

IPPC JERUSALEM – A MIX OF CHEMISTRY AND ECOLOGY

Elaine Warrell reports on a major international crop protection conference

The organisers of the XIVth International Plant Protection Congress (IPPC), held in Jerusalem in late July, made an exceptionally good attempt at meeting their theme: *Plant Protection towards the Third Millennium: where Chemistry meets Ecology*. The 1000 or so delegates came from a wide mix of countries and crop protection specialisms for a stimulating four days of papers followed by a day with a choice of field trips which, in a country so steeped in history, all included a visit to one of Israel's many archaeological sites.

Chemistry was well represented at the Congress. Several speakers took an in-depth look at the best prospects for research as well as at the regulatory, resistance and environmental issues faced by the agrochemical industry. As R M Hollingworth from the National Food Safety & Toxicology Center, Michigan State University, pointed out in the session on new insecticides and acaricides, the last decade has been a good one for new insecticides and acaricides. It has seen the commercialisation of neonicotinoids such as imidacloprid which act at specific target sites within the nervous system, spinosyns which activate receptors not present in mammals and are therefore particularly safe, and what he described as 'an under-utilised category', the naphthoquinone propesticides such as acequinocyl from Agro Kanesho, Japan, which inhibits electron transport at a critical site.

However, as Dr Hollingworth said, totally novel sites of action are few and very difficult to find but combinatorial chemistry and functional genomics are opening up new approaches and new opportunities. This is essential for the US and almost certainly in the future for other countries now that the US Environmental Protection Agency is applying the 'risk cup' concept to the approval of new compounds. All compounds with a similar mode of action are grouped together and subjected to usage and dosage calculations. Once the 'risk cup' is deemed full, no new compound with that type of action can progress through the regulatory process unless a product is withdrawn and there is 'space' to fill.

He was also concerned for the future in general with the increasing contraction of the research-based agrochemical industry. This was underlined in another session on novel targets by Jim Bone from Griffin Corporation in his paper on generic crop protection. He pointed out that by 2005, over 70% of the current patented products will have become generics and that over 90% of all areas treated chemically will be with generic products. He also sounded a note of warning that regulators must bear in mind the fact that

reducing the number of chemicals available to farmers increases the risk of resistance. The organising committee of IPPC recognised the importance of resistance with two sessions on metabolic resistance and target-site resistance of pests to pesticides and a discussion session on pesticide optimisation in pest resistance management.

Closely tied in to the future of many of the long-established agrochemicals is the question of minor crops. As Nancy Ragsdale of ARS/USDA, Beltsville, pointed out, minor crops – fruits, vegetables, ornamentals, herbs and spices – account for some 40% of the value of US crop production. As in Europe and elsewhere, increasing regulatory requirements have increased costs to the point where companies are no longer interested in maintaining registrations. Dr Ragsdale's options included stopping production of some crops, growing them only in season under optimum conditions, and finding alternatives to current pest management systems. She listed as ways forward new chemistry, new delivery systems, integrated farming, biological control and new crop varieties using biotechnology to incorporate pest resistance.

Delivery systems is a topic that exercised Tom Bals from Micron Sprayers Ltd, UK. He feels strongly that, although many farmers are now actively looking to reduce both spray volume (and dosages) to reduce costs, the agrochemical industry has chosen not to advocate or even research low volume application techniques, despite frequent demonstrations of better spray targeting. Calls to the industry for information on agrochemical dose response curves to allow more informed decisions about lower dosages have generally been ignored, he says, except in Denmark.

Denmark is also leading the way in precision farming. In a lively discussion meeting, Svend Christensen from the Danish Institute of Agricultural Sciences, Flakkebjerg, commented that there is political 'push' behind precision spraying in his country. There is no let up in the campaign there to reduce pesticide use and the government is about to present its next agrochemical plan. There are rumours that it may say patch spraying is a requirement. In Denmark this is already in use for fertiliser application so many tractors are already equipped with the necessary GPS and computer equipment.

High on the environmentalists' list is the problem of methyl bromide, and for the agricultural scientist, how to control soil-borne pests and diseases when this fumigant has been phased out. Cultural and chemical alternatives were discussed at the Jerusalem meeting, most, as James Stapleton from University of California, Parlier, pointed out,

combined with soil solarization (SoSo), a technique that is being used increasingly outdoors and under glass in areas like the Mediterranean, the Near East and East Asia where air temperatures are naturally very high in summer.

There are some disadvantages to SoSo, as Dr Stapleton pointed out at a discussion meeting on solarization. There is plastic film to be disposed of, naturally high temperatures are needed and it does not consistently control heat resistant-pests. However, work in progress in several countries to refine the method, for example by adding mulches or chemicals to enhance the process, was described by speakers from the USA, Egypt, Italy, Greece and Israel.

