Research Article

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PESTICIDE RESIDUES IN ANIMAL FEED AND EFFECTS ON ANIMALS AND ITS PRODUCTS WITH SPECIAL REFERENCE TO ENDOSULFAN

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ABSTRACT

The presence of pesticide residues in feed and its animal products is in the focus at the present scenario in the view of WTO. The residues not only affect the public health but also cause economic losses to the livestock industry. Not only these affect the health of livestock and human beings but also affect the quality of animal products. Pesticide residues accumulate in the animals either by direct contact with pesticide or by indirect contact with environment. Pesticides are used in crops for pest control and they leave the residues in the feed and fodder consumed by animals. The source of contamination of feed and fodder may be by direct spraying or by drift from other crops, contamination of soil and water used for fodder production.

Keywords: Pesticides, animal feeds, effect on animals, Endosulfan, GLC and HPLC.

INTRODUCTION

Sources of contamination

Mannivannan[1] reported that pesticide affect the quality of dairy products by inhibiting the metabolic activities of starter bacteria. Fodder maize and jowar retained residues even during harvesting which were sprayed during early stages of growth. Prasad and Chabra (2001)[2] reported that concentrate to be an important source of pesticide residue intake by animals.

Sandhu (1980) and Unnikrishnan (1998)[3] reported that apart from pesticides used for crop production, their indiscriminate usage during storage also play a role in the case of oil cakes, grains and milling products.

Contamination of the soil and water sources used for drinking purpose of animals also forms another source of pesticide residue in animals. Direct contact of the animals with pesticides during control of external parasites on animals and insects and fly control in cattle yards and sheep sheds also form other source of pesticide residues in animal body. The monitoring studies conducted at AICRP on Pesticide Residues, Hyderabad indicated the contamination of animal products, feed and fodder samples collected from different parts of the state.

Poultry feed

Poultry feed samples (maize grains, soyabean, groundnut cake, sunflower cake, concentrate feed mixture) were contaminated with HCH, DDT, Aldrin, Carbendazine and Thiram. Thiram residues were as high as (1.25mg/kg) in concentrate feed mixture and 2.25 mg/kg in maize grain in comparison to other pesticides

Feed and fodder

Contamination with HCH, DDT, Aldrin and Endosulphan was evident in the samples of feed and fodder.

Chicken

The dressed chicken samples were found contaminated with HCH, DDT and Endosulphan.

The pesticides residues are retained in the milk and fat of the animal whether they are by direct contact or by indirect contamination of soil, water, feed and fodder. Bruce (1965)[4] and Demott (1966)[5] reported that the rate of accumulation in the body and excretion depends on nature and amount of pesticide ingested and duration of exposure. Vreman (1980)[6] reported that long-term oral intake of pesticides at low levels result in higher accumulation than short-term intake at higher doses. Effects on animal are determined by the chemical structure of the pesticides, its action on metabolism and fate of the chemical within the animal. Not all animals react to all pesticides in the same manner and response can be species or individual specific. The system of one animal may metabolize a pesticide to a nontoxic metabolite, whereas that of another species may not (species –specific response) and individual animals of a species also can respond differently (Individual-specific response).

Organophosphorous pesticides used to control external parasites in cattle and sheep are absorbed to a greater extent and deposited in fatty tissues and excreted in milk. Mark and Kucher (1991)[7] reported that pesticide excretion may continue upto five days following dipping and spraying. [8] Verma (1990) reported 17 and 12 µg of Lindane per kg in buffalo and cow milk respectively from Indore. [9] Kannan (1992) reported higher levels of DDT and the presence of aldrin and dieldrin in cow milk and human milk. [10] Surendranath (1998) reported that milk samples showed decreasing trend in level of pesticide residue, when compared to tissues such as kidney, liver and adipose of cattle, sheep and goat which contain noticeable levels of DDT and HCH. [11] Surendranath et al (2002) reported milk samples from areas where DDT was used to eradicate mosquitoes and found to contain 25% higher levels. Ramesh and Vijayalaxhmi (2002) [12] reported that endosulfan residues could not be detected in milk samples in areas where aerial spraying carried out 3 months prior to sample collection.

RESULTS AND DISCUSSION

Determining pesticide residue

Chromatographic separation (GLC, HPLC) assumes greater significance in the quantitative and qualitative analysis of pesticide residues. Residue trials are needed on cultivated crops consumption in animals that will provide initial information of whether a clinical trial on animal transfer studies is needed or not. Clinical trial studies are designed to screen and detect highest amount of bio-accumulated pesticide residues in edible animal tissues like meat, fat of animal, milk and eggs (Figure 1).

Specially designed clinical trial on animal are needed only when significant residues (<0.1mg/kg in total animal diet) occurs in crops or part of a crop fed to animals of that particular region. Metabolic studies indicates that significant residues (<0.1mg/kg) may occur in edible animal tissue or the potential of bioaccumulation of the pesticide. Clinical studies may be necessary in both ruminant species and poultry as well to conclude[13]. Preferably the cow is the perfect ruminant species, but some time lactating goats are an acceptable model for ruminants depends on the pesticide where as in poultry species hens are most preferable. A study on pigs may be required if the metabolic rates are significantly declines in ruminants, poultry and rats.

