Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2017; SP1: 30-33

S Lokesh Babu
M.Sc (Ag), Department of Extension Education, College of Agriculture, Latur, Maharashtra, India

DD Suradkar
Assistant Professor, Department Extension Education, College of Agriculture, Latur, Maharashtra, India

PA Ghadage
Assistant Professor, Department Agriculture Extension, College of Agriculture, Ambi, Pune, Maharashtra, India

Correspondence
S Lokesh Babu
M.Sc (Ag), Department of Extension Education, College of Agriculture, Latur, Maharashtra, India

Study about the Signs of Illness Experienced By Farmers When Exposed To the Agrochemicals (Pesticides)

S Lokesh Babu, DD Suradkar and PA Ghadage

Abstract
An agrochemical is a chemical product used in agriculture. An agrochemical is any substance used to help manage an agricultural ecosystem or the community of organisms in a farming area. Agrochemicals include: (1) fertilizers, (2) liming and acidifying agents, (3) soil conditioners, (4) pesticides and (5) chemicals used in animal husbandry, such as antibiotics and hormones. Pesticides are designed to (in most cases) kill pests. Many pesticides can also pose risks to people. Generally, however, people are likely to be exposed to only very small amounts of pesticides – too small to pose a risk. The present study was conducted to know the signs of illness when affected by pesticides. The present study was conducted in Nanded district of Maharashtra with 120 respondents for study. The study revealed the illness signs as follows Excessive sweating (75.00%), Burning of eyes (60.00%), Dehydration (55.00%), Vomiting (53.33%), Whirling sensation (48.33%), Blurred vision (45.00%), Fatigue (38.33%), Excessive salivation (36.66%), Headache (33.33%), Redness of skin (26.66%), Burning nose (23.33%) and cough (15.00%).

Keywords: Agrochemicals, fertilizers, soil conditioners, etc.

1. Introduction
Pesticides represent widely used chemical substances in agriculture to increase production and quality through controlling pests and pest-related diseases. The widespread use of pesticides is a significant source of air, water and soil pollution. Pesticides are also very important risk factors on human life not only effects on health as a result of misuse or accident, but also via leave a lasting harmful chemicals into the environment. The majority of pesticides are not specifically targeting the pest, during the application non-target plants and animals are also affected. It has been estimated that only about 0.1% pesticides reach the target organisms and the remaining applied pesticides contaminates the surrounding environment. All creatures, humans and the environment are at risk of adverse effects of pesticides but especially agricultural workers and family members of pesticide applicators have the highest risk of exposure. Exposures to pesticides both occupationally and environmentally cause a range of human health problems. An average of about 200,000 people die from the toxic exposure of pesticides per year across the world, the United Nations says, calling for tougher global regulation of substances meant to control pests or weeds for plant cultivation [U.N report 2017].

A vast majority of the population in India (56.7%) is engaged in agriculture and is therefore exposed to the pesticides used in agriculture. Pesticides being used in agricultural tracts are released into the environment and come into human contact directly or indirectly. Humans are exposed to pesticides found in environmental media (soil, water, air, and food) by different routes of exposure such as inhalation, ingestion, and dermal contact. The UN report - published on 24th January 2017 - said although pesticide use has been correlated with a rise in food production, it has had "catastrophic impacts" on human health and the environment.

The pattern of pesticide usage in India is different from that of the world in general. In India 76% of the pesticides are used as insecticide, as against 44% globally. The use of herbicides and fungicides are correspondingly less. The main use of pesticides in India is for cotton crops (45%), followed by paddy fields and wheat farming (Relyea and Diecks, 2008) [14]. However, the use of pesticides in tea and vegetable crops in India is not negligible. Moreover, repeated low dose application has caused large impact in the agro-ecosystems than single exposure. Pesticides are extensively used for pest control in agriculture. Their usage and unsafe handling practices may potentially result in high farmer exposures and adverse health effects. Pesticides can enter the human body through inhalation, ingestion, or by dermal penetration through the Skin. Those who work with agricultural pesticides are the most at risk if they are not properly dressed or if there are broken and leaking equipment.

The majority of average citizens who are effected by the pesticides intake the pesticide through consumption of a food that was been contaminated with a pesticides. Pesticides cause headaches, blurred vision, vomiting, abdominal pain, suppress the immune system, lead to blood and liver diseases, depression, asthma, and nerve damage. The issue with these effects is that they may wait appear until a while after being ingested so tracing the symptoms back to the pesticide can prove to be quite difficult. Many of the symptoms can be mistaken for the flu and therefore not properly treated. Pesticides that are being used in agricultural fields disseminate into the environment and come in human contact directly or indirectly. Humans are exposed to pesticides that are found in the environmental by different routes of exposures like inhalation, ingestion and dermal contacts. Keeping these in the backdrop, a study among the farmers of Nanded district, Maharashtra state India was carried out to look into the various aspects of pesticide use in agriculture and its probable impact on human health.

