Endosulfan deaths and poisonings in Benin

Official sources in Benin state that at least 37 people died over the 1999/2000 season in the northern Borgou province due to endosulfan* poisoning, while another 36 people experienced serious ill health. In view of the relative share of the Borgou province in national cotton crop area, Peter Ton, Silvère Tovignan and Simplice Davo Vodouhê report that at least 70 people may in fact have died in Benin over the season from endosulfan poisoning. These cases of death and poisoning can be directly linked to the decision-making process about pesticides use in West African cotton production. Solutions to technical problems with crop protection are being decided upon without adequate consideration of the wider contexts in which cotton pesticides are being managed and used. Endosulfan was introduced in cotton production all over francophone West Africa over the 1999/00 season, as part of a West African regional programme to combat pyrethroid resistance of the American bollworm Heliothis/Helicoverpa armigera. Endosulfan has a reputation as a highly toxic and dangerous pesticide, particularly under poor spraying conditions without any use of protective clothing. Endosulfan is banned in a significant number of countries, while campaigns for banning its use are going on in others. The PR-PRAO project for pesticide resistance management Heliothis/Helicoverpa armigera is the main cotton bollworm pest in West Africa, as it is in many other cotton-growing countries in the world. The larvae of Helicoverpa spp. feed on flower buds, flowers and bolls – the reproductive organs of the plant. Helicoverpa spp. are found on a very wide range of wild and cultivated host plants such as maize, sorghum, sunflower, pigeon pea, chickpea, groundnut, tomato, soybean and okra1.

Control of *Helicoverpa spp*. on cotton has depended almost exclusively on insecticides; initially DDT, then endosulfan, and latterly the pyrethroids2. In West Africa, the cotton pest complex is very broad, so that broad-spectrum insecticides are used to combat damage by bollworms and sucking insects. Since the early-1980s, chemical control has been dependent upon a combination of organophosphates and pyrethroids. Resistance to pyrethroids by Helicoverpa spp. has been reported in numerous countries: Australia (1983), Turkey (1984), Thailand (1984/85), Colombia (1984/85) and the USA (1985/86); while resistance has also been noted in China, India, Pakistan and South Africa3. In West Africa, first reports on a decreasing sensitivity of Helicoverpa armigera to pyrethroids were made over the 1996/97 season4,5. Over 1998, the Projet Régional de Prévention et de gestion des Résistances de Helicoverpa armigera aux pyréthrinoïdes en Afrique de l'Ouest (PR-PRAO)6 was started by the national cotton research institutes in West Africa, the French cotton company CFDT, CIRAD and the global IRAC7 network, to combat pesticide resistance of Helicoverpa spp. The objectives of the PR-PRAO project include monitoring of the dynamics of Helicoverpa armigera populations and their susceptibility to pyrethroids, and the search for alternatives to pyrethroid use. Countries participating in the project are Benin, Burkina Faso, Guinea, Ivory Coast, Mali, Senegal and Togo. The results of the 1998/99 PR-PRAO experiments were discussed at a meeting on 16-18 March 1999 in Bobo-Dioulasso in Burkina Faso8. It concluded that:

‘Infestations by Helicoverpa armigera arrive earlier in the season and that they do not spare early sowings as they did in the past.’ The report also stated: ‘Within the framework of the experiments to prevent and manage pyrethroid resistance by Helicoverpa armigera…, satisfying results have been obtained in all countries with endosulfan being applied during the first two sprays.’ The meeting then decided that: ‘For the 1999/00 season, the countries in the region engage in the development of a so-called ‘window’ programme at the start of the season with endosulfan. This product will generally be used for the first two sprayings during a period of 40 days, which corresponds with one generation of Helicoverpa armigera, with a deadline which should approximately be 15 August 1999.’

Endosulfan deaths

In Benin, the cotton research institute Recherche Coton et Fibres (RCF) proposed the adoption of the ‘window’ programme to the state-led cotton marketing board SONAPRA9. In early-1999, Callisulfan 350 EC TBV (endosulfan 350 g/litre) of the French company Calliope was distributed all over the country.

