

## **PESTICIDES: Food Safety Concerns, Precautions and Safety Measures**

### **SUMMARY**

Pesticides are important inputs for crop protection and sustaining production by managing the pests and diseases during the cultivation and post harvest practices of food commodities. These chemicals are used to protect the crops from the ravasus or pest and diseases. There is a misconception among general masses that pesticides are unregulated in India. The objective of this Guidance document is to reflect information on regulations and safety of pesticides use in India. Guidance document also covers different precautionary methods used for reduction of exposure of pesticide residues in human being through food commodities.

### **KEY TAKEAWAYS**

- A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest.
- Excessive and unauthorized use of pesticides can cause harmful effects on health.
- Central Insecticides Board & Registration Committee (CIB &RC) under Ministry of Agriculture and Farmers Welfare is responsible for registration of the pesticides, under the provisions of Insecticides Act, 1968.
- Scientific Panel on Pesticide Residues an independent scientific body constituted by Food Safety & Standards Authority of India, recommends the Maximum Residue Limits (MRLs) of pesticides on intended crops based on safety and risk assessment of the data provided by the manufacturers through CIB &RC.
- Various precautions need to be taken while handling the pesticides at all stages including at house hold levels. General hygiene, personal protection, proper storage, proper disposal of pesticides needs to be taken.
- Methods like adequate washing, blanching, peeling, cooking, dehydration, extraction etc can help in reducing most of the contact pesticide residues in the food commodities.

## 1.0 Introduction

"Pesticide" means any substance intended for preventing, destroying, attracting, repelling, or controlling any pest including unwanted species of plants or animals during the production, storage, transport, distribution, and processing of food, agricultural commodities, or animal feeds or which may be administered to animals for the control of ectoparasites. The term includes substances intended for use as a plant-growth regulator, defoliant, desiccant, fruit thinning agent, or sprouting inhibitor and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport. The term normally excludes fertilizers, plant and animal nutrients, food additives and animal drugs.

The Food Safety and Standard Authority of India (FSSAI) under Ministry of Health and Family Welfare utilizes the Good Agricultural Practice (GAP) data for fixation of MRL, keeping in view the dietary exposure and risk assessment after approval of the same pesticide by the Registration Committee (RC).

Under the Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare sponsored central sector scheme, "Monitoring of Pesticides Residues at National Level" during the year 2017-18, Twenty seven NABL accredited participating laboratories located in different parts of India collected and analysed the samples of vegetables, fruits, spices, curry leaves, red chilli powder, rice, wheat, pulses, milk, fish/marine, tea, meat, egg and water for retail outlets, APMC markets, mother dairy, organic outlets and farm gate for the possible presence of pesticide residues. A total of 23,660 samples were collected and analysed. The monitoring data indicated that 2.2% of the samples are detected above MRLs notified by FSSAI. 14.0% were detected with presence of non approved pesticides.

The monitoring data indicated that 1.9% (vegetable samples), 1.1% (various fruits samples and pulses), 7.22% (Rice), 17.4% (spices) 1.0% (Wheat) were found above the MRLs. The samples of tea (180 samples), packaged milk (453 samples), meat/eggs (374 samples), fish/marine (902 samples) and water (2031) were also analysed by various laboratories and none of the samples were detected above MRLs.

### What is Pesticide residue?

"Pesticide residue" means any specified substances in food, agricultural commodities, or animal feed resulting from the use of a pesticide. The term includes any derivatives of a pesticide, such as conversion products, metabolites, reaction products, and impurities considered to be of toxicological significance. (Note: The term "pesticide residue" includes residues from unknown or unavoidable sources (e.g., environmental), as well as known uses of the chemical).

## **Good Agricultural Practices in the use of Pesticides**

"GAP" includes the nationally authorised safe uses of pesticides under actual conditions necessary for effective and reliable pest control. It encompasses a range of levels of pesticide applications up to the highest authorised use, applied in a manner which leaves a residue which is the smallest amount practicable. Authorised safe uses are determined at the national level and include nationally registered or recommended uses, which take into account public and occupational health and environmental safety considerations. Actual conditions include any stage in the production, storage, transport, distribution and processing of food commodities and animal feed.