Methodology

The study was conducted in Nanded district of Maharashtra state. From Nanded district three tahsils namely Mudhked, Himayathnagar, Kinwat were selected, four villages from each tahsils were selected and ten respondents from each village were selected thus comprising of 120 respondents for the study. Data required for the study was collected in the form of personal interview with the respondents. The farmers were asked to reveal the signs and symptoms experienced by them when they were exposed to pesticides. Data regarding the pesticides which were commonly used by the farmers was also collected and presented in the form of table. The answers given by farmers were recorded in the schedule and they were analysed. The results were presented in the form of percentages.

Results

The study revealed the symptoms as follows, Excessive sweating (75.00%), Burning of eyes (60.00%), Dehydration (55.00%), Vomiting (53.33%), Whirling sensation (48.33%), Blurred vision (45.00%), Fatigue (38.33%), Excessive salivation (36.66%), Headache (33.33%), Redness of skin (26.66%), Burning nose (23.33%) and cough (15.00%).

Table 1: Signs and symptoms experienced by farmers presented in the order of rank (N=120)

S.no.	Signs and symptoms of illness	Respondents		
		Frequency	%	Rank
1.	Excessive sweating	90	75.00	I
2.	Burning of eyes	72	60.00	II
3.	Dehydration	66	55.00	III
4.	Vomiting	64	53.33	IV
5.	Whirling sensation	58	48.33	V
6.	Blurred vision	54	45.00	VI
7.	Fatigue	46	38.33	VII
8.	Excessive salivation	44	36.66	VIII
9.	Headache	40	33.33	IX
10.	Redness of skin	32	26.66	X
11.	Burning nose	28	23.33	XI
12.	Cough	18	15	XII

Commonly used pesticides

It was revealed through interview of the sprayers that the most commonly used pesticides in Nanded district of Maharashtra Monocrotophos, Profenofos, Cypermethrin, Dimethoate, Chloropyriphos, Malathion, Deltamethrin Dichlorophos, Phosphamidon, phosalone etc. Some of the pesticides used by the farmers are 'extremely hazardous'; many are 'highly hazardous' and few are 'slightly hazardous' (Table 2). The farmers also used some other products like ash, cow dung, oilcake, kerosene, Neem (*Azadirachta indica*) leaves, Neem (*A.indica*) cakes, mixture of tobacco leaves and washing soap, leaves of *Xanthium indicum* etc., in their farm land, but the use of these products were in very less quantities as compared to their inorganic counterparts.

Table 2: Pesticides commonly used by the farmers in the survey area**.**

Pesticide common name	Chemical family	No of farmers	%N =120
Extremely hazardous			
Phorate	Organophosphate	40	33.3
Highly hazardous			
Monocrotophos	Organophosphate	96	80
Profenofos	Organophosphate	80	66.6
Cypermethrin	Synthetic pyrithroids	100	83.3
Dimethoate	Organophosphate	110	91.6
Choloropyriphos	Organophosphate	103	85.8
Deltamethrin	Synthetic pyrithroids	68	56.6
Dichlorovos	Organophosphate	56	46.6
Phosphamidon	Organophosphate	60	50
Phosalone	Organophosphate	45	37.5
Slightly hazardous			
Malathion	Organophosphate	34	28.3

Factors affecting exposure to pesticides

1. Direct exposure: Handling of pesticide and application of the same in recommended concentration in the field requires the use of appropriate personal protection equipment as a precaution against pesticide exposure. This involves the use of gloves, masks, protective personal hygiene, appropriate footwear, headgear etc. It was observed that sprayers in the study area took no necessary individual protective measures while handling pesticides. It was also observed that the farmers mix different pesticides in a vessel with water or pour them directly into the spraying jars and mix the pesticides with water using bare hands. The ideal practice however, is to mix in a barrel, using a stick which is often not adhered to by the farmers in question. Very few of the farmers use old/ worn out cotton cloth materials as mask. While spraying pesticides, some of the sprayers were seen chewing betel-nut, tobacco etc. and some of them were even found smoking.

