The case for banning endosulfan

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The 'Commentary' by Sreekumar and Prathapan[1] that brings to light a few flaws in the medical reports[2,3], makes interesting reading. The endosulfan case of Malabar coast, considered as one of the worst pesticide disasters in the field of community health and toxicology, needs no introduction. This extended tragedy was reasoned out to the two-decades long aerial-spraying of endosulfan over the cashew estates of Plantation Corporation of Kerala (PCK) without a proper monitoring of its collateral impacts. After a multitude of media reports, subsequent several studies, court cases and years of pugnacious and widespread public protests, in 2003, the High Court of Kerala banned the sale and use of endosulfan within the state. Latest in 2011, it is enlisted under the persistent-organic-pollutant category, to be eliminated worldwide[1].

Pesticides in cashew – a critical evaluation

A proper understanding of the trends and patterns of the use of pesticides in cashew is essential for making a holistic analysis of the endosulfan issue. A review article[4] describes how pesticides developed through 4–5 phases. The first phase is 'subsistence'; in particular for cashew being grown on eroded soil prior to 1960. Shortly follows the second phase, i.e. 'exploitation' wherein irrigation, fertilization and crop-protection practices were introduced. DDT was the first insecticide to be used widely against tea mosquito bug *Helopeltis antonii* (Figure 1) followed by carbaryl, endrin, dieldrin and gamma-HCH (lindane) as the standards. The cashew plantations now under PCK were then under the Government during 1963–1997. From 1963 onwards, agro-chemicals were used extensively in cashew estates. Hand pumps along with toxic chemicals like endrin were in use without proper precautions. From 1980, 'aerial spraying' was started as it proved to be effective and economical in large-scale plantations. In the 'exploitation' stage, different generations of pesticides (organo-chlorines, organo-phosphates and carbamates, synthetic pyrethroids and botanicals) were tried and tested. The third one in the series was the 'crisis' phase that emerged as a result of indiscriminate use of pesticides coupled with the introduction of a large genetic variability through hybridization and varietal improvement programmes (Figure 2). This promoted the pest build-up in more susceptible types. For its additional fungicidal property, endosulfan has proved to be most effective in field trials across the country for the last couple of decades[4]. It could protect cashew from bug (tea mosquito) – fungi (*Colletotrichum*) complex successfully, which is why it was adopted in large scale. The fourth and the worst phase, namely 'disaster', followed with all these problems aggravated to serious proportions coupled with allegedly all sorts of health hazards in Padre village, as reported by the Centre for Science and Environment (CSE), New Delhi. Many media reports over the last decade[5] implicated endosulfan as the sole culprit. One good reason to cheer CSE, howsoever questionable its allegations may be is that it could, at least, trigger a serious scrutiny of the scientific community as well as the policy makers for environment-impact-assessment of

Figure 1. Tea mosquito bug – target insect pest for endosulfan spray in cashew plantations.

Figure 2. Cashew plantation in Kerala. Young plants (hybrids) are more vulnerable to tea mosquito bug attack. (Inset) Damaged cashew reproductives.

chemicals used in cashew, chiefly of endosulfan.

Critical calculation

A critical look into the data on chemical control over 3500 ha (under PCK plantation), in the light of the recommended three-round standard chemicals[4], on even a conservative estimation (viz. endosulfan 2 ml/l, 5 l water/tree, 100 trees/ha) amounts to 3500 l of endosulfan per one round spray. For a period of two decades, it amounts to not less than 70 tonnes in PCK plantations. One can imagine (assuming even a half-life period of 3 months) how much would be left in the environment. Add to this is the fact that in an insecticidal application, more than 99% goes waste and enters the environment as pollutant[4].

Concerns and counter arguments in the Commentary[1]

(1) While dealing with the clause subheading 'Sociological confounding issues ignored', the authors' mention: 'This study had been designed to assess plausible improvement in the reproductive health of women following withdrawal of endosulfan application. The study report has specified that data on the reproductive health events in all married women in the study area were collected. However, women are literally transplanted into the family of their husbands following marriage, under the Indian family system, for which Kasaragod is no exception. This means, at least a section of the women studied by the CMC researchers was living outside the study area with their parents during the period of application of the insecticide.'

The table 1 (critique[1]) in the medical report[2] should have been more appropriately titled as 'Natality-related (rather than reproductive-related) events'. Even when women were shifted/migrated from unsprayed areas to sprayed areas, the natality-related events were taking place within the sprayed areas and were obviously post-nuptial.

Similarly, 'many housewives in Banam (unsprayed reference area) are likely married into their respective families from the neighbouring sprayed areas'. This argument rather supports the fact that despite this, the natality-related events were lower compared to the sprayed areas dataset, thereby making statistical significance still robust.

