WHY PARAQUAT SHOULD BE BANNED

Barbara Dinham, Director, PAN UK, on behalf of Pesticide Action Network, explains why the risks associated with the continued use of paraquat are too high and cannot be justified
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The herbicide paraquat has a long history of poisonings and deaths. It is acutely toxic and has no antidote. Less than a teaspoonful leads to death. Many of the recorded deaths have been accidents or cases of suicide. These tragedies have detracted attention from the risks of occupational exposure to paraquat. While regular contact or occasional use does not necessarily result in a fatality, acute poisoning and chemical burns to agricultural workers and small-scale farmers are a frequent occurrence. Recent evidence is indicating new concerns with chronic effects, such as a possible link to Parkinson's Disease.

Public interest organisations have called for a phase out of the production and sale of paraquat also known by its trade name, Gramoxone. The active ingredient was included in the list of 'Dirty Dozen' pesticides drawn up by the Pesticide Action Network (PAN) in 1982. Paraquat has been banned by 13 governments, but according to the manufacturers it is still used in over 120 countries. In 2003, the European Commission's Standing Committee on the Food Chain and Animal Health approved paraquat for use in Member States under its pesticide Authorisations Directive (Plant Protection Products Directive (91/414/EEC)). The decision was not unanimous, and the Swedish government has now taken action in the Court of Justice of the European Communities, charging the Commission with misjudging the risks associated with the use of paraquat, and disregarding its duty of protection. Sweden alleges that the Commission has "overstepped the limit of its discretionary powers by infringing the precautionary principle in connection with the risk assessment and risk management of paraquat." (Kingdom of Sweden v. Commission of the European Communities) Six public interest organisations have initiated legal action against the European Commission in the European Court of First Instance, calling for an annulment (European Environmental Bureau, PAN Europe).

The largest manufacturer of paraquat, now the Swiss company Syngenta, acknowledges that acute health problems, particularly skin irritation and nail damage (www.syngenta.com), 'may be found during occupational exposure, mainly in hand-held applications, as a result of unwashed spillages, from unwashed splashes of commercial product, or from prolonged dermal contact with spray solution.' It adds that the damage is 'indicative of inadequate standards of personal hygiene.' But numerous studies demonstrate that workers and small-scale farmers are living and working in conditions that make it almost impossible to protect themselves against hazardous pesticides (Murray & Taylor 2001, Wesseling *et al.* 2001) .

The annual global sales of paraquat are estimated to be over $1,000 million, equivalent to about 25,000 tonnes (Copping 2002): Syngenta accounted for about $300 million in 2003 (Newman 2004). Paraquat is used widely in the production of maize, fruit and vegetables, rice, sugar cane, bananas, cereals and many other crops. In crops like cotton and potatoes it can be used to desiccate leaves before harvest, and it is commonly used in no-till agriculture.

At least 62% of sales are in developing countries, particularly in Asia and Latin America (See Table 1). This compares to less than 30% of all pesticide sales to developing countries, suggesting that paraquat sales are targeted in these regions. Two years after Syngenta's joint venture to establish a paraquat plant in Nantong, China has become the second largest market for Gramoxone after the US (Syngenta 2002).

In developing countries, 900 million of the poorest people, surviving on under $1 a day, live and work in rural areas. Most depend in some way on agriculture. Few have

Table 1. Indication of paraquat sales in agriculture in 46 top markets (US$000) (Industry sources, data covering the period 1995–2001)

	Sales*	%
Asia (excluding Japan)	154,802	39
Japan	24,769	6
Central and South America	85,842	22
North America	85,784	21
Europe	34,648	9
Africa	7,085	2
Oceania	3,255	1
Total available sales figures	**396,185**	100

**Sales figures from the latest year available in each country, range is 1995:2001.*

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the training, information or resources to protect themselves from hazardous pesticides. In the South African fruit farming industry, for example, a common practice involves applying weed killers from a hand-held hose behind a moving tractor. The herbicide, often paraquat, drips from puncture holes in the hose. The work is regarded as suitable for temporary labour, frequently women workers, who wear little or no protective clothing (London *et al*, 2003). In Malaysia's palm oil plantations, women workers have been spraying paraquat on a daily basis for up to nine months of the year.

