate genetic aspects of low-allergenic oil, and insect resistance.
Current Progress	Seed from the tea tree breeding project has been made available to the industry since 1997. Seed sales total over 8kg (enough to plant over 1000 ha). Released seed is from the best provenances, together with improved seed from both seedling and clonal orchards. Over 980g ($80/g) of seed from the clonal orchard have been sold since 2004 when yield gains of over 70% (averaged over 4 harvests) were confirmed for this seedlot. Improved seed from second-generation seedling seed orchards has been available since 2007. Sales of this seedlot are now over 180g. A large (>34,000) yield trial was established at Bungawalbin this year to compare the performance of all seed releases to that of industry standards. Twenty elite clones are being assessed in a series of plant density/progeny trials at Bungawalbin. Results from a first harvest indicate that reducing plant density from 33K to 16K plants per ha will reduce oil yield because leaf production per ha was reduced by 37%. At first and second harvests, clones (as physiologically mature plants) demonstrated 50% and 9% higher oil concentrations than seedlings respectively. The implication for growers is that clones may return higher early yields than seedlings but this advantage appears to diminish by the second harvest.

Research in Progress - TTO- Demonstrating proof of concept/efficacy for innovative applications of tea tree oil

Project Title	Tea tree oil to prevent staphylococcal infections in dialysis patients
RIRDC Project No.:	PRJ-000459
Start Date:	4/7/2006
Finish Date:	10/11/2008
Researcher:	Thomas Riley
Organisation:	University of Western Australia
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Objectives	The project aims are: (1) To demonstrate that tea tree oil products are efficacious in the prevention of staphylococcal infections associated with dialysis catheters, (2) To demonstrate that tea tree oil products are a suitable alternative to existing products used to prevent staphylococcal infections associated with dialysis catheters and (3) To provide clinical data on the efficacy and safety of tea tree oil products.
Current Progress	Progress has been severely hampered by the extended time taken to obtain ethical and regulatory approvals to conduct the trial. The final approval required from within the University has now been given and the trial will be registered with the Therapeutic Goods Administration (TGA). Recruitment of participants cannot begin until this has been completed. This process usually takes about 1 month. The trial product can now be manufactured and provided for the trial. This is also expected to take approximately 1 month and will occur while the TGA finalises its paperwork. An existing product is being used for the study so no delays are anticipated.

Research in Progress - TTO-Identifying regulatory regimes and market barriers, and enhancing the ability of industry to meet safety standards

Project Title	Use of tea tree oil against buffalo flies in cattle
RIRDC Project No.:	PRJ-000002
Start Date:	19/9/2006
Finish Date:	16/9/2009
Researcher:	Lex Turner
Organisation:	The State of Queensland Acting through the Department of Primary Industries and Fisheries
Phone:	(07) 5464 8749
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Objectives	The aim of this project is to scientifically investigate the efficacy of tea tree oil against buffalo flies and the effects of buffalo flies on cattle.
Current Progress	Animal ethics approval has been obtained for the trial. APMVA approval was not granted without further information so the treated animals now need to be euthanased. An amendment to the animal ethics approval was obtained. The cattle were organised for the trial. Cull cattle were to be used as some were to be euthanased. Structures were designed and manufactured to support the 'backrubbers'. Small paddocks were allocated and fencing altered to accommodate the 'backrubbers'. The oil has been delivered and is being stored at Mutdapilly. Not enough buffalo flies were observed so the trial did not start over this buffalo fly season. A variation to the contact was obtained to extend the time so that the trial could be completed over the next buffalo fly season. The cattle that were organised have now been sold. The trial will be reorganised for the next buffalo fly season.

TEA TREE OIL

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RIRDC's Tea Tree Oil sub-program aims to support the continued development of an environmentally sustainable and profitable Australian tea tree oil industry that has established international leadership in marketing, value-adding, product reliability and production.

The Rural Industries Research and Development Corporation (RIRDC) manages and funds priority research and translates results into practical outcomes for industry.

Our business is about developing a more profitable, dynamic and sustainable rural sector. Most of the information we produce can be downloaded for free or purchased from our website: www.rirdc.gov.au, or by phoning 1300 634 313 (local call charge applies).

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