2. Indirect exposure: Farmers reported that other usual farming activities continue in the farm, while pesticides were being sprayed. Consequently, women, children and others working in the same field have a chance of being exposed to these pesticides. Exposure of the general population to pesticides occurs mainly through eating food and drinking water contaminated with pesticides, whereas substantial exposure to pesticides can also occur when living close to a workplace that uses pesticides or even when workers bring home contaminated articles. Non-occupational exposure originating from pesticide residues in food, air and drinking water generally involves low doses and is chronic (or semi-chronic). As a result of pesticide use in or around the home, individuals can be exposed during the preparation and application of pesticides or even after the applications are completed, whereas delayed exposure can occur through

inhalation of residual air concentrations or exposure to residues found on surfaces, clothing, bedding, food, dust, discarded pesticide containers, or application equipment. Also, accidental poisoning with pesticides in the home is a possibility from pesticide use around the house or garden. Exposure is likely to occur from pesticide spills, improper use, or poor storage as a result of use without reading or accounting to the pesticide label. Pesticide mishandling such as transferring the products from their original packages into household containers and also the lack of compliance with instructions of the label are also sources of exposure.

Discussion

Most of the pesticides used in the agricultural sectors in the three tahsils of Nanded district ranges from moderately hazardous to highly hazardous categories, and thus, all of them have detrimental health effects as reported by various workers from time to time. Organophosphorous pesticides that work by disrupting the sending of nerve signals seem to cause this long term damage to myelin coating. The results are muscle weakness and paralysis. There is also evidence of chronic disruption of the acetylcholine mechanisms for carrying nerve signals from one nerve fibre to another, from the brain to the body (Sataka *et al*., 1997) [16].

Cypermethrin, a very active synthetic pyrethroid insecticide and is used to control pests of a variety of crops. Giray *et al*. 2001 [9] reported that Cypermethrin exposure of rats resulted in free radical-mediated tissue damage and reduced the S-methylglutathione level by 20%. Cypermethrin has also been reported to induce gene mutations in male germ cells of Drosophila (Batiste– Alenton *et al*., 1986) [4] and genotoxicity and sperm abnormality in mice (Bhunya and Pati, 1988) [5]. Malathion is a commonly used organophosphorous insecticides and has been employed in major eradication programmes in the metropolis (CDHS, 1991). The large scale use of malathion in various eradication programmes has raised concern over its potential to cause genetic damage (Flessel *et al*., 1993) [7]. Fenvalerate, a third generation synthetic pyrethroid has been reported to inhibit intra cellular communication (Flodstrom *et al*.,1988; Warngard and Flodstrom, 1989) [8]. Fenvalerateinduced genotoxicity in mammalian tests systems have also been reported by Chatarjee *et al*. (1982) [6] and Pati and Bhunya (1989). Carbamates (such as Carbofuran
and Aldicarb) are also used in minute quantities to control root-knot nematodes in tea. Chloropyriphos is one of the most widely used Organophosphorous pesticides and has been reported to be a developmental neurotoxicant, specially targeting the immune system (Pope, 1999 and Barone *et al*., 2000) [13, 3]. Malathion is a known Cholinesterase inhibitor which leads to the hydrolysis of body choline-esters, including acetyl choline at cholinergic receptors. It has been shown to induce changes in the epithelium of rat mammary glands, influencing the process of carcinogenesis, such alterations occur in the nervous system by increasing cholinergic stimulation.

Most of the farmers in the study area are not aware of the health hazards caused by the above pesticides and also the consequences of their improper handling. The farmers as a precautionary measure use cloth masks made of cotton. This, in fact increases the absorption rate of pesticides (Kishi *et al*., 1995) [11]. To reduce the nauseating feeling, the practice of chewing or smoking while spraying is also hazardous to health. Combining more than one pesticide together should ideally be discouraged. This could be dangerous, because mixing of pesticides can alter their chemical properties, thereby increasing its detrimental effects on health, besides synergic effect on the ambient environment. Salameh *et al*. (2004) [15] has already mentioned that the combined use of hazardous pesticides and the absence of appropriate precautions are detrimental to the farmers' health. The continuation of pesticide spraying and other farming activities concurrently in the field can lead to direct exposure to pesticides as they may still be dispensed in air (Antonella *et al*., 2002) [2].