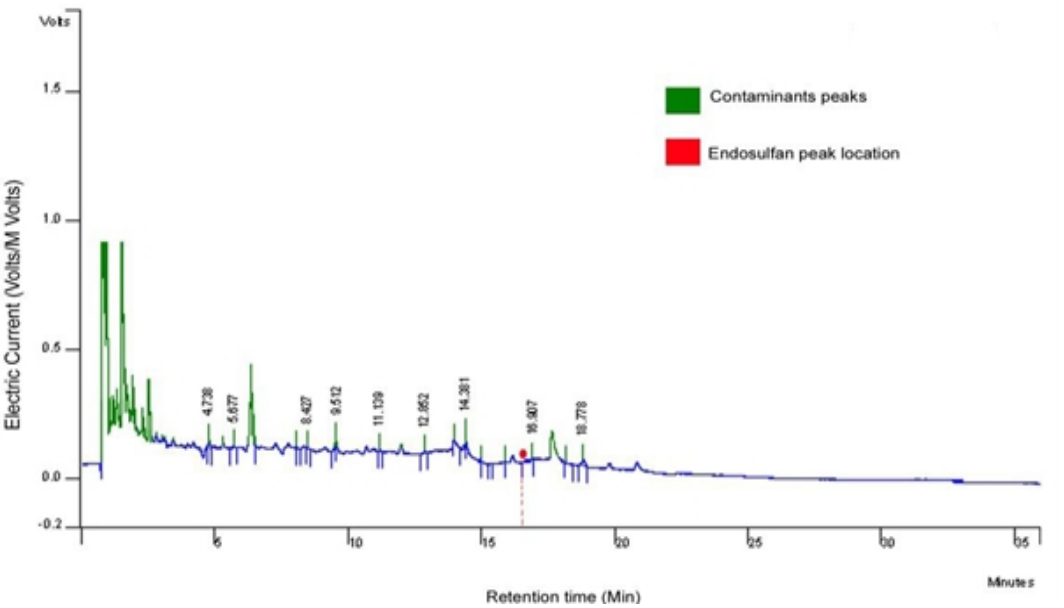

Figure 1: Endosulfan contaminants and peak locations in milk and milk Products

The minimum commodities that should be selected for the animals concerned are as follows:

Animal grouping	Preferred Species	Commodities to be sampled
Lactating animal	Dairy cow	Meat, Fat of meat, Kidney, Liver, Milk
Monogastric animal	Pig	Meat, Fat of meat, Kidney, Liver, Milk
Laying Hen	Domestic Hen	Meat (With overlying skin),fat of meat, Kidney, Liver, Eggs

PFA MRL (Maximum residue Limits) Values (PFA act, now FSS act 2006)

Name of the Pesticide	Livestock Product	Tolerance Limit(ppm)
Aldrin, Dieldrin	Milk and Milk Products	0.15
	Meat	0.2
	Eggs	0.1
Chlordane	Milk and Milk Products	0.05
D.D.T	Milk and Milk Products	1.25
	Meat, Poultry and Fish	7.0
	Eggs	0.5
Fenitrothion	Milk and Milk Products	0.05
	Meat	0.03
Hepatachlor	Milk and Milk Products	0.15
Lindane	Milk	0.05
	Milk Products	0.01
	Meat and Poultry	0.10
Deltamethrin	Milk	0.05
Chloropyriphos	Meat and Poultry	0.2
	Milk and Milk Products	0.1
2,4D	Milk and Milk Products	0.2
	Meat and Poultry	0.05
Ethion	Milk and Milk Products	0.5
	Meat and Poultry	0.5
	Eggs	0.2
Monocrotophos	Meat and Poultry	0.05
	Milk and Milk Products	0.02
	Eggs	0.02
Trichlorfon	Meat and Poultry	0.05
	Milk	0.1
Carbendazine	Meat and Poultry	0.10
	Milk and Milk Products	0.10
	Eggs	0.10
Benomyl	Meat and Poultry	0.10
	Milk and Milk Products	0.10
Carbofuran	Meat and Poultry	0.10
	Milk and Milk Products	0.05
Cypermethrin	Meat and Poultry	0.20
	Milk and Milk Products	0.20
Fenthion	Meat and Poultry	2.00
	Milk and Milk Products	2.00

Pesticides banned

Aldicarb, Aldrin, BHC, Calcium Cyanide, Captafol, Carbofuran, Chlordane, Chlorobenzilate, Cibromochloropropane, Copper acetoarsenite, Dieldrin, Endrin, EDB, EMC, Ethyl Parathion, Heptachlor, MH, Menazone, Methamol, Nicotine sulphate, Toxafen

Measures to reduce pesticide residue

Need to establish new regulatory standards and manage mental practices to reduce the residues. A practical approach to reduce the residue levels in milk and animal products is to ensure that their levels in animal feeds are within acceptable levels as contaminated feed are main sources of residues. Farmers and animal owners must use right way of using any pesticide with correct doses. The marketing personnel and extension workers should shoulder responsibility in educating illiterate farmers regarding chronic effects of pesticide residues. Educate the cultivators towards using less toxic pesticides as prescribed by World Health Organization. Integrated Pest Management system should be followed to reduce usage of pesticides. A safe waiting or withdrawal period after spraying of pesticide and before harvesting of crop residues and grains should be followed. Mass media education on pesticide residue should be taken up by Government, NGO, and Scientist, who are involved in crop –animal production system. Herbal Pesticides prepared from Neem and other herbs should be popularized and used which are environment friendly. Usage of Herbicides should also be scrupulously followed just like pesticides. Legal or strict punishment should be imposed if banned pesticides or herbicides etc are used.

CONCLUSION

A developing country like India, with diversification in dietary habits, requires better quality safe products for consumption. Food safety is also becoming prominent in the changed scenario. The presence of pesticide residues in all the animal products is chief concern relating to human health, animal health and its products. Several studies have been conducted to ascertain the presence of pesticide residues, sources of contamination and also maximum residue limits in livestock products. Establishing regulatory standards, managemental practices of animals and legal punishment on using banned pesticides are the alternatives to reduce their incidence in livestock products.

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