Health problems associated with paraquat

The World Health Organisation (WHO) classes paraquat as 'moderately hazardous (class II). WHO reports that risk is dependent on route of exposure as well as the dose, and that the target organs are lungs, kidneys, liver and myocardium. It points out that "(a) Ingestion of large amounts result in multiple organ failure and death; (b) Ingestion of moderate amounts result in renal failure and/or massive pulmonary infiltration and fibrosis. Fatalities are not uncommon; (c) The concentrated product is severely irritant and local exposure can result in mucous membrane, skin and eye damage." (http://www.inchem.org/documents/pims/chemical/pim399.htm). Systemic paraquat poisoning is characterized by burns of the upper digestive tract and multi-organ failure. Less frequently there is damage to the central nervous system, myocardium, suprarenal glands and muscles. Death generally follows within three weeks of ingestion of small quantities of paraquat (http://www.inchem.org/documents/pims/chemical/pim399.htm).

Although many paraquat deaths in the past were by accidental ingestion, the addition to formulations of a dye and strong smell has reduced this risk. However while large companies add these deterrents, many smaller producers do not.

Many suicides occur because of easy access to a lethal agent at a time of crisis (Lester 2000). When paraquat is the suicide agent, a cry for help or moment of acute distress results in a long and painful death (Gunnell & Eddleston 2003, www.pan-germany. org download/fact_paraquat2.pdf). It is not safe to assume that the majority of fatalities are deliberate. Suicide cases appear more often at hospitals and are reported in surveillance systems, but there is strong evidence of chronic under-reporting of occupational pesticide poisonings. One study identified 15 occupational fatal poisonings, including five due to contact with diluted spray solution (Wesseling *et al*. 1997). A study of rural communities in seven Central American countries found under-reporting rates of at least 98%. Of these 76% were work-related. The survey suggests that 4.9% of those exposed to pesticides (200,865 of the survey sample) suffered a symptomatic episode of pesticide poisoning requiring medical treatment during the period 2000–2001 (Murray *et al*. 2002). Paraquat was one of 12 pesticides responsible for the majority of cases. Almost twenty percent of the poisonings reported to the surveillance system of the Costa Rican Ministry of health were caused by paraquat (Ministry of Health, Costa Rica 2001).Twenty of 26 deaths from pesticides were due to paraquat. With almost no protective equipment, small-holders use paraquat very widely in the country on banana, cocoa, coffee, pineapple, cotton and oil palm plantations (Foro Emaus 2004). For millions who spray paraquat, often on a daily basis, it is important to recognise that the acute effects can be constant, painful and debilitating, and can include:

- skin problems ranging from mild irritation, burns, ulceration, peeling, necrosis (cell death in skin tissue), of hands, thighs, legs, feet, back and scrotum
- eye injuries including blepharitis (eyelid inflammation), conjunctivitis, ulceration or keratosis (growth like a wart) of the cornea
- damage to finger nails, ranging from localised discolouration to nail loss
- nosebleeds resulting from local irritation of the upper respiratory tract, burning sensation in the nose and throat

In developing countries dermal exposure is the most likely route of uptake (Wesseling *et al*. 2001). While paraquat is poorly absorbed through intact skin, penetration is increased by damage. Scratches and broken skin are common in physical agricultural work, and paraquat itself is a skin irritant. Inhalation is not considered a high risk, but can occur under some application methods. Accidental oral exposure can occur through splashes in the mouth during mixing, splashes in the mouth during spraying when slipping or when a hose detaches, blowing or sucking blocked spray nozzles, eating with contaminated hands, or eating contaminated food. It may occur from swallowing 'run off' on the face caused by droplets in spray mist. Further, families and communities are exposed through spray drift, washing drenched clothes, household storage and other routes.

Because chronic health effects emerge over time, it is difficult to identify the cause and effect. However recent concerns have linked paraquat to Parkinson's Disease (PD). PD results from a degeneration of the brain cells which produce dopamine, the substance allowing people to move normally. A US study of 20,000 farmers, of whom 55 had PD, revealed unequivocally that "selective dopaminergic degeneration … is a characteristic of paraquat neurotoxicity." (McCormack *et al*. 2002) The findings are backed up by other research and epidemiological studies (Thiruchelvam *et al*. 2000, Liu *et al* 2003). A South African study has indicated that regular exposure to paraquat will lead to reduced lung capacity (Dalvie *et al*. 1999).