Predictably, biotechnology papers attracted large audiences. In the current climate of caution over GM crops because of consumer resistance, mainly in Europe, there were several speakers on regulatory issues. Marjorie Hoy from University of Florida, Gainesville, USA, who is working on GM as a way of improving the potency of arthropods as natural enemies, warned of the need to think very carefully about what genes are put into species. She believes more work is needed on horizontal gene transfer and says that first releases at least should be male sterile. The scientists are ahead of the regulators; no guidelines as yet exist to cover the use of transgenic arthropods in practical pest management programmes, she stated.

With transgenic soya, corn and cotton the crops that are usually in the headlines, it was a pleasant surprise to hear Dr Gonsalves of the Department of Plant Pathology, Cornell University, report work on papaya in Hawaii that has saved the local industry. Papaya ring spot virus is a worldwide problem for growers, including those in parts of Hawaii. Moving the industry to the unaffected Big Island in 1960, where there was a natural physical barrier to infection, together with strict surveillance kept the problem at bay until early 1994. By October that year, the virus had swept through the region and the crop was all but abandoned.

However, as Dr Gonsalves told the conference, work had started in the mid-'80s on transgenic papaya and at a November 1994 risk assessment conference his suggestion that a trial should be set up in the devastated papaya area was approved. It has been an outstanding success with yields of 100,000 lb/acre/year from virus-resistant transgenic trees compared to 5000 lb and a short life from non-transgenic trees. Seed distribution to growers started in 1998 and farmers are now busy reclaiming their land.

Outcrossing with non-transgenic papaya is not a problem in Hawaii as there is no natural compatibility with wild papaya, and in any case there are no wild papayas in Hawaii. But, as Dr Gonsalves pointed out, there are a few snags in what is otherwise an outstanding GM success story. About 40% of the Hawaiian crop is exported to Japan and there is no clearance there for GM papaya; the industry is hoping for an exemption in 2000.

A whole session was devoted to Sterile Insect Technique (SIT), best known as the answer to Old and New World screwworm but now being developed as an effective technique to control and in some cases eradicate key insect pests such as fruit flies (*Ceratitis* spp) and tsetse without the

use of chemicals. Jorge Henrichs, head of insect and pest control section at the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, Vienna, Austria who chaired the SIT sessions, expects SIT to become increasingly important in cross-boundary IPM campaigns against pests such as fruit flies.

There are now facilities in Europe as well as the Americas for production and release of sterile males of the insect species to be controlled. Alan Robinson from the FAO/IAEA Agriculture and Biotechnology Laboratory, Siebersdorf, Austria, described work he is involved in to develop through gene transfer male only strains which make SIT programmes more economical.

Overall, as reflected at IPPC, IPM still looks set to dominate practical crop protection for the foreseeable future, combining the use of chemicals with pest scouting and probably soon precision agriculture, good husbandry, choice of variety and other techniques designed to minimise the amount of agrochemicals used and thus lessen any impact on the environment.

The first plenary lecture of the conference was given by Mike Jeger of Wageningen University on 'Bottlenecks in IPM'. In a thought-provoking overview, he pointed out that integrated pest management (IPM) is not new, is not an overnight fix for pest problems, nor an approach that organic farmers can necessarily use, or a formula for eliminating pesticides. He sees little room for ideology and questions whether it is even right to raise the question of whether a bottleneck exists to implementing IPM if there is no perception among farmers that it is needed. In developed countries, IPM is industry led, and in developing countries, IPM campaigns are led by bilateral and multilateral aid agencies based in developed countries. Even in developed countries, IPM awareness is not high – only 40% of cereal growers in the UK are familiar with the term.

However, Dr Jeger does believe that in the right place, IPM can provide economic benefit to farmers; he cited, for example, tomato growers in Mexico. Other speakers in sessions on fruit, field, forage and perennial crops, and technology transfer in developing countries, took the practical side of IPM forward. It may be a technology with many definitions and overtones of political/industry lobbying but it fitted well with the IPPC conference theme 'where chemistry meets ecology', and international interest remains high.

Abstracts of the 650 or so plenary lectures, papers and posters are available from congress organisers, Kenes, e-mail: conventions@kenes.com

The XVth IPPC, sponsored by the newly formed International Association for the Plant Protection Sciences (IAPPS), and organised by the China Society of Plant Protection, takes place in Beijing from 6–11 July 2003. Details from Wen Liping, Institute of Plant Protection, Chinese Academy of Agricultural Sciences, Beijing 100094; e-mail: cspp@impchina.cn.net