During the study, it was observed that women in the field continue to work, while pesticides are being sprayed. This exposure to pesticides could cause a variety of reproductive health problems of the reproductive age group. This aspect of women being prone to various ways of exposure to pesticides has been highlighted in the study done among the cotton growers of India by Mancin *et al*., (2005) [12]. These farmers have been spraying pesticides for more than a decade which implies that a large number of the farmers get exposed to pesticides over long durations. This may cause chronic health impacts to the farmers. Young people seem to be engaged in pesticides spraying more than the older people, which may affect their reproductive organs. Pesticide exposure has been found to be linked with chronic disease like diabetes, hypertension, ophthalmic disorders etc. Asthma, a chronic disease, was noticed to be prevalent among the farmers, who are associated with pesticides exposure (Hoppin *et al*., 2002) [10]. The data showed a higher prevalence of reduced vision among the farmers which could be associated with the prolonged exposure to pesticides. The farmers may not be aware whether they have other chronic disease like diabetes, hypertension etc. because many of them are unaware of the necessity of having health check-ups/clinical tests. The present findings are in accordance with the previous literature by Amera (2008) [1] that farmers experienced a variety of signs and symptoms related to pesticides. Among populations, the prevalence of signs and symptoms related to pesticide exposure was higher among the farmers involved in spraying. The higher percentage of some signs and symptoms among the non-sprayers could be due to their direct exposure to pesticide or due to previous exposure to pesticides. It can thus be suggested that awareness needs to be created on use of personal protective measures among growers, while handling pesticides. Growers needs to be encouraged to reduce, if not eliminate the use of pesticides, with the introduction of incentives to the growers to help them shift from synthetic pesticides to bio pesticides and organic farming. Due emphasis is required to be given on the adoption of protective measures among the farmers in the study area in particular and all agricultural field of the globe in general, where such practice is lacking.

References

1. Amera T. A comparative study of impacts of cotton IPM in the rift valley of Southern Ethiopia. Institute for Sustainable Development and Pesticide Action Network. Ethiopia, 2008.
2. Antonella F, Bent I, Manuela T, Sara V, Marco M. Preventing health risks from the use of pesticides in agriculture. Protecting Workers' health series n01, edited by International Centre for Pesticide Safety, WHO, Geneva. 2002, 12-18.
3. Barone S, Das KP, Lassiter TL, White LD. Vulnerable process of nervous system development. A review of markers and methods. Neurotoxicology. 2000; 21:15-36.

4. Batiste-Alenton XM, Velazquez N, Creus A, Marcos R. Mutagenicity of the pyrethroid insecticide cypermethrin in Drisiphila. Mutageneis. 1986; 1:343-346.
5. Bhunya SP, Pati PC. Genotoxic effects of a synthetic pyrethroid insecticide cypermethrin in mice *in vivo*. Toxocol. Lett. 1988; 41:223-230.
6. Chatarjee KK, Talukder G, Sharma A. Effects of pyrithroids in mammalian chromosomes. Sumicidin. Mutat. Res. 1982; 105:101-106.
7. Flessel P, Quintana PJE, Hopper K. Genetic toxicity of malathion: a review. Environ. Mol. Mutagen. 1993; 22:7-17.
8. Flodstrom S, Warngard L, Ljungquist S, Ablborg UG. 'Inhibition of metabolic cooperation *in vitro* and enhancement of enzyme altered foci incidence in rat liver by the pyrethroid insecticide fenvalerate'. Arch. Toxicol. 1988; 61:218-223.
9. Giray B, Gurbay A, Hincal F. Cypermethrin – induced oxidative stress in rat brain and liver is prevented by vitamin E or allopurinol. Toxicol. Lett. 2001; 118:139-146.
10. Hoppin JA, David M, Umbach S, London J, Michael CR, Alavanja DP *et al*. Chemical predictors of wheeze among farm pesticides applicators in the Agriculture Health Study. Am J Respir Crit. Care Med. 2002; 165:683-9.
11. Kishi M, Hirschhorn N, Djajadisastra M, Satterlee LN, Strowman S, Dilts R. Relationship of pesticide spraying to signs and symptoms in Indonesian farmers. Scand. J. Work Environ. Health. 1995; 21:124-33.
12. Manchini F, Van Braggen AHC, Jiggins JLS, Ambatipudi AC, Murphy H. Acute pesticide poisoning among female and male cotton growers in India. Int. J Occup. Environ. Health. 2005; 11:221-232.
13. Pope CN. Organophosphorus pesticides: Do they all have the same mechanism of toxicity? J Toxicol. Environ. Health. 1999; 2:161-181.
14. Relyea RW, Diecks N. An unforeseen chain of events: lethal effects of pesticides on frogs at sublethal concentrations. Ecol. Appl. 2008; 18(7):1728-1742.
15. Salameh RP, Daldi I, Brochard P, Saleh BA. Pesticides in Lebanon: a knowledge, attitude and practise study. Environ. Res. 2004; 94:1-6.
16. Sataka MY, Mido MS, Sethi SA, Iqbal HY, Taguchi S. Environmental toxicology. Discovery Publishing House, New Delhi, India, 1997, 185-197.