



# ChemicalWatch Factsheet

A Beyond Pesticides/ NCAMP Factsheet

## Paraquat

While a major expansion in the use of paraquat dichloride (Gramoxone™) is being considered in the United States for cannabis eradication, several other countries, including Finland, Sweden and West Germany, have banned or refused to renew registrations for paraquat in recent years, citing the high risk of acute toxicity.

A notoriously toxic agent, paraquat takes thousands of lives every year, particularly in developing countries, and for this reason is included on the Pesticide Action Network's "Dirty Dozen" list of pesticides that should be removed from the world market.

In mammals, paraquat attacks the epithelial tissues (the skin, nails, the cornea of the eye, and the linings of the respiratory and gastrointestinal tract). There have also been reports of damage to the heart muscle and to nerves. It is easily absorbed through the skin as well as orally. Paraquat causes specific damage to the lungs, where residues concentrate in a particular lung cell, the pneumonocyte. This leads to the formation of large amounts of non-functional scar tissue, so that poisoning victims suffocate to death. Paraquat is also

a lung carcinogen in rats.

There is no antidote, except to remove as much of the material from the system as possible by feeding bentonite clay or activated charcoal, nor is there very clear medical understanding of the mechanism by which paraquat does its damage. One hypothesis holds that the cell damage is related to the ability of

with paraquat annually, particularly in no-till/minimum-till corn and soybean production. Paraquat is also used in cotton and potato fields and in orchards. In its recently released Environmental Impact Statements, DEA is proposing to use paraquat, 2,4-D and glyphosate for control of cannabis on 1.9 billion acres of non-federal lands alone. Paraquat is not, however, currently registered for use on rights-of-way or on ditchbanks, and has never been registered for use in forests due to concerns about wildlife toxicity.

Paraquat is rapidly absorbed by foliage and is very resistant to removal by rain. It is active

only in the presence of light and on the green part of the plant, although the residues are susceptible to photodegradation. It binds tightly to clay particles, and is extremely difficult to dislodge once so bound, essentially making the residues biologically unavailable. This tight binding reaction protects residues from the sun and from microbial degradation, accounting for its long environmental half-life of greater than 45 days. In soils with low clay content, such as may be found

### *chemicalWATCH* Stats:

**Chemical Class:** Bipyridylum, dipyridylum

**Use:** Non-selective contact herbicide for control of weeds and grasses in agricultural and non-agricultural areas. Restricted Use Pesticide.

**Toxicity rating:** Moderate to high acute toxicity

**Health Effects:** Highly toxic if inhaled -acute toxicity I for inhalation effects. Linked to Parkinson's Disease.

**Environmental Effects:** Immobile but persistent in soil. It is moderately toxic to birds, mammals and non-target plants.

paraquat to generate toxic free-radicals, primarily hydrogen peroxide. Mortality is high, ranging from 33-78% according to a 1983 review. Those patients who survive the pulmonary damage face a protracted convalescence, and possibly a shortened lifespan.

Paraquat is an extremely nonselective, water-soluble contact herbicide of the bipyridyl class. It is a powerful and fast-acting desiccant- a marijuana plant dies within hours after treatment. The Drug Enforcement Agency (DEA) estimates that between 10 and 12 million agricultural acres in the U.S. are treated

in Hawaii, paraquat residues can be mobilized due to their water-solubility. In 1973, rain-mobilized residues poisoned 60 geese in Cuba, and other reports have been published of large fish and rabbit kills after paraquat applications.

Hatch-rates of bird eggs have also been reported to be negatively affected.

Paraquat is produced by the British firm ICI (Imperial Chemical Industries) thought to be the largest privately held firm in Great Britain. Until the recent cancellation of their agreement with ICI,

Chevron held the sole franchise for the distribution of paraquat in the United States. ICI is rumored to be considering a major expansion of its paraquat production capacity in England.

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Paraquat is the common herbicide name for 1,1 -dimethyl-4, 4 -bipyridinium dichloride. Commercially available paraquat is produced and sold as the dichloride salt. In the US, paraquat is classified as "restricted commercial use," meaning people must obtain a license to use the product. The US EPA completed the Reregistration Eligibility Decision (RED) for paraquat in August 1997. To mitigate the high risk of occupational exposure, the EPA outlined modifications for the personal protective equipment (PPE), reentry periods of 12hrs and 24hrs for spraying and harvesting uses. The chronic risk assessments used by the EPA found no significant adverse effects.

However, recent studies have linked paraquat to reproductive effects and Parkinson's disease (PD). It has been shown that farm workers exposed to paraquat were twice as likely to develop Parkinson's disease. In a study conducted in Taiwan, where paraquat is commonly used on rice fields, the odds ratio for PD was as high as 6.4 among those exposed for more than 20 years. Animal models have also reported a reduction of dopamine neurons in the substantia nigra- a part of the brain that controls muscle movement- after paraquat was administered to rodents.

The European Union formally banned paraquat in July 2007, citing failure to meet strict EU health standards. The ruling indicated that the European Commission, which is responsible for regulating herbicides and pesticides, was mistaken when it found no signs that the chemical could cause nervous system diseases such as PD since it failed to review existing studies on paraquat.

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