

## **Impact of Pesticides Application in Agricultural Industry: An Indian Scenario**

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### **Abstract**

Application of chemical pesticides dates back in India since 1948 while the production started in 1952 with the establishment of manufacturing plant of DDT & BHC near Calcutta. The pesticide consumption in India during the period 1954-2000 shows that it has raised from 434 MT to 46,195.16 MT. Cotton (36%) is the highest pesticide consuming crop followed by rice (20%). Andhra Pradesh is the highest pesticides consuming state (23%) followed by Punjab & Maharashtra. At present, in India nearly 150 pesticides are registered with legal application. Currently India is the largest producer of pesticides in Asia and ranks 12<sup>th</sup> in world for application of pesticides. Despite their enormous benefits the unregulated and indiscriminate application of pesticides has raised serious concerns about environment and human health. Indian records show first case of lethal death back in 1958 in Kerala while consuming contaminated wheat flour with parathion. 25 million agricultural workers in the developing countries are suffering of an episode of poisoning every year. The series of lethality continues with many incidences such as Bhopal MIC tragedy & latest Bihar, Saran district, tragedy where more than 30 children died because of consuming of monocrotophos, a deadly organo-phosphorus pesticide. Besides these alarming numbers long term exposure at even low concentration causes serious health problems such as immune-suppression, hormone disruption, diminished intelligence, reproductive abnormalities, and cancer. The obvious reason lies in the research data that says only 0.1% of pesticide application targets the pest rest 99.9% remain and seep in environment. So the purpose of present article is to minimize the hazards of chemical pesticides with their regulated and controlled application as well as

focuses on the importance of bio-pesticides and Integrated Pest Management for sustainable development in Indian agriculture.

**Keywords:** Chemical Pesticides, Biopesticides, Hazards.

## **1. Introduction**

Agriculture is the lynchpin of the Indian economy and contributes 18% to the GDP. Ensuring food security for more than 1.27 bn Indian populations with diminishing cultivable land resource is a herculean task. In the process of achieving the target pesticides play an important role in Indian agriculture. Pesticides, the agrochemicals, are one of the invaluable inputs in sustaining the agricultural production as substantial food production is lost due to insect pests, plant pathogens, weeds etc. However since the green revolution (1966) has been started in India, the application of these chemicals increased more than hundred times and causing tremendous loss to environment and human health. Internationally big effort is made to safe use of chemicals which are reflected in Chapter 19 of Agenda 21 which identified the elements for the sound management of the chemicals. In India Nearly 65% of the workforce derives livelihood from agriculture and are therefore exposed to chemical pesticides (Asian Monitor Resource Centre). The rampant use of pesticides has played havoc with living beings and the environment as these chemicals persist and seep in environment for a long time because of more water solubility, tendency to adsorb to the soil (soil adsorption) and more half-life that is tendency to persistence in the environment.

Consumption and production Pattern of Pesticides in India:

It started in 1948 with the application of Miracle organochlorine insecticide DDT which was synthesized by Mueller with its insecticidal properties, in 1939. Production dates back in 1952 with the establishment of a plant for the production of BHC near Calcutta. Since then and India is now the second largest manufacturer of pesticides in Asia after China and ranks twelfth globally (Mathur, 2010). There has been a steady growth in the production of technical grade pesticides in India, from 5,000 metric tons in 1958 to 85,000 MT in FY09-10. (Directorate of Plant Protection and Quarantine;2011). The size of the Indian pesticide industry was estimated at Rs.180 bn during FY10, including exports of Rs. 100 bn which is about 2% of the total world market (Statistics India Data 2011). However in global context pesticide consumption in India is low (around 500 g per ha) compared to other countries like Japan (12 kg per ha) and Germany (3 kg per ha). In India problems resulting from unregulated and uncontrolled usage are quite alarming. It can be attributed to fragmented land holdings, lower level of irrigation, dependence on monsoons, low awareness among farmers about the hazards of usage of pesticides etc.

## **2. The pattern of pesticide usage**

India, being a tropical country, the consumption pattern is also more skewed towards insecticides (Indian Pesticides Industry; 2011). So the pattern of agrochemical-application in India is not similar to that for the world in general. In India 76% of the pesticide used is insecticide, as against 44% globally (Mathur, 1999). The herbicides and fungicides' application is correspondingly less heavy. Crop wise, cotton accounts for the maximum share of pesticide consumption i.e. around 37% followed by paddy (20%). In India together they account for around 57% of the total pesticide consumption. While the wheat and pulses contribute of about 4 %, vegetable 9 % and the other plantation crops 7 % (Ministry of Agriculture, 2009). State wise Andhra Pradesh is the highest pesticides consuming state (23%) followed by Punjab & Maharashtra.