First reports on cotton pesticide poisoning were published in August and September 199910,11, and led the Council of Ministers of Benin on 15 September 1999 ‘…to authorise an investigation mission in the Borgou and Atacora departments to evaluate the extent of resurgent food poisoning.’12 No official figures have been made public since then about the extent of poisoning in Benin. The extension service CARDER in the Borgou province, however, made calculations of pesticide poisoning on 13 October 1999 in Parakou (see Tables 1 and 2). In all cases, explicit mention was made of the pesticide formulation Callisulfan. The CARDER-Borgou figures may very well underestimate the real extent of endosulfan poisoning in Benin, as they probably only refer to cases in which a direct link could be made with Callisulfan, and cases of less severe poisoning may not have been reported. Furthermore, Callisulfan continued to be available in rural areas after mid-October 1999. The figures should be considered of the minimum number of poisonings observed in northern Benin.

The CARDER-Borgou claims that 37 people died between May and September 1999 in the Borgou province due to Callisulfan use, while another 36 people suffered serious health effects. Deaths and poisonings were reported from 16 villages in seven out of 12 districts or sous-préfectures. As the cotton crop area in the Borgou province is 52% of total area in Benin13, extrapolation impies that 70 people may have died due to endosulfan poisoning over the 1999/00 season, while another 90 people may have suffered serious illness.

Endosulfan use in practice

Right in front of this farmer is a pepper plant growing in cotton which has been heavily sprayed with endosulfan.

Peppers are picked fresh and used for sauces.Photo: Peter Ton

In a separate and unrelated study of pesticide poisoning incidents by the Beninese NGO OBEPAB in Borgou province in the 1999/00 season, the scale of deaths and poisonings due to cotton pesticide use was reinforced. OBEPAB documented 147 cases of poisoning, in which 10 people died and the 137 others suffered from serious ill health. Callisulfan was found to be responsible for 60% of these cases. Young people were the most affected. 85% of the victims were less than 40 years old; 90% of victims were men, and 10% women.

Farmers using Callisulfan as a cotton pesticide also reported dramatic effects on the environment at large. One farmer in the Borgou province stated that: ‘Earthworms emerged from the soil, and subsequently died. Then, birds came to eat the earthworms and they died as well.’ Another farmer even reported that ‘…fields smelt awful two or three days after spraying because virtually every living thing had been killed and started rotting’.

Endosulfan poisoning through food from a cotton field

‘On August, 24, 1999, in the village of Maregourou, three boys between the age of 12 to 14 went to weed the cotton field of their father. The cotton crop was cultivated together with maize. The day before, the father had sprayed the field with endosulfan and the boys did not know. After the work, they were hungry and they took a few maize cobs to eat. Fifteen minutes later they started vomiting. They were taken to the hospital of Bembereke where one boy of 12 died. The two others survived.’

One farmer in the Banikoara region witnessed the break-up of the food chain by endosulfan: ‘Some termites were killed in a cotton farm sprayed by endosulfan. A frog fed on the dead termites, and was immobilized a few minutes later. An owl which flew over saw the immobilized frog, caught it as a prey, and then sat on a tree branch to enjoy its meal. Ten minutes later, the owl fell down and died.’

Elsewhere in the country, the situation was similar. One farmer in the Aklampa area in central Benin reported: ‘This year the product is very effective. It kills everything – even snakes. Earthworms appeared from the soil in large numbers immediately after spraying, and subsequently died. Even the leaves of the cashew nut trees I planted next to my cotton field turned brown due to the new product.’ In Goumori, lots of fish were reported to have died from pesticides running off cotton fields.

Factors ignored by pesticide decision-makers

The dramatic cases of endosulfan deaths and poisonings in Benin can be directly linked to a decision-making process dominated by cotton entomologists, without sufficient back-up from, or debate with, experts in other disciplines, including pesticide experts, social scientists, environmentalists and others. CIRAD defended the introduction of endosulfan14, drawing on the fact that it is used on a large scale in cotton in Australia, the USA, and elsewhere. Australia was emphasised as it claims successes in pesticide resistance management using endosulfan15,16.

