STORED PRODUCT PROTECTION – technology into action

A delegate reports on the 8th International Working Conference on Stored Product Protection (IWCSPP), held at York, UK, from 23–26 July 2002

Maintenance of quality in durable products such as grain, oilseeds, pulses, cocoa and coffee has come under the spotlight increasingly in recent times. This has been due to the increasing length and complexity of the food chain and end-user concerns about contamination. IWCSPP began in 1974 as an entomological conference but by its fourth incarnation in 1986 the name had changed to better reflect the increasing importance of food safety issues such as mycotoxins and mites and the rise of engineering solutions to maintaining quality. Since the 5th conference in Bordeaux in 1990, the conference has been associated with a trade exhibition, reflecting the industrial relevance of the forum and the co-operation between academy and industry.

Taking as its theme 'Technology into action', the conference reviewed new developments, future challenges and possible solutions over five days centred on the Central Hall and exhibition centre at the University of York. While over 300 delegates attended, this still represented a fall in attendance over previous such gatherings, largely accounted for by reduced support from the host country, a sadly familiar trend. Rather than running as a series of concurrent sessions, which effectively separates the disciplines, the conference progressed through plenary sessions under five themes. These were:

- The future of stored product protection
- Biology, detection and bio-control
- Food safety
- Chemical and physical control
- Processing and applications

The podium papers were supplemented with two poster sessions which flanked the lecture auditorium throughout proceedings. With all attention thus focused, it was imperative that the papers chosen for oral presentation were interesting and appropriate and while this was usually the case, there were occasions when the paper presented appeared more relevant to another session or where one would have preferred to hear further details of one of the posters. In particular, the absence from the food safety session, of any presentations on the pressing problem of ochratoxin A (OA) in cereals was baffling.

Food safety

Lord Haskin's introduction to the conference majored on the improvements in food safety issues, largely managed by correct storage temperatures and the science behind that. The first paper of the conference highlighted the considerable food safety issues attached to the storage of products and the consistent and serious decline in funding for this important area. How ironic then that Lord Haskins should have to depart the meeting so swiftly in order to handle press criticism of the UK Government's handling of the foot and mouth epidemic, based, among other things on the neglect of research funding and the loss of appropriate expertise. These initial impressions were followed up by an outline of the impact on science of political decisions. Imposed 'deregulation' or 'liberalisation' of internal markets of developing countries had effectively driven many communities back to subsistence farming once the internal grain boards disappeared. One problem was that producers had no idea of the correct market price and it was shown how simple internet access to this information ensured that producers got a fair price and motivated them to produce a saleable surplus.

Pest control

Another talk of the first session looked at pest control from different perspectives. The differing ambitions were contrasted of scientists (concerned with 100% accuracy), customers (who may be content with cosmetic success for treatments) and practitioners working in the highly competitive environment of fumigation. Crucial to the success of the whole process was effective training and review. Whether or not it was coincidental, to finish the conference with a paper from the same speaker giving examples of storage training modules available from the web, was entirely appropriate and nicely symmetrical!

New products

How well was the theme fulfilled by the programme contents? One burning technological issue is the search for alternatives to fumigants which appears to be largely interpreted as the search for new formulations of existing fumigants or for new chemicals to act as fumigants. This is perhaps not quite the point but understandable in view of the business to be made by fumigating grain or mills both prophylactically or curatively. The attendance of Dow AgroSciences with the new fumigant, sulfuryl fluoride and Cytec with their phosphine / carbon dioxide mix testified to this. However, one alternative that is becoming widely appreciated and applied as a rapid disinfesting solution, is hot air. Temp air and Thermokil UK offered equipment to apply heating solutions to infestation while papers by several authors gave targets or models for thermal

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infestation against pests from diverse food industries and gave examples of practical experiments either using grain or in empty facilities. Insects Ltd have been in the pioneer vanguard of hot-air disinfestation of mills in the USA.