Paraquat and the environment

Although persistent in soil, because of its ability to bind quickly to clay particles paraquat is not considered to be a significant environmental contaminant. Nevertheless, the German registration authority asserted in 1983 that repeated treatments of paraquat led to accumulation in the soil and damage to crops. ICI (the original producer, and a forerunner of Syngenta) took legal action. Although the German

authority lost the court case, it allows use on the same area no more than once every four years in maize, sugar beet and tree nurseries, with additional limitations on use in grape vines. Wider registrations were refused because of effects on the environment (BGBl. I S. 1533 2003). When authorising continued use of paraquat in European Member States, the Standing Committee called attention to adverse impacts on ground nesting birds, lethal and sub-lethal effects on hares and the need to protect aquatic organisms (Commission Directive 2003/112/EC 2003).

Precautions, restrictions and bans

Many governments have banned paraquat because of its health risks. Ten of these, including six industrialised countries, have formally notified the Secretariat of the Rotterdam Convention on Prior Informed Consent (PIC) of their ban: Austria, Denmark, Finland, Indonesia, Republic of Korea, Kuwait, Sweden, Hungary, Slovenia, and Togo. As most of these bans were taken some years ago none meets the Convention's definition for inclusion in the PIC List. The Swiss government has announced it will review its 1989 ban in order to notify its control action (Swiss Federal Council 2002).

Malaysian plantation workers have struggled for almost 17 years to encourage their government to ban paraquat (Agrow 2002), and in 2002 the government announced that all new applications to register or re-register paraquat would be rejected. The authority concluded that less risky alternatives are readily available on the market and that paraquat poses unacceptable risks to the main users (Agrow 2002).

Many countries stipulate precautionary risk mitigation measures. When the US Environment Protection Agency (US EPA) re-registered paraquat in 1997, it found that the margin of exposure for handlers using a backpack sprayer had been too low (US-EPA 1997). The US restricts paraquat for purchase and use only by certified applicators. Workers who mix and load paraquat are required to supplement their use of Personal Protective Equipment (PPE) by wearing gloves, a chemical-resistant apron and face shield. PPE requirements for those applying paraquat include a long-sleeved shirt and long pants, chemical-resistant gloves, shoes and socks. A minimum 12-hour re-entry interval should be observed. These conditions would only be met in developing countries under exceptional circumstances. The European approval of 2003 (Commission Directive 2003/112/EC 2003) prohibited use by knapsack and handheld applications in home gardening by either amateur or professional users. Pesticide workers in developing countries will regularly use this method of application, using stronger formulations, and without access to the washing and medical facilities available to European home users.

The European authorities were concerned about the implications of their registration for developing countries and a letter from Syngenta (Syngenta 2003) indicated that it runs "training programmes on safe use of paraquat". Company-led training in paraquat use cannot reach the many millions of agricultural workers and small-scale farmers applying paraquat, address poverty, or meet the scale of the problem. Any public funds for training could be more appropriately used to support more sustainable alternatives. In the meantime, the Malaysian Palm Oil Association (MPOA) placed two full-page 'advertorials' in the local press arguing that the European registration justifies continued use in Malaysia (New Sunday Times 2003). Such company campaigns undermine the risk-based decisions taken on the evidence of an analysis of local and national conditions.

Conclusion

The problems of paraquat can only be addressed by removing it from the global market, and by making a transition to less hazardous, more sustainable alternatives. These must be economically and environmentally sustainable, and must not damage human health or biodiversity. In the long term, all stakeholders are working to achieve this objective. The steps along the way will include better education and training for farmers, accessible information about viable pest management strategies in an IPM context and the availability of safe and effective products. In setting priorities to achieve this goal, action needs to target the withdrawal of pesticides that cause harm to those most at risk from exposure. While paraquat remains on the market, it will continue to be sold and used under conditions that contribute to health problems and misery. The only way to avoid these problems is to withdraw paraquat from the global marketplace.

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