However, cotton growing conditions and socio-economic conditions differ enormously between Australia and West Africa. Australian cotton is irrigated, and produced on immense farms of several hundreds to thousands of hectares. Cotton fields are well demarcated, and cotton is the only crop in the fields. Cattle do not roam around in cotton fields, nor eat cotton stalks left over at the end of the growing season17. Packaging materials are destroyed rather than being re-used. And if farmers need pesticides for any specific insect pest for the production or storage of food crops, they can buy them in specialised shops. Also, as pesticides are relatively inexpensive in Australia, there is less pressure to use left-over products on food crops.

This is not the case in Benin or elsewhere in West Africa. In the Borgou province, the use of cotton pesticides for vegetable production and food storage was the predominant cause of death. CARDER-Borgou reported explicitly for at least four death cases that poisoning resulted from ‘…stocked sorghum that had been washed prior to consumption’. The specific characteristics of the product probably explain why people’s common coping strategy (i.e. washing the food before consumption) was dramatically unsuccessful: endosulfan does not dissolve easily in water18. This might also serve as an explanation for the high death-toll reported through contaminated vegetables and through re-use of pesticide packaging materials. Other major causes of involuntary poisoning were: maize and cassava that were contaminated during pesticide transport (16%), okra and maize plants that emerged voluntarily in cotton fields (14%), the re-use of pesticide packaging materials as food cans (8%), and inhalation during spraying (3%).

It is common practice for Beninese farmers to grow other food crops around the cotton fields, to leave voluntarily emerging food crop seedlings in the cotton field, to spray food stocks, and to re-use pesticide packaging materials. Farmers cannot afford and do not have access to proper protective clothing for pesticide application. Farmers tend to spray bare-foot or in sandals, and without the use of safety goggles, gloves, long sleeves or respirators. Men, women and children can be in the field during spraying – as well as sheep, goats and chickens. More often than not, farming families live on diets low in protein, or spray without having eaten properly, which results in a higher susceptibility to poisoning. Inappropriate use of cotton insecticides, for example on food crops or in storage, results from the fact that these are virtually the only pesticides available in the rural areas of northern Benin, and the only ones that are delivered on a credit loan basis. Also, farmers are not adequately informed about the products they use. Such inappropriate uses of cotton pesticides in West Africa is very well known to cotton research institutes19, and should have been taken into account by the PR-PRAO project when selecting insecticides for large-scale application.

Conclusions

Endosulfan should be banned as a compound in West African cotton production as of the next growing season 2000/01, just like all other organochlorine compounds. Organochlorines are not adapted to local growing conditions or to local patterns of use. Endosulfan's high short-term toxicity in particular should have alerted the PR-PRAO project against to using endosulfan as a compound in West African cotton production.

Decision-making on cotton pesticide use in francophone West Africa should be more consultative, rather than remaining in the hands of cotton entomologists. It needs to be more open and public so that other cotton and development experts, women and men farmers, other stakeholders and groups such as consumers' unions and environmental NGOs are actively involved. Integrated management of pests, pesticides, pesticide resistance and crops requires an interdisciplinary and participative approach that goes well beyond the technical level to include social, socio-economic, cultural and ecological considerations, as well as the preferences of cotton farmers, livestock herders and fishing communities in cotton areas, cotton ginning personnel, and consumers of food crops from cotton growing areas.

The PR-PRAO project has made a poor start by copying the already mixed Australian experiences with endosulfan use to West African growing conditions without adequate consideration of local conditions and patterns of cotton pesticide use. The PR-PRAO project should open up as soon as possible, and actively invite other stakeholders to participate in the design, elaboration, execution, monitoring and evaluation of strategies put in place to manage pests, pesticides, pesticide resistance and crops.

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