## **3. Hazard of Agrochemicals**

Presently pesticides are present as common contaminants in the biosphere and on non-target organisms in our urban landscapes, where they can affect plants and animals ranging from beneficial soil microorganisms and insects, non-target plants, fish, birds, and other wildlife. There is now overwhelming evidence that some of these chemicals do pose a potential risk to humans and other life forms and unwanted side effects to the environment (Forget, 1993; Igbedioh, 1991; Jeyaratnam, 1981). One of the consequences of indiscriminate use of pesticide is the adverse health impact on society in general and vulnerable population like children in particular. Among human beings some of the well-known health effects of pesticide exposure include acute poisoning, cancer, neurological effects and reproductive and developmental harm (CSE, 1997).

Researchers at the New Delhi based Centre for Science and Environment have found alarmingly high levels of pesticides in blood samples of villagers in Punjab, the showpiece state of India's green revolution. India needs to urgently take a tough look at the indiscriminate and careless use of pesticides (Ramesh Menon 2006)\*. A study of randomly selected blood samples from four Punjab villages viz, Mahi Nangal, Jajjal and Balloh in Bhatinda district and Dher in Ropar district revealed six to thirteen pesticides in virtually all the blood samples, some of them include HCH, Aldrin, DDT, Monocrotophos, Endosulfan, Phosphamidon, Chlorpyrifos and Malathion (H. B. Mathur, H. C. Agarwal; CSE, 2005) Cancer cases are rampant in the villages of Punjab due to prolonged exposure of pesticides.

Prolonged pesticide exposure includes liver malfunction, immune malfunction, neurologic impairment, and reproductive effects yielded inconclusive results. An excess mortality from cardiovascular and respiratory diseases was uncovered, possibly related to the psychosocial consequences of the accident in addition to the chemical contamination. An excess of diabetes cases was also found. Results of acute carcinogenic cases result into mortality. However, results cannot be viewed as conclusive side effects of pesticides, because of various limitations. Recent research supports the early notion that dioxin is carcinogenic to humans and corroborates the

hypotheses of its association with cardiovascular- and endocrine-related effects, both are notorious pesticide components (Pier *et al.*, 2001).

Operation Ranch Hand, lasted from 1962 to 1971 during the Vietnam War where United States military forces sprayed nearly 19 million gallons of herbicide on approximately 3.6 million acres of Vietnamese and Laotian land to remove forest cover, destroy crops, and clear vegetation from the perimeters of US bases. Various herbicide formulations were used, but most were mixtures of the phenoxy herbicides 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T). Approximately 3 million Americans served in the armed forces in Vietnam during the Vietnam War. Some of them (as well as some Vietnamese combatants and civilians, and members of the armed forces of other nations) were exposed to defoliant mixtures, including Agent Orange. There was evidence on cancer risk of Vietnam veterans, workers occupationally exposed to herbicides or dioxins (since dioxins contaminated the herbicide mixtures used in Vietnam), and of the Vietnamese population.

#### **4. Green Gold: Bio-pesticides; the only option to chemical pesticides**

Bio-pesticides are typically microbial biological pest control agents that are applied in a manner similar to chemical pesticides. Most beneficial advantages of bio-pesticides are that they are the harmful residues are not detected. They can be cheaper than chemical pesticides when locally produced. They can be more effective than chemical pesticides in the long-term. They are Biodegradable. Currently in 2013 there were approximately 400 registered bio-pesticide active ingredients and over 1250 actively registered bio-pesticide products (U.S. Environmental Protection agency).

#### **5. Conclusion**

It is estimated that around 800,000 people in developing countries may have died due to pesticides since the onset of the Green Revolution. Nearly 20,000 people in developing countries die each year of pesticide consumption through their food - multiply that by 40 years (The World Health Organization). Demonstration of IPM & farming without chemical pesticides is possible and viable & was demonstrated under a unique programme called Community Managed Sustainable Agriculture (Andhra Pradesh's Govt.), on 10 lakh (1, 00,000) acres of land in 2008, when farmers used ecological practices and principles to grow their crops.

So application of chemical pesticides, and using extremely toxic pesticides that endanger farm workers, is unacceptable. The government bodies should acknowledge these alternatives and provided proactive support to farmers so that they may shift to ecological, sustainable and healthy ways of farming. Thus use of biopesticides as a component of Integrated Pest Management (IPM) programs can greatly decrease the use of conventional (chemical) pesticides, while achieving almost the same level of

crop yield. However, effective use of biopesticides demands understanding of a great deal about managing pests especially by the end users.

\*In April 2006, Ramesh Menon won the Ramnath Goenka Excellence in Journalism award for Environmental Reporting, for his articles on pesticide poisoning in Punjab.

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