AGRICULTURAL ADJUVANTS

Alan Knowles of FORM-AK (http://www.form-ak.com) reports on a recent conference, organised by the Pest Management Group of the Society of Chemical Industry (SCI) in London on 3 December 2002

The scene was set by Allen Underwood, Helena Chemical Company USA who reviewed the global market for adjuvants. In line with the agrochemicals market, the global adjuvants market has been fairly static over the last 2–3 years with a total value of about US$ 1 billion, of which the USA market represents about 40%. However, there have been numerous changes in product groups. For example, the US adjuvant market comprises 18 different types of adjuvants recommended for use on EPA registered labels. This consists of non-ionic surfactants (24%), crop oil concentrates (23%), fertiliser based adjuvants (19%), compatibility, antifoaming and buffering agents (19%), spreaders/stickers (8%) and others (7%).

Adrian Friedmann, Syngenta UK described some recent advances in the understanding of adjuvancy. Work is being carried out to understand the mode of action of adjuvants in terms of spray droplet retention and spreading on leaves, as well as uptake and translocation through the leaf cuticle. UV protection of the active ingredient on the leaf can also be important in some cases. The effect of added adjuvants can be overlaid by effects from the formulation additives, and the combination of these may well affect more than one parameter for bioefficacy. Work is being done to put this on a more scientific basis by studying individual parameters on isolated cuticular waxes.

Biological pesticides usually occupy niche markets estimated at about 1% of the total market for agrochemicals. The principal uses of adjuvants for biopesticides were outlined by Roy Bateman, CABI Bioscience UK, namely phagostimulation of ingested microbial control agents (especially viruses and bacteria), retarding evaporation of spray droplets and deposits, and mitigating the effects of sunlight. It has been found that the application of mycopesticides as suspensions in mineral oils and sprayed as ULV formulations gives enhanced activity. More recently, emulsifiers are being added to the oil suspensions to produce emulsifiable suspensions (ES) which can be sprayed from water in conventional hydraulic sprayers.

Christian Gauvrit, INRA France, discussed adjuvants based on vegetable products particularly seed oils such as soyabean and rapeseed oils. These oils are usually ethoxylated and are self emulsifying. The higher ethoxylates have been shown to be good adjuvants for glyphosate. Monoterpinic alcohols from pine oil display interesting properties particularly on spray retention on difficult-to-wet plant surfaces.

A new type of adjuvant based on natural waxes was described by Franz-Leo Heinrichs, Clariant Germany. Montanwax aliphatic acid ether esters are formulated as aqueous dispersions for use as tank mix additives. They reduce evaporation, improve rainfastness and allow penetration of the active ingredient into the leaf surface. Enhanced effects have been found with glyphosate and lambda cyhalothrin. Wax dispersions can also be applied as film coating agents for seed treatments.

Kirsty Hall, Lurmark UK, looked at the effect of adjuvants on droplet size distribution using different spray nozzles. Conventional flat fan nozzles behaved differently to air inclusion nozzles with the same adjuvants, suggesting that nozzle manufacturers should evaluate the whole spray process when designing nozzles for the future.

The effect of adjuvants on pesticide residues in crops was considered by Peter Holloway, formerly of Long Ashton Research Station, UK. Although it is well known that adjuvants can increase the retention, spreading and uptake of active ingredients into crops, little information is available about the ultimate effects on pesticide residues in food crops. Results showed that the level of residues varied markedly with the pesticide, the adjuvant and the crop under test.

The topical issue of the regulation of inert materials and adjuvants in the USA was discussed by Johnny Reynolds, Syngenta USA. The current EPA process is undergoing a major revision to bring the guidelines into compliance with the Food Quality Protection Act (FQPA) of 1996. The EPA system is based on a risk assessment analysis of the individual components, where risk is a function of toxicological hazard and exposure. Materials will be placed into Tier 1 to Tier 3 categories depending on their risk. This is quite different to the registration system in the EU where the total formulation containing inerts and adjuvants must be registered, or in the case of tank mix adjuvants toxicological and efficacy data must be provided.

The final paper was given by Hans de Ruiter, SURFaPLUS R&D The Netherlands. Adjuvants applied either as tank mix or built-in adjuvants (co-formulants) may exert phytotoxic effects themselves which can be considered as a loss of selectivity of the application concerned. The best approach is to optimise adjuvant use for each active ingredient and each crop.

In summary, it seems likely that the use of adjuvants will become more important in the future as companies try to enhance the activity of pesticides and reduce the dose rates. Much work still needs to be done to understand the complex mode of action of adjuvants in order to optimise activity and to reduce wastage of pesticide sprays.

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