

## PLAIN ENGLISH SUMMARY

Cotton aphid, is an important late season pest in Australian cotton. It can be specifically targeted for control, or is sometimes coincidentally controlled by organophosphate sprays directed at other pests. Cotton aphid is usually controlled with cheap organophosphate insecticides such as dimethoate, and recently Pirimor® and Pegasus® were additionally registered for its control. Overseas studies have found cotton aphid to be resistant to many insecticides which have lead to complete control failures.

During the 1998-99 Australian cotton season, transgenic Ingard® cotton accounted for about 20% of the cotton area giving an overall reduction in insecticide use. Typically there were reductions of about 50% in insecticide use on Ingard® cotton in the first half of the season. This gave an overall reduction in selection pressure for resistance but created an environment where aphid populations could build to high levels earlier in the season. If cotton aphid is then specifically targeted for control, insecticide resistance may develop and honey dew contamination of the cotton lint could result. Up until the 1998-99 cotton season, control failures against cotton aphid in Australia have not been shown to be due to resistance, even though pyrethroid and endosulfan resistance have now been detected. This study aims to document the level and abundance of pyrethroid and endosulfan resistance in field-collected cotton aphid. It additionally aims to screen a number of strains for carbamate and organophosphate resistance to ascertain why there continues to be reported failures to those chemicals.

This study found organophosphate and Pirimor® resistance to be generally absent from NSW strains of cotton aphid. Conversely, NSW cotton aphid were often endosulfan and pyrethroid resistant. In contrast to NSW, organophosphate and Pirimor® resistance was common in WA,

NT and Qld, and often at a high or extreme levels. Extreme levels of resistance in cotton aphid was also detected in crops other than cotton, such as melons and cucumbers. In all states surveyed there were instances of Pirimor® resistance in cotton aphid exceeding >1,500x. Some of these high level resistances have been directly linked to field-control failures of Pirimor®, a first for Australian cotton. Clearly, resistance in cotton aphid has the potential to seriously impact the Australian cotton industry. Resistance management of cotton aphid should now be an industry priority and should be implemented in time for the 1999-00 cotton season.

There should be systematic monitoring of field-collected strains of cotton aphid to aid effective resistance management. Indicative organophosphates, Pirimor® and the novel chemicals Pegasus® and Confidor® should be included into any monitoring program. Monitoring data would be used to verify, and where considered necessary modify, a resistance management strategy for cotton aphid. It is also desirable to investigate alternative chemistries and underlying resistance mechanisms for cotton aphid control. Finally, it would be useful to ascertain, what influence if any, resistant cotton aphids from horticulture, may have on cotton.

**Addendum to plain English summary: abstract-** In an earlier study we established baseline data to detect resistance in *Aphis. gossypii* Glover and used that data to detect endosulfan and pyrethroid resistance. This study expands upon that discovery and aims to survey for endosulfan and pyrethroid resistance in *A. gossypii* Australia-wide. It additionally aimed to monitor for pirimicarb and organophosphate resistance, which unusually was not detected in the earlier study. Organophosphate and pirimicarb resistance was detected and there was a general dichotomy of response between NSW and other than NSW (WA, Qld and NT). *A. gossypii* from NSW was almost organophosphate and pirimicarb resistance free, conversely, NSW strains were often endosulfan and pyrethroid resistant. Organophosphate and pirimicarb

resistant *A. gossypii* was abundant in WA, NT and Qld and at high to extreme levels. Pirimicarb resistance levels against *A. gossypii* were >1,500x in all states and were linked to field-control failures for the first time. Resistant *A. gossypii* have the potential to seriously impact the Australian cotton industry and is elaborated upon in the discussion. Resistance management of *A. gossypii* should now be an industry priority.