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RESEARCH ARTICLE

Pesticide use and health risk assessment in drought prone area of Maharashtra

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SUMMARY: The organochlorine compounds are manufactured since 1940 for use as pesticides. It is known that organochlorine insecticides easily accumulate and persist in living system. They are prepared commercially for use in the different fields in the form of dust, spray, liquids and wetable powder, which are generally used as individuals and also in combination with other pesticides. Their extensive use during 1940-1970s revolutionized modern agriculture, which interns increased the output of crops. However, they are not safe for house hold applications as they persist in the environment for large duration after their initial use. The organochlorine, organophosphorus, pyrethroids etc. pesticides are widely used in agriculture. Their applications and usage have increased tremendously in the few last decade. Drought prone area of Maharashtra state (India) is famous for pomegranate and horticultural activities. To control crop pest and to improve crop yield, various kinds of pesticides and fertilizers were applied on large scale. Especially the use of organochlorine pesticide is banned by many country because of their bioaccumulative properties in aquatic organisms and human health hazards, still they were used in drought prone area. By considering these aspects present study was conducted to study health risk assessment, pesticides use and practices in drought prone area of Maharashtra (India).

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The production of pesticides started in India in 1952 with the estimate of a plant for the production of BHC near Calcutta, and India is now the second largest manufacturer of pesticides in Asia after China and ranks twelfth globally (Mathur, 1999). The term pesticides covers a wide range of chemical compounds including insecticides, fungicides, herbicides, rodentcides, molluascicides, plant growth regulators etc. Among these, organochlorine insecticides used for controlling a numbers of were banned or restricted after 1960s in most of the advanced countries because of harm to wild life and their bio-accumulative properties.

In India agriculture is the backbone of the economy and contributes 18 per cent of GDP and nearly 65 per cent of the workforce derives livelihood from agriculture. A vast majority of the population in India (56.6%) are engaged in agricultural and are therefore, exposed to the pesticides used in the agricultural fields. (Anonymous, 2002). During Green Revolution high yielding variety of various crops were introduced in to farming system to increase productivity. These varieties were found to be more susceptible to plant pests and diseases which ultimately reflected to intense use of pesticides. Indiscriminate use of pesticides have recently become a matter of public concern in India. Pesticide hazard to producer, agricultural labour and farm workers in a highly unsafe environment who are directly or indirectly exposed to pesticides. The pesticides infest humans through various routes of exposure such as inhalation, ingestion and skin contact. Exposure to pesticide results in acute and chronic health problem. like eye irritation, excessive salivation, headache and chronic disease like cancer, reproductive and developmental disordars, etc. (Yassi *et al.*, 2001).

Pesticides are largely applied by landowner,

low-income peoples, and landless workers. Many of them suffer from malnutrition and the infectious disease make them more vulnerable to poisoning ((London and Rothe, 2000; WHO, 1990).

Specific studies dealing with the pesticide use practices of farmers and its health impact is need to make informed policy decision to bring about change in agricultural practices and awareness among the farmers. Solapur district of Maharashtra comes under semi-arid area. Sangola Taluka is one of the thirteen Talukas of Solapur district. Sangola is considered as drought prone area of Maharashtra where scanty and ill distribution of rainfall is of regular observation. Sangola Taluka is famous for pomegranate and other horticultural practices where various kinds of pesticides are used in large quantity. Therefore, we undertook a study into various aspects of pesticides used in agriculture and its impact on human health in drought prone area of Maharashtra.

EXPERIMENTAL METHODOLOGY

Study had been carried out in the drought prone area of Solapur district which is famous for pomegranate and other horticultural practices in Maharashtra.

Data collection :

The questionaires was designed according to the signs and symptom. The interview questionnaires were designed to elicit details on the land ownership, plantation, exposure to pesticide, modes of pesticide use, commonly used pesticides, precautions taken, signs and symptoms of illness related to pesticide exposure etc. have been studied. The sprayerers population was classified according to the age group. In addition to the severity class, the total sum of signs and symptoms reported in each questionaires was also considered. As an indicator of poisoning, details of signs and symptoms were collected as self-reported by the farmers. Pesticides were categorized according to WHO classification (WHO, 2004).

EXPERIMENTAL FINDINGS AND DISCUSSION

The present our study showed that many hazardous and highly hazardous pesticides like phorate, endosulfan and monocrotophos which are restricted or banned in developing countries were used in large quantity in study region (WHO, 2004). Most commonly used pesticides according to sprayeres were dimithoate, phorate, endosulfan, quinolphos, monochrotophos, docofol, carbaryl, nuvan, cypermethrin, etc (Table 2). It has been observed that age group between 21-40 years was actively engaged in spraying of pesticides (Table 1). All the signs and symptoms computed in study were self-reported data presented in Table 3. Data collected from field were clubbed according to sign and symptoms. It has been

Table 1 : Characteristics of sprayers age group (n=104)