(2) *Inconsistencies in the results and conclusions of the study*. Endosulfan residues in blood samples reportedly[2] ranged from 2.51 to 170 ppb, as against 0–12.7 ppb found in the NIOH study[6]. The cited fourfold increase over 10 years, according to the critique[1], based on such a comparison sounds almost unfounded as the sampling procedure, detection methodologies and protocols might have been different for these two different studies. Even after the cessation of spraying, endosulfan residues may still be present in the environment. Let alone any increase, the mere presence of endosulfan in blood serum[2] is quite disturbing. The NIOH report[6] observed endosulfan residues in 85% and 75% of female and male subjects respectively. The report concluded a close similarity between the spectrum of the health effects observed in the study population and those in the animal experiments, and the possibility of endocrine-disrupting effects in its study. The Centre for Water Resources Development and Management (CWDRM) reported no detectable endosulfan residues in water. In contrast, extremely high levels of residues were observed in the blood serum.

(3) The 2001 census data show that Kasaragod does not have an increased rate of any of the mental or physical disabilities compared to other districts in the state. There are no reliable data to prove that there is a higher occurrence of any disease or disability in the sprayed area compared to the unsprayed area. By stating so, it implies that the entire Kasaragod district was sprayed with endosulfan as against unsprayed other districts. This is not the reality.

The allegedly increased health issues in endosulfan-sprayed areas in Kasaragod have not been proved conclusively by any study till date. It is quite difficult to exclusively prove the ill-impacts of a pesticide like endosulfan in a country like India, that too after almost a decade of stopping the spraying schedules. If the same method of spraying, viz. aerial spray had been adopted for other toxic pesticides like monocrotophos, etc. it might have resulted in the same magnitude of problems as endosulfan reportedly did. The fact that endosulfan is (at least) suspected and is already under a phase-out process in many developed countries, (thereby making a strong ground for it to be dumped in India too), further instils confidence in the agitating masses. The fear psychosis amongst the victims of the sprayed areas, many times multiplied by media hype, must be dispelled with proper care and counselling; and the propaganda causing it must be stopped for the larger good of the nation.

Circumstantial causality, nevertheless national necessity

A lot of hype persists in the media about banning endosulfan. A seed of suspicion, however, sprouts in one's mind when concerted attention is drawn towards a single pesticide. What is the ground reality, and whether it is a lobby played by some influential forces against endosulfan, is a matter of past debate right now. The more one searches on the Internet, the suspicion rather soars. Available are both negative[5] as well as supporting/positive views on this controversial issue. If reflected in scientific perspective, a pertinent question arises as to why adverse health effects similar to those seen in Kasaragod have not been reported from other parts of the nation consuming endosulfan in much larger quantities? [Kerala accounts for a meagre 1% of total pesticide consumption compared to Andhra Pradesh (14.3%), Maharashtra (11%), Madhya Pradesh (10.1%), West Bengal (9.3%) and Rajasthan (7.5%).] Is there something unique about the Kasaragod issue? An article in *Frontline*[7] reasoned it out to the improper mode of application, and blatant violation of the laws and regulations behind the apparent adverse effects of endosulfan. In another article the after-effects of the endosulfan ban was apprehended[8]. Endosulfan is banned in more than 75 countries; and the demand for alternative pesticides has increased after the ban. Some countries like Argentina, Peru, Chile, Germany and Benin are providing alternatives as well. But are these methodologies suitable for India? It is high time we realized the fact that our country should walk along other nations in the global fraternity, and that the circumstantial pressure cannot be ruled out in such situations.

Human rights perspectives cannot be ignored

The right to live in a pollution-free world is a basic human right; and this funda-

mental right to life is threatened by toxic chemicals, hazardous wastes, and contaminated drinking water and food[9]. Human rights entail access to free, prior and informed consent by all sectors of civil society in the regulatory decision-making aspects of chemical safety, and to information on risks that pesticides pose to human health and environment. Majority of the pesticides currently in production and use have still not been adequately tested for their impact on human health and environment, particularly in the face of emerging concerns that challenge the central dogma of toxicology such as endocrine disruption, epigenetics, ongoing low dose exposures, etc. No doubt, the chemical industry plays a significant role in the global economy. But at the same time, it is a matter of grave concern that a steadily increasing share of the global chemical production is shifting to the developing and transition countries that lack the capacity to manage and regulate the compliance mechanisms for mitigating risks to human health and environment. We cannot afford avoiding global phase-out of hazardous, unmanageable chemicals, viz. pesticides, persistent bio-accumulative toxins, endocrine-disrupting chemicals that affect reproduction, immune and nervous systems, and substances that involve long-range transport. A global phase-out is essential in order to avoid banned and restricted chemicals from one country being sold or dumped in another. We ought to commit ourselves and call upon all stakeholders to act together and urgently reform and harmonize chemical-assessment, regulation and management, both regionally and domestically, so as to achieve a toxic-free future for all of us globally.

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