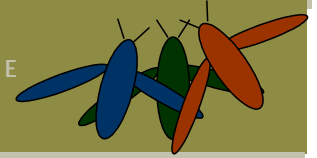


AUSTRALIAN SIT NETWORK

AUSTRALIAN NEWSLETTER ON FRUIT FLY STERILE INSECT TECHNIQUE

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South Australian Research and Development Institute, GPO Box 397, Adelaide, SA 5001 <http://www.sardi.sa.gov.au/>
Contact: Vanessa Cockington, cockington.vanessa@sau.gov.sa.gov.au, Phone 08 8303 9537

SIT Research and Training at Macquarie University

In the *Centre for the Integrative Study of Animal Behaviour* (CISAB) at Macquarie University we have a variety of current Q-fly projects, carried out principally by two Post-Doctoral Research Fellows (Dr Diana Perez-Staples & Dr Chris Weldon) and two PhD students (Preethi Radhakrishnan & Sam Collins). We also have a new Honours program starting mid-year, and so we will soon have an additional boost to our productivity through these additional, very capable, student researchers. This is especially encouraging as our goals include both providing the research foundations upon which informed management strategies must rest and also training the next generation of researchers in the field. Our current work has two main themes: application of sexual biology research in SIT and refining SIT production and delivery protocols.

Dr Diana Perez-Staples, funded by a UNESCO-L'Oreal Fellowship, has been continuing her research into the Q-fly mating system, and the application of such information to SIT. Two of her studies, one dealing with sperm storage and usage and one dealing with the critical importance of protein feeding for sexual performance, will be published soon in *Physiological Entomology*. Additional studies on the control of copula duration and on the merits of short periods of access to protein for adult Q-fly performance are close to completion. This year, Diana is presenting her work at Australasian Society for the Study of Animal Behaviour

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(Canberra) and Evolution 2007 (NZ).

Dr Chris Weldon, funded by grants from Horticulture Australia Ltd, has been working in close collaboration with Diana, Preethi and Sam, and has also been gathering some very interesting data on how adult nutrition influences cue-lure responses

of Q-flies. More on this in the next newsletter... This year Chris will be presenting his work at US-Animal Behavior Society (USA) and International Ethology Conference (Canada).

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New researcher, NSW DPI

Dr Olivia Kvedaras commenced as a research entomologist at the Wagga Wagga Agricultural Institute working on the Queensland fruit fly, *Bactrocera tryoni* in December 2006. Olivia came to the WWAI after completing a 3 year postdoctoral fellowship as a Sugarcane Entomologist with the University of Witwatersrand (Wits), Johannesburg, South Africa based at the South African Sugarcane Research Institute (SASRI), Durban. Olivia's area of research was on the role of silicon in enhancing host plant resistance to the pyralid stem borer, *Eldana*
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New researcher...continues from page 1

saccharina Walker. In addition to the research, Olivia was also involved in teaching and supervision of postgraduates at Wits. Following her appointment to the WWAI as a field entomologist, Olivia leads a collaborative project on improvements to sterile insect technique (SIT) release methodologies for *B. tryoni* (funded by Horticulture Australia Limited, HAL). Olivia is also involved in a project headed by Mr Andrew Jessup, Gosford Horticultural Institute on the development of a female lure for *Bactrocera* spp. (funded by HAL), and a trap placement project, looking at reducing the existing trapping grids for fruit flies while still maintaining the same detection capabilities, headed by Dr Francis De Lima, Western Australia Agriculture (funded by HAL and the CRC Plant Biosecurity).

Olivia is also involved in lecturing undergraduate students and the supervision of postgraduate students.

Contact: Olivia Kvedaras, Phone 02 6938 1613,



Olivia Kvedaras, the new Fruit fly researcher

South Australian Plant Health Operations

Key performance indicators

- 148,980 visits to SA properties servicing 3,820 fruit fly trapping sites
- Approximately 13,000 telephone contacts serviced through the fruit fly hotline 1300 666 010 and the Quarantine Domestic Emergency Plant Pest Hotline 1800 084 881
- Over 600,000 vehicles processed at the Ceduna, Oodla Wirra, Pinnaroo and Yamba Roadblocks
- 2million quarantine bookmarks distributed nationally
- Roll out commenced on the installation of quarantine warning signs in other States on highway approaches to SA
- PIRSA joined the SA Tourism Commission 'A brilliant blend' campaign with quarantine messages in all tourism guides targeting more than 1 million travellers to SA
- Close cooperative arrangements maintained with the Tri-State Fruit Fly Committee, The SA Fruit Fly Standing Committee and the SA Horticultural Plant Health Consultative Committee

New Tri State website
www.fruitfly.net.au

Improving Performance In Sterile Male Medfly, Perth Western Australia

Sexual competitiveness tests for mass-reared sterile male Medfly (VIENNA 7/ Mix 99) were carried out at the Department of Agriculture and Food, Western Australia in April. This strain of Medfly has been in continuous production at the Department's South Perth facility for 8 years.