Inert dusts and herb oils have been forefront of possible alternatives to admixture chemicals so it was a little discouraging to note a report of induced laboratory resistance to DEs (diatomaceous earths). Similarly, the keynote speech reminded us of the achievements of Darwin in elucidating natural selection, showing how every bruchid has its niche and in doing so had overcome each plant's natural defences. Nevertheless, there were plenty of examples of successful application of both approaches for instance, the introduction of DEs to the UK market has fortunately coincided with the withdrawal of OP dusts. Perhaps the most interesting alternative close to the US market is 'Spinosad', an actinomycete mycotoxin which will require proven efficacy against mites if it is to be applied in the UK. While conventional OPs may have lost their research appeal, they are of course widely applied in the marketplace and the panoply still available in France were outlined and models of residue and efficacy decline of one of these illustrated. FMC presented ProStore, a mixture of bifenthrin and malathion, available as EC or ULV formulations in a number of European countries. The costs of registration in individual countries must still be a powerful disincentive in such a relatively small market as stored product protection. Harmonisation of these processes, such as are occurring within EU states, may be a remedy to this situation.

The title '*working* conference' is justified by the series of evening workshops, and the one on 'Intelligent automated grain management systems' seemed to sum up the integrated nature of the conference. It highlighted how temperature and moisture measurement, both required for accreditation schemes, could be combined with decision support systems and cooling (or drying) fan control. This supported the technical exhibition display from Robydome. The workshop also heard of the difficulties of insect detection while at the same time viewing an impressive demonstration of an automated insect detector from OPI StorMax Insector. But the most telling intervention was perhaps from a store operator who asked, "why pay for an expensive insect detection tool when I can fumigate with phosphine for a few cents per tonne?"

New research

As might be expected from this relatively mature research area of stored product research, most approaches have been explored at one time or the other, so there was little that was truly novel. The main challenges have been the appearance of new pests, increasing market demands, decreasing pesticide choice and resistance to pesticides. Nevertheless a summary of diagnostic tools for detecting arthropod contamination showed how sensitive new technology could be, although one might consider how relevant this could be to the US market where 2 insects/kg were tolerated in the market place. It was also interesting to see an account of the response of insects to maize genetically modified to contain Bt genes. Use of an electronic nose to characterise mould contamination in cosmetically cleaned grain would also be useful in the context of detecting OA. There was some 'pure' science as well with investigations of the ultrastructure of the mite digestive tract and even more appositely, in the context of the current challenge of OA, examination of the selective transfer of fungi to stored grain by mites. The potential of microwave disinfestations was raised again and we were shown how vacuum had been applied using a PVC 'cocoon' to disinfest cocoa beans at 35 mm Hg, a scientific presentation supported by the technical exhibition of GrainPro. Biocontrol generally remains in the 'proof of principle' rather than application stage though Germany seems to be making some progress. For example, it was reported that *Lariophagus*, a parasitoid of the grain weevil, could locate a host at radii and depths of 4 m, far better than we can do using even the most sensitive detection methods.

While it could be argued that the concerns of the developed countries are largely with cosmetic or economic / commercial problems, developing countries still battle with very real ravages of pests, which threaten their livelihood and even survival. Simple and effective solutions for these problems are urgently required. These aspects tended to get submerged in the elegant technologies of the conference. Solutions to the problems of *Prostephanus truncatus*, introduced from S. America to Africa, are still paramount. Notable contributions attempted to identify key local sources of this wood-borer and to predict outbreaks based on local climatic fluctuations. We were also offered control options including combining DEs with synthetic pyrethroids or plant extracts.

Summary

In summary, the future of stored products technology seemed to lie in engineering rather than pesticide solutions and the conference concluded with a series of papers modelling physical control applications. In future, this approach is likely to be at the centre of the conference, as well as of storage science, since it supplies the real answer to 'sustainable fumigation alternatives'. Rather neatly, the theme of the next International Conference on Controlled Atmosphere and Fumigation in stored products which is closely allied to the IWCSPP and takes place in two years time in Australia.

The Proceedings of the 8th IWCSPP will be published in April 2003 by CABI Biosciences.

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