### **2.0 Pesticides Regulation in India**

#### **2.1 The Insecticides Act, 1968**

The import, manufactures, sale, transport, distribution and use of insecticides with a view to prevent risk to human beings or animals and for matters connected therewith are regulated under a comprehensive legislation "The Insecticides Act, 1968".

Central Insecticides Board & Registration Committee (CIB &RC) under Ministry of Agriculture and Farmers Welfare is responsible for registration of the pesticides under this statute.

The Central Government has constituted a Registration Committee (RC) which has the mandate to register insecticides after scrutinizing their formulae and verifying claims made by the importer or the manufacturer, as the case may be, as regards their efficacy and safety to human beings and animals.

#### **2.2 Food Safety & Standards Act, 2006**

Under this statute, FSSAI has constituted Scientific Panel with relevant experts which recommends Maximum Residue Limit (MRL) on the basis of data provided by CIB&RC which interalia includes GAP provided by the Registration Committee, the dose schedule, frequency schedule and pre harvest interval; taking into account the Acceptable Daily Intake (ADI) derived from the various toxicological data and the food consumption pattern of Indian population. It is ensured by the Scientific Panel that the MRL thus recommended is safe for human being.

These MRLs are notified under Food Safety and Standards (Contaminants, Toxins and Residues) Regulations, 2011. Till date, MRLs of 213 pesticides for various foods have been notified. Appropriate punitive action is taken against the Food Business Operators if pesticide residues beyond MRL are found in products.

### **3.0 Personal protection from pesticide residues through food chain**

Under ideal conditions, the pesticide residues left in/on the food commodities are not supposed to pose any harm to the consumers. However, as a precautionary principle, following measures can be taken at the household level:

- Read pesticide Labels properly for safety instructions (warnings) and directions of use.
- Store pesticides at a place that can be locked and is not accessible to unauthorized people or children.
- Left-over insecticide suspension can be disposed off properly by pouring it into a specially dug hole in the ground or a pit latrine. It should not be disposed of where it may enter water used for drinking or washing, fish ponds or rivers.
- The reuse of pesticide containers is risky and not recommended. Pesticide containers should be rinsed as soon as they are empty, completely filled with water, and allowed to stand for 24 hours. They should then be emptied, and the process repeated twice.
- Do not eat, drink or smoke while using insecticides. Take a shower or bath at the end of the day.
- Gloves should be worn when handling the insecticide concentrate and preparing the insecticide mixture.

### **4.0 Safe Use Practices to reduce/ eliminate pesticide residues**

Pesticides are toxic to both pests and humans. However, they need not be hazardous to humans and non-target animal species if suitable precautions are taken. Most pesticides will cause adverse effects if intentionally or accidentally ingested or if they are in contact with the skin. Pesticide particles may be inhaled with the air while they are being sprayed. An additional risk is the contamination of drinking-water, food or soil. Special precautions must be taken during transport, storage and handling.

### **5.0 Methods to reduce the Pesticide Residues from the Food Products**

Following methods can be used for reducing the pesticide residues in most of the foods:-

- Scrub firm fruits and vegetables, like, melons, root vegetables, like, carrot and tubers like potatoes. Soft brush can be used to scrub the fruits and vegetables for five to ten seconds before rinsing with slightly warm water.

• **Washing with water:** Pesticide residues can be reduced from the food products by washing. Washing in clean running, preferably drinking water reduces pesticide residues as it has abrasive effect. About 75-80% of pesticide residues on the surface of cereals, pulses, fruits and vegetables are removed by washing with water. Washing with 2% of salt water will remove most of the contact pesticide residues that normally appear on the surface of the fruits and vegetables. The pesticide residues that are on the surface of the grapes, apples, guava, plums, mangoes, peaches, pears etc, and vegetables like tomatoes, brinjal, okra require 2-3 washings.