A number of treatments were used to reproduce practices used in sterile Medfly area-wide release programs. The treatment groups were composed of sterile male flies in three age groups that were either exposed or not exposed to Ginger Root Oil (GRO). Males were identified with a small paint mark on their thorax to designate the treatment group. Walk-in field cages erected at South Perth were used as the arena in which the performance of sterile flies in securing wild female matings was tested. The tests were run over 7 days using 5 field cages each day. An observer in each cage recorded environmental data and captured mating pairs.

Preliminary results obtained from the relative number of sterile and wild matings have indicated a marked advantage to 5 day old sterile male Medfly exposed to GRO for 24 hours in a room. Males from this treatment group accounted for approximately 60% of matings overall. The comparative lack of mating performance in non GRO exposed laboratory males indicates that replacement or genetic enhancement of the VIENNA 7 strain may be warranted.

Bill Woods (DAFWA) brought together several fruit fly researchers from around the world for the series of tests and related meetings at South Perth. These included Don McInnis (USDA, Hawaii), Max Suckling, Andrea Stephens (Hort Research, New Zealand), Vanessa Cockington (SARDI, South Australia) and Olivia Kvedaras (NSW Dept. of Primary Industries). Don McInnis also provided training in dissection for fruit fly sperm identification.

DAFWA officers Bill Woods, Jeremy Lindsey, Roselia Fogliani, Ian Lacey, Terry Black and Ernie Steiner were all involved in various aspects of the tests.

Contact: Ernie Steiner, ph 08 93683584, email esteiner@agric.wa.gov.au or Bill Woods 08 93683962 bwoods@agric.wa.gov.au



Don McInnis (USDA), above, and Vanessa Cockington (SARDI), below, looking for Medfly pairs on artificial trees in the field cages.



SIT research...continues from page 1

Preethi Radhakrishnan, funded by a scholarship from Macquarie University, continues her PhD research into mechanisms regulating female remating inhibition in Q-flies. While it is obviously essential that sterile males mate with wild females for SIT to work at all, it is also very important that sterile males succeed in rendering their mates unreceptive to subsequent males. Otherwise there is a good chance that they will receive viable sperm from later fertile males and remain fertile themselves. Having confirmed that molecules in the male ejaculate are responsible for inducing female remating inhibition (published in *Journal of Insect Physiology*), Preethi has been carrying out a detailed study of these molecules and the glands that produce them. Preethi will be presenting her work this year at Australasian Society for the Study of Animal Behaviour (Canberra) and Evolution 2007 (NZ).

Sam Collins, funded by a scholarship from a Horticulture Australia Ltd grant, is at a much earlier stage in his PhD into "Optimal irradiation procedures for sterilization of Q-flies", but already has some very interesting results. Sam started out his research by refining some of the standard QC tests to better suit Q-flies (flightability and field cage tests), and these studies are currently being written up for publishing. Sam then turned his attention to the question of whether dose rate influences the sterility or quality of mass-reared Q-flies. Low dose rates (~4 Gy/min) in a GATRI irradiator allow extremely accurate total dosage, and are generally preferred. However, much higher dose rates may sometimes be used if a large number of samples need to be processed in a short period or if the GATRI system is unavailable so that a Gamma-cell is used instead (~70 Gy/min). So far the results are encouraging and do suggest that dose rate may be varied over quite a wide range with few consequences for fly quality. Sam will be presenting his findings this year at the Australian Entomological Society Annual Conference (Beechworth).

An additional PhD position has been advertised for a new student to study Q-fly larval nutrition, and to develop new and improved mass-rearing diets to ensure reliable supply and economic production. This project will be carried out in collaboration with Chiou Ling Chang of USDA-ARS, Hawaii. Please have anyone interested and suitable contact me directly asap.

As for myself, I have been very busy keeping the momentum and energy up, writing grants and preparing manuscripts with my own staff and students as well as with colleagues elsewhere. Along with Richard Mankin of USDA, I have been completing a manuscript detailing the effects of irradiation on the calling and courtship songs produced by male Q-flies to attract and woo potential mates. While there appear to be some quite notable and consistent differences in songs, these do not appear to have much of an effect on mating performance. We will be continuing our lab-based Q-fly research throughout the winter and will have much more to tell you all about in the next newsletter.

For further information, see:

<http://galliform.bhs.mq.edu.au/~phil/>

Contact: Phil Taylor, phil@galliform.bhs.mq.edu.au,

Ph: (02) 9850 9463.

Australian Entomological Society
38th Annual General Meeting and Scientific
Conference 2007
LaTrobe University campus
Beechworth, Victoria
23-26 September 2007
<http://aes2007.org/>

Meeting in California of the *Bactrocera* Scientific Advisory Panel

There are many things one learns on these trips and many of them are conceptual, some are operational details, and some are techniques which we in Australia may be able to compare and possibly adopt. The following are some memories of my eight April days in California as part of the *Bactrocera* Scientific Advisory Panel.

