

## Endosulfan ban in India: for good or not?

Endosulfan is an organochlorine insecticide used on a wide range of food crops and cash crops. It does not dissolve easily in water. It breaks down on exposure to sunlight, but in shade or in a humid area it adheres to soil particles and takes a long time to degrade completely. Endosulfan is a neurotoxicant, causes mild headache to severe poisoning and may even result in death depending on dosage and other factors. The United States Environmental Protection Agency has categorized endosulfan as a 'highly toxic' substance. Carcinogenic risk of endosulfan was proven in experimental studies on animals. However, there is no substantial evidence of its carcinogenicity in humans. Endosulfan is banned in more than 75 countries and in some countries like Argentina, Peru and Chile, the demand for alternative pesticide substances increased after the ban (<http://ipsnews.net/news.asp?idnews=55474>). Recently, India witnessed a furor over banning endosulfan, with reports appearing on endosulfan poisoning, and the subsequent political pressure.

Pesticides are efficient weapons against pests but may affect some non-target or non-harmful and beneficial organisms and persist in the air and/or water, and/or soil environments. Most of the synthetic chemical pesticides are toxic to the environment at varying degrees. Toxicity of pesticides or any hazardous substance on living organisms depends on the mode of exposure, dose, duration and individual traits. Exposure to agricultural pesticides happens mostly from food and contaminated drinking water. Farmers perhaps have a greater probability of exposure to pesticides because of unsafe use, direct contact with the skin and inhaling contaminated air. Global pesticide use has increased 50-fold since 1950, with the drastic growth in human population. The following pesticides have caused accidents in different parts of the country during 1958–2002: parathion, benzene hexachloride, endrin, DDT, diazinon, aluminum phosphide, methyl isocyanate, cartap hydrochloride, phorate and endosulfan<sup>1</sup>. Among these, DDT, diazinon, aluminum phosphide, methyl isocyanate, cartap hydrochloride, phorate and endosulfan pesticides are not yet banned. Endosulfan was previously banned in Kerala and has been recently banned in

Bihar. Currently, in India 217 pesticides are registered under section 9(3) of the Insecticide Act, 1968 for use and 65 technical grade pesticides are manufactured indigenously.

India is the largest producer of endosulfan worldwide and consumption is also high for agricultural insect pest control purposes. Endosulfan is recommended by agriculturists to the farmers for controlling most of the economically significant pests such as *Helicoverpa armigera* (American bollworm) and *Spodoptera litura* (Asian armyworm) in India. *H. armigera* alone has caused about Rs 5,000 crore of crop losses in India<sup>2</sup>. As of now, endosulfan is the most common insecticide used in India for protection of several crops. Insecticide resistant management is one of the major problems in insect pest management. Most of the economically important polyphagous insect pests, including *H. armigera* and *S. litura* have developed resistance against most of the insecticides commonly used. The development of resistance in insects has left many insecticides ineffective. Due to this farmers are trying to apply higher doses of pesticides in the field and prefer using highly toxic pesticides like endosulfan.

To suppress the pest population, overcome insecticide resistant development in pests and conserve the environment, Integrated Pest Management (IPM) strategy is highly recommended to farmers in the current era. In India, some of the agricultural universities, institutions, NGOs and other volunteer groups are actively involved in IPM, organic farming and non-chemical management programmes, and awareness and training programmes for farmers. The funding agencies of the Indian government like ICAR, CSIR, DST, DBT and UGC are financially supporting scientists and volunteers to promote eco-friendly agricultural programmes. Despite this, due to inadequate knowledge, illiteracy, poverty and competitiveness, farmers are involved in the indiscriminate use of chemical pesticides. India is an agriculture-based developing country; nearly 60–70% of the people depend on agriculture. IPM or organic farming programmes are not completely implemented all over the country. Approximately, only 5–10% of the farmers follow the eco-friendly pest

management programmes in large-scale farming. Eco-friendly programmes are not attractive to the poor farmers as well as large-scale farmers because of the requirements of extra skill and labour.

In developing countries, farmers cannot afford and do not have access to protective clothing for pesticide application; pesticide sprayers tend to spray pesticides barefoot or with open shoes, without using safety goggles, gloves, long sleeves and respirators. In developed countries, on the other hand, farmers use sophisticated materials and methods. Furthermore, in the temperate regions pest control problem is less compared to that in the tropical regions. Unfortunately, in India's warm climate, pest attack is more on agricultural crops. Alternative sources are urgently required to solve the pesticide issue. Already the demand for biological pesticides and other resources has increased in India. Countries like Germany and Benin where endosulfan is banned, are providing alternative ways of protecting crops ([http://www.pan-germany.org/download/field\\_guide\\_without\\_endosulfan.pdf](http://www.pan-germany.org/download/field_guide_without_endosulfan.pdf)). But are these methodologies suitable for India or Indian farmers?

India is a lead producer, consumer and exporter of endosulfan. Regarding the ban on endosulfan in India, pest management experts, particularly entomologists, play a vital role in the decision-making process compared to clinicians, environmentalists, social scientists, politicians and others. More Farmer's Field Schools for IPM should be implemented and organic farming programmes be promoted in villages or Panchayats. By introducing genetically modified crops, we can restrict the use of pesticides in India. Otherwise, endosulfan ban can lead to agricultural complications.

1. Arora, S., Dureja, P., Kanojia, A. J. and Bambawale, O. M., Report, National Centre for Integrated Pest Management, New Delhi, 2009, p. viii, 110.
2. Gujar, G. T., Chandrashekar, S. and Kalia, V., *Curr. Sci.*, 2006, **90**(7), 907.

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