• Carrot, okra, brinjal, cabbage and cauliflower can be washed with 1 percent tamarind solution.

• **Vinegar Soak:** Whip up a solution with 10 percent white vinegar and 90 percent water and soak fruits and vegetables in them. Stir them around and rinse thoroughly.

• **Blanching:** Blanching is a short treatment in hot water or steam applied to most of the vegetables. Certain pesticide residues can effectively be removed by blanching. But before blanching it is very important to thoroughly pre-wash the fruits and vegetables.

• **Peeling:** Contact pesticides that appear on the surface of the fruits and vegetables can be removed by peeling. Peeling and trimming fruits like mango, citrus, apple, pear, peach, kiwi and vegetables like gourds reduces pesticide residues.

• Discard outer layer of leafy vegetables like cabbage, lettuce etc before washing as they grow close to the ground where soil could be tainted.

• Vegetables and some of the fruits which are consumed along with the peel, can be soaked in water for half-an-hour to one hour and rinsed a few times before use. Soaking fruits and vegetables five to ten minutes in a solution of diluted form of hydrochloric acid with four tablespoons of salt and juice of half a fresh lime and rinsing thoroughly with clean water helps in reducing residues. Use of dilute vinegar/acetic acid followed by thorough rinsing is also recommended.

• Dry produce with a clean cloth towel or paper towel to reduce residues.

• Vegetables can be kept in boiling water just for a minute and rinsed in running thereafter to reduce pesticide residues.

• Steaming and cooking of vegetables eliminate most of the residues that are not removed by washing or peeling.

• Consumption of variety of fruits and vegetables helps in maintaining a balanced diet and also avoiding excessive consumption of pesticide residues from a small range of food items.

- Juicing of fruits, like, grapes reduces the residue level. Clarification processes, such as centrifugation and filtering further reduce the residues.

- **Lemon/Baking Soda Wash**

1 Tbsp. lemon juice - (natural disinfectant), 2 Tbsp. baking soda (neutralizes the pH level of pesticides), 1 cup (250 ml) of water.

Put the mixture in a spray-topped bottle. Spray the fruit or vegetables, leave it to sit for 5-10 minutes, then rinse well.

- **Lemon/ Vinegar Wash**

1 Tbsp. Lemon juice – (natural disinfectant), 2 Tbsp. white vinegar cleans the fruits and vegetables and neutralizes most pesticides, 1 cup (250 ml) of water in a spray-topped bottle.

Spray the fruits or vegetables, wipe and eat.

- **Vinegar/ Salt Wash**

¼ cup vinegar (cleans the fruits and vegetables and neutralizes most pesticides)  
2 Tbsp. salt (draws out dirt and insects)

Just fill a sink or large bowl with water and the above ingredients (depending on the method you choose) and let the vegetables sit for about 20 minutes, then rinse or else you can fill an empty water bottle and spray onto your produce and then rinse and wipe.

- **Cooking Animal Products:** Animal products may be a source of contamination by pesticide residues in human diets since the animals feed on fodder, which are sprayed with pesticides. Pressure cooking, frying and baking will minimize the harmful effect of pesticide residues.

- **Dairy products:** Boiling of milk at high temperatures destroys the persistent pesticide residues.

- Several other methods such as concentration, dehydration, and extraction from the raw product can further reduce pesticide residues in the end produce. Refined Vegetable oils will have fewer amounts of pesticide residues. Household heating of oils will also minimize pesticide residues.

- Don't use any soap, detergents, chemicals which could leave their own harmful residues.

- Exposure to ozone gas (O<sub>3</sub>) and dipping in ozonated water helps in reduction of pesticide residues. Gaseous ozone treatment during storage degrades contemporary pesticides.

Ozone sanitation method does oxidize pesticide residues. An extended wash in clean water can help further reduction in pesticide residues. Some companies have started marketing the equipment for ozone sanitation.

- Prefer foods grown organically. Look for 'Jaivik Bharat' logo.

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