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Final Report

REPORTS

Part 1 - Summary Details

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Project Title: Travel to XXI International Congress of Entomology - Iguassu Falls, Brazil

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Research Program: ~~Insect Management~~ K: HUMAN RESOURCES.

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The International Congress of Entomology is the premier conference in this field. There were a wide range of symposia / sessions, many with particular emphasis on topics of relevance to agriculture and cotton. Some examples included sessions on; acarology, agricultural entomology, ecology and population dynamics, chemical and physiological ecology, integrated pest management and insect disease vectors.

At the conference I made good use of time by;

1) Attending as many sessions as possible, especially those of value to cotton research. Sessions attended included those on;

   a) The spread of plant diseases by insects. This was useful given the emergent Cotton Bunchy Top syndrome in Australian cotton. Of particular interest was a presentation on the problems encountered by the eitrus industry in the south-eastern USA due to citrus tristeza virus (Browning and Michaud). Black citrus aphid spreads this. Use of resistant varieties is possible but these act as symptomless hosts – creating further problems for non-resistant plants. We need to test this possibility with our current Cotton Bunchy Top (CBT) resistant varieties. This can initially be done using grafting and is currently underway. Spread of the tristeza virus is dependent upon aphids reaching densities where alates (winged aphids) are formed. This is a feature that we may be able emphasis in strategies for CBT once we have more information, i.e., tolerate aphids until the alates are seen, then evaluate the presence of CBT and need to control the aphids. Notably the presenters of this paper emphasised that the brown citrus aphid was not really a major pest but that its abundance was strongly influenced by practices directed at plant agronomy and other pests – not unlike the situation with cotton aphid in Australian cotton.

      Another study focussed on a bacterial disease called citrus variegated chlorosis (Marcos Pozzan). This is spread by 'Sharpshooters', which are sucking pests a bit like jassids. This study emphasised the role of trying to address the problem by reducing the availability of alternative hosts of the vector. The authors pointed out that if the vector has too many alternative hosts then it would be difficult or impossible to implement such an approach. This is especially so if many of the alternative hosts are 'symptomless'. Instead it is then be best to try to manage the vector directly on the host and / or use resistant varieties if available. Other studies highlighted many standard techniques and procedures for identifying and developing management strategies for plant diseases. The research into CBT is following these strategies.

   b) I attended sessions which gave overview of the current thinking and trends in plant / insect interactions (Hawkins, Price, Wratten, Tanhuanpaa, Mills, Kindlmann, Gutierrez, Berryman). Much debate is occurring about the role of the host plant versus natural enemies in influencing the dynamics of pest populations i.e. top-down versus bottom-up. Authors gave examples to support each position i.e. some pointed to classical biological control while others pointed to the primary influence of food quantity and quality of the abundance of prey. Many of the studies tended to have a very narrow focus and so it was difficult to see any generality in the results. As an applied entomologist I found much of this debate to be confused, as it would seem that the dichotomy suggested is entirely artificial. The significance of food or natural enemies (or climate!) in influencing prey abundance would vary in significance depending on the situation, and this is what could be concluded from the range of

presentations. Nevertheless I found the debate interesting and the enthusiasm of some of the student presenters was impressive.

c) I attended sessions relating to integrated pest management (IPM). I was impressed most strongly by the IPM progress of the Australian citrus industry in Southern QLD (Dan Smith). In general terms I was disappointed that many of the IPM presentations focussed strongly on a single component, most commonly the use of beneficials, either naturally occurring or introduced. Most of the systems presented tended to have a very strong 'entomocentric' view of pest management. We have been fortunate in Australia that the cotton growers and consultants have helped to ensure that our IPM strategy takes a much broader 'farming systems' approach.