In their street trees chemical program, CDFA use vehicles with a hand gun which delivers a specific volume of liquid onto street trees, and their system is gas pressurised. NSW DPI uses a noisy compressor/motor and is more likely to draw attention to operations. CDFA used a gel with methyl eugenol and insecticide as a male annihilation technique in one area with fortnightly applications – they preferred this to the conventional killer pads used in Australia. We also saw several experiments on various gel formulations, some had difficulty leaving the gun and were clearly in very early stages of development however seemed to be indicative of a move towards gel formulations. CDFA was very interested in using spinosad in their operations however there was a concern that resistance may develop quickly. Their potential range of insecticides remains very few, as in Australia. They also discontinued the use of chlorpyrifos as an under tree treatment. The Panel was not confident that it actually worked and that environmental pollution concerns were significant. Some Australian states still use chlorpyrifos as a under tree and compost heap treatment despite the lack of evidence that it actually works. This use pattern should be researched or potentially discontinued in Australia.

Their monitoring program still uses a book/paper system in vehicles which NSW abandoned in 1999. The field staff did not see any value to bar code readers however the upper management saw the value to centralised data capture and review, which the barcode readers offer. CDFA use waxy cardboard Jackson traps to monitor flies with flies being trapped on sticky trays in the bottom – flies in glue do not

make for great taxonomic samples. They use glass McPhail traps and claim they are better than the plastic ones. The weight of these glass traps was considerable and I suspect many of our tree branches would have trouble with the weight. The attractant liquid was water and a pellet of yeast/borax, and traps were inspected weekly.



CDFA chemical program – passenger with field hand gun which delivers a specific volume of liquid onto street trees, and their system is gas pressurised.

At the mass rearing facilities, the pink dye is very pervasive and that is in keeping with our observations in NSW. They were using aroma therapy on flies and perhaps had not done all the research to support the strategy; they were relying on indicative work done on smaller colony samples. Their male only Medflies were comparatively short-lived in the field, hence the need for frequent releases. They were looking at experiments to hold the flies several more days to improve performance but this new approach was still being evaluated. There appears to be two main camps; those that supported releases based on large numbers of flies and those who preferred lower numbers of higher quality flies. The current high number group held sway however some in the other camp questioned the real value of these flies. Conversely there was a concern that lower numbers would be insufficient to inadequately cover the area, irrespective of their quality. The matter remains unresolved. There was a mood to move production increasingly towards the “Worley towers” and steadily abandon the PARC box rearing, due to the considerable savings in labour and space.

Field trials in South Australia

Vanessa Cockington and Cathy Smallridge from the South Australian Research and Development Institute (SARDI) conducted a series of field releases to compare the recapture data of sterile Queensland fruit fly fed either on just the standard pre-release diet of 5% sucrose or on the sucrose solution and supplementary protein for 1 – 2 days before release. Recent research has indicated that male Queensland fruit fly need protein to mature. One hypothesis to explain relatively poor recapture rates in South Australia is that released sterile flies may have delayed maturation due to an inability to find sufficient protein to mature in the wild. It was thought that providing protein to the males prior to their release may enable them to mature earlier and a greater proportion would be sexually active prior to succumbing to natural field mortality. This would be reflected in earlier recaptures, and greater total recapture rates, of protein-fed flies. The results of four release trials indicate that overall, there was no significant difference between total recaptures of protein-fed or protein-deprived sterile flies. Patterns of their recapture rate over time are currently being analysed.

Collaborative work.

Cathy and Vanessa hosted visits from Don McInnis, USDA (April 3 – 6) and Olivia Kvedaras, NSW Dept Ag (April 16 – 17). Don visited PIRSA's release facility, and advised on experimental issues and culture techniques. Olivia's visit included visits to South Australia's Plant Health Operations office and release facilities as well as discussions of areas of future potential collaboration. Vanessa also spent time in Western Australia (April 10 –13) assisting with trials conducted by WA Dept of Agriculture, on the effect of ginger root oil on mating competitiveness of Mediterranean fruit fly.

For more information contact:

Vanessa Cockington, ph 8303 9537, email: Cockington.Vanessa@saugov.sa.gov.au

Meeting in California ... from page 5

Regarding the movement of *invadens* through Africa, there was an increasing mood that it genetically could not be separated from *dorsalis*. If this "new" species was really *dorsalis*, it would mean that the *dorsalis* trade protocols could be used by invaded countries and that there was no need to develop new disinfestation protocols, along with the costly research to support new protocols. The *invadens* story is not over yet.

It was pleasing to see that the problems encountered in Australia were also largely the same as in California and the US programs. As with any programs, the solutions to problems are often driven by technical, economic and political factors. For instance, California cannot use malathion because of its poor reputation during the aerial bait spraying program some years ago. However malathion remains the mainstay pesticide in NSW and many other States.

My thanks to Dr Kevin Hoffman and CDFA for hosting the trip. The interaction with scientists from Hawaii, Malaysia, Japan, Reunion Island, Brazil and California was great, and interesting to see that we held similar opinions on most matters.

Contact: Bernie Dominiak, ph 02 6391 3703, email bernie.dominiak@dpi.nsw.gov.au

Conference
Evolution 2007, 16–20th June in New
Zealand

<http://www.evolution2007.com/index.htm>