

The truth about chemical odours

By Chris van der Hoven, Cotton Business Manager, Syngenta

The EPA has received about 300 complaints over the past four years related to chemicals used in cotton production. These are typically from residential areas that are situated close to cotton-growing areas.

Traditionally, a reasonable proportion of these complaints have been attributed to profenofos or Curacron, with no distinction made between various brands of profenofos.

Over the years Syngenta has invested, and made considerable progress, in minimising the odour related to profenofos. As a result of this, six years ago profenofos-Q, a refined version of profenofos, was introduced into the Australian cotton market.

Technical grade profenofos contains varying amounts of formulation impurities including the highly volatile and odorous environmental breakdown products n-propyl mercaptan (commonly known as 'mercaptans'), diethyltrisulfide and ethylpropyltrisulfide. The concentrations of these impurities are dependent on the manufacturing process and may vary significantly between suppliers.

ODOUR INDUCED SYMPTOMS

While the daily workplace air concentration limit of mercaptans is 0.5 ppm, their odour threshold is approximately 500–5000 fold lower. This means that you can smell mercaptans at much lower levels than the level at which they can do you harm. But the fact remains that chemical odours can cause a range of symptoms known as cacosmia or chemical odour intolerance.

The introduction of profenofos-Q with significantly less odour was therefore seen as a very positive step. This development allowed the introduction of Curacron 250 Flexi and more recently, Curacron 500 Pro. Curacron 500 Pro has the added benefit of being twice the volume of active ingredient than Curacron 250 Flexi, thereby reducing packaging waste and transport by half.

After Syngenta completed the phasing out of all non Q-grade Curacron, varying amounts of standard grade profenofos has been re-introduced into the cotton market by other suppliers. Although only small volumes of this product have been used, due to low insect pressure, Syngenta still con-

siders this material to be a significant step backwards for the industry as a whole.

Walking the walk after talking the talk

In response to an approach from the Pesticide Odour Working Group of the National Registration Authority (NRA), Syngenta commissioned two research studies into the issue of profenofos odours.

FIELD TESTING

The first study, conducted by the independent Centre for Environmental Health and supported by Cotton Australia, involved field testing of spray drift and sampling of the evolution of odours following aerial application of profenofos to cotton.

This study was also intended to quantify the ambient concentration and spread of mercaptans formed during or following the spray application. Odour dispersion may be influenced by atmospheric conditions (hot, windy conditions will increase drift) and crop architecture (a thick canopy will trap the spray).

Prior to this study, no air samples had been collected from affected areas in Australia, and so there has been no way of quantifying *in situ* the type or concentration of the odorous chemicals. Conducted in Collarenebri between February and March this year, applications were made with commercial equipment in what was classified as 'typical' summer conditions using Curacron 500 Pro that was 12 months old.

A total of four spray events (timings) and 15 sampling cycles were undertaken. Sampling for each campaign was conducted for the pesticide and mercaptans both prior to, and up to 48 hours after, application. Air samples were taken at 10 points around the spray area, some of them as far as two kilometres downwind.

Results from this study indicate that the maximum spray drift occurred within the first six hours, but was still significant after 48 hours and off-gassing was still significant for at least 72 hours. Of primary importance, however, was the conclusion that "aerial application of Curacron 500 Pro under typical field conditions does not result in significant evolution of odorous mercaptans".

Only three out of 60 sample tubes contained traces of mercaptans and all tubes

showed residues that were below the limit of detection. Due to these low levels it could not be determined whether the pesticide and mercaptan volatiles behaved differently with regards to concentration, distance and other physical parameters.

The absence of quantifiable mercaptans in the field trials needs to be viewed in the context of the very low concentration of mercaptans in Curacron 500 Pro. So any observed mercaptan in the study would have had to evolve as a result of degradation of profenofos after application. Clearly, this did not occur at a rate to permit detection at the minimum limit. With this study, Syngenta hopes to establish the groundwork in confirming the link between cacosmia and pesticide odours.

HEALTH RISK ASSESSMENT

A second study was conducted by the Queensland Department of Primary Industries. This involved a health risk assessment, construction of a dedicated spray chamber and utilisation of an olfactometry laboratory. The olfactometry laboratory uses human panellists to assess the strength of comparative odours. Curacron 500 Pro was compared with Curacron 250 Flexi, standard grade profenofos and chlorpyrifos.

The QDPI concluded that there was a significant difference between standard and Q-grade formulations of profenofos. It also identified that both Curacron formulations were less odorous than chlorpyrifos.

Although there was a significant difference between Q-grade and non Q-grade products, there was no significant difference between Curacron 250 Flexi and Curacron 500 Pro (both Q-grade products), nor was there a significant difference between standard grade profenofos and chlorpyrifos.

It is clear from these studies that Curacron 500 Pro is a significantly lower odour formulation of profenofos than others on the market. It is also clear that agrochemical odours should not immediately be attributed to this product, particularly in light of the reintroduction of standard grade profenofos formulations and the extent of use of chlorpyrifos.

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