   Areas that we need to be considering though include greater information on the value of biopesticides and trap crops. There were a number of interesting presentations on the use of trap/refuge/nursery crops to improve beneficial effectiveness. Many emphasised the importance of looking at exactly what the crop provides and the interactions between pests, their natural enemies and the natural enemies of the natural enemies. Sometime results were not as expected, for instance some crops enhance the levels of parasites of key natural enemy groups, and therefore can be counterproductive (i.e. Wratten). Other presenters considered the attractiveness of host crops to beneficials and how this can be influenced by the presence of the pest (Guy Poppy) or through plant breeding (Dicke).

   I also attended a strong session on resistance and resistance management (McKenzie, Suckling, Daly, Caprio, Heckel). Presenters discussed the common factors in cases of economically significant resistance. Significant for Australian cotton was that there is not necessarily a fitness cost to resistance, therefore selection against resistance when the insecticide is not used, i.e. through winter, may not be very effective in helping to dilute resistance, if at all. Furthermore, all presenters agreed that the prediction of the likely development of resistance in a particular species was still not very good. Joanne Daly in particular presented an excellent paper on the genetics of resistance in *Helicoverpa armigera*.

   Finally there was a session about new insect ides that emphasised efficacy and selectivity against target pests. There was an interesting presentation by Dow about spinosad where they claimed that there were no cases of field resistance – this is in spite of the presenter being fully aware that there were resistance problems in Australia detected by Dr Robin Gunning. Other presentations considered bifenazate (a new miticide), indoxacarb (Steward), thiomethoxam (Cruiser), methoxyfenozide and thiacloprid.

d) Informal meetings with scientists from other regions including Prof. Ted Wilson, Prof Alan Knutson, Prof. Steve Wratten, Dr Tanja Schuler, Dr Angelica Hillbeck, Dr Gabor Lovei and Dr Dave Heckel.

2) I presented a poster on 'IPM and early pest damage: How to succeed by doing nothing'. This focused on some the work that has shown that cotton plants can recover from a degree of pre-squaring damage, often with no impact on yield or crop maturity. I presented this poster on the Friday afternoon session (25/8/00). The title ensured that there was quite a lot of interest. There were probably about 40-50 visitors during the 4-hour period. Many were interested in the degree of damage that cotton could recover from

and saw the value of this research. I had interesting discussions with a number of visitors about the relationship between the distribution and intensity of damage and the recovery capacity of plants. This is a fairly new area of research and we are at the forefront. Research underway with Dr Tom Lei and Prof Ted Wilson (Texas A&M) is looking at the effects of distribution of damage (even, random, clumped) on recovery and on the distribution of re-damage – ie what happens with successive damage events.

3) I presented a paper on 'Non-target effects of Bt-cotton: A case study from Australia'. This was presented at a morning session on the Wednesday (23/8/00) as part of a major symposium on 'Environmental Impacts of Genetically Modified Crops'. The session was well attended and there was lively debate following all presentations, including my own which was the only field study presented. There is a huge amount of interest in this area and to some extent the debate is polarized between those in favor and those against, even in this well educated forum. The 'against' group is very suspicious of the motives and funding of the 'pro' group. This is an area where we are lagging behind to some extent. We have large-scale field experiments, such as I present in the paper co-authored with Gary Fitt, but we are lacking in more specific experiments to investigate possible non-target effects of GMO's. For instance, experiments where predators such as ladybeetles or lacewings were reared on Helicoverpa or other prey that had fed on Ingard® cotton. This could also be complemented with studies using Ingard® resistant larvae to see if the way in which the larvae deals with the Cry1Ac protein affects the availability of the protein to predators. To some extent these questions will be addressed through the new CSIRO GMO Initiative. Funding from this initiative has been used to employ Dr Mary Whitehouse (CSIRO Entomology) to address some of these questions.

Conclusions

I thank the CRDC for funding which allowed me to attend this conference. I believe it was of value to the CRDC because information gleaned has already contributed to the approaches taken in several research projects funded by the CRDC, notably those dealing with early damage and aphids (CSP103C) and the CBT project (CSP143C). The opportunity was also valuable to me personally as I was able to quickly obtain a snapshot of the latest thinking in relevant areas. This is valuable as current research is often a year or more in front of the published literature.