Sr. No.	Age group (in year)	Sprayers (male sprayers)
1.	Less than 20	04
2.	21-30	32
3.	31-40	48
4.	41-50	04
5.	51-60	16

observed that 42 per cent farmers showed ophthalmic disorders including burning of eyes (65.36%) and blurred vision. About 21 per cent farmers reported cutaneous disorders including skin redness, white patches and skin scaling. Farmers suffered from respiratory system health effect including running/ burning nose, sore throat, shorting of breath cough asthma (43.65%). 12 per cent ill effect of digestive system due to pesticide exposure in the present study were reported including salivation, vomiting, nausea, stomach pain and diarrhoea. About 25.86 per cent farmers showed neural health problem. 23.07 per cent people reported chest pain/ burning feeling in chest. Pesticides were classified according to the WHO hazard classes: Class Ia (extremely hazardous) Class Ib (highly hazardous) Class II (moderately hazardous) Class III (slightly hazardus). Extremely hazardus pesticides phorate; highly hazardous, monochrtophos, cypermethrin; moderately hazardous pesticides quinilphos, dimithoate, endosulfan, carbaryl, endotaf were found to be in use(Table 2).

Table 2 : Commonly used pesticides by the farmers of drought prone area

Phorate	OP
Monochrotophos 36%EC	OP
Dimithoate 30%EC	OP
Quinolphos 25 %EC	OP
Lanthate 25% EC	OP
Ekalux 25% EC	OP
Chloropyriphos 20% EC	OP
Malathion 50 % EC	OP
Asataf	OP
Endosulfan 35% EC	OC
Endotaf	OC
Docofol 18.5 % EC	OC
Carbaryl	Carbamate
Nevon	Carbamate
Mancozeb 75% EC	Carbamate
Bavistin	Carbamate
Tatamida	Pyrethroid
Cypermethrin 25 EC	Pyrethroid

Table 3 : Symptoms of illness in population among sprayerers of study (n=104)

Sr. No.	Symptoms	No. of sprayerers in per cent
1.	Excessive sweating	34.61
2.	Burning of eyes	65.36
3.	Dry/ soar throat	42.50
4.	Fatigue	30.76
5.	Dizziness	30.70
6.	Skin redness	11.53
7.	White patches	23.07
8.	Skin scaling	15.38
9.	Numbness	26.92
10.	Muscle cramps	15.08
11.	Running/ burning nose	50.00
12.	Blurred vision	19.23
13.	Chest pain/ burning filling	23.07
14.	Shortness of breathing /cough	38.46
15.	Excessive salivation	0.38
16.	Vomiting/ nausea	30.76
17.	Stomach pain	0.38
18.	Diarrhea	15.03
19.	Weakness	42.30
20.	Wheezing	26.92

Endosulfan causing congenital deformities of hands, feet, frequent menstrual disorders, early menarche, male breast enlargement, liver cancer, brain tumers, congenital mental retardation, delayed mental and cycomotar development, learning disability, low IQ, frequent illness, skin disease, ear nose throat problem, vision impairment etc.(Quijano, 2002). In this region, endosulfan was used in large quantities which will lead similar problems in future. In present study, (65.36%) farmers reported burning of eyes. Adverse effects of central and peripheral nervous systems were typical due to poisoning of organophosphorous pesticides (Keifer, 1997). Organophosphorous pesticides are cholinesterase inhibitor and their long term exposure may lead to cancer (McConnell and Magnotti, 1994; Wessling *et al.*, 2002). Organophosphorous pesticides like phorate, monocrotophos, quinolphos, ekalux, asataf, malathion etc. were majoritily used by pomegranate farmers of drought prone which will cause neurological disorders. The acute poisoning symptoms related to ophthalmic, cutaneous, respiratory, digestive and neurological disorders if were not identified and treated at proper time, they will lead to chronic diseases like, partial or full loss of vision, asthma, kidney failure, cirrhosis of liver, hypertensions and cardiac failure. These chronic diseases are also prevalent in few farmers. There is scarcity of data in relating pesticide exposure to chronic diseases. Establishing such link would be out of scope of study as it would need different analytical guidelines.

Conclusion :

It was observed that many extremely, highly and moderately hazardous pesticides which were banned in developed countries still they are used in drought prone areas. The chief source of fatal, banned pesticides is the unethical, purely commercially driven stockiest, dealers and retailers.

Pesticides of the classes like organochlorine, organophosphorous, carbamate, pyrethroids if not handled with due safety precautions can cause serious health hazards among the farmers and agricultural workers. Sprayerers age group between 21- 40 years (76.92%) was actively engaged in spraying activities, which is a reproductive age group, would suffer from health risk.

During spraying, the farmers do not take care of necessary protective measures such as full clothing, use of rubber boots, rubber hand gloves, safety goggles, masks, etc. The main cause of their unwillingness to use protective aids is its unavailability and high cost of personal protective products. The present study clearly indicated that most of the farmers were not aware of the health hazards caused by the improper handling of hazardous pesticides. Farmers are not aware about their social responsibility to keep both human and environmental safety at prime importance even though there small loss of revenue.

Farmers should be made aware of health hazards caused by the inappropriate handling of hazardous pesticides. This could be done by arranging workshops and providing training to them. It is prime need to conduct awareness camps and campaigning in study regions. Farmers should be encouraged to avoid overuse of fatal pesticides and divert them to bio-pesticides, integrated pest management and use of eco-friendly products. We suggest GO's and NGO's should take imitative for providing personal protective measures to the farmers which would be easily available and even at low cost which will help in reducing the pesticide poisoning and related health hazard.

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