

CHAPTER 11

PESTICIDE RESIDUE AND SAFETY

OBJECTIVES

After studying this chapter, students will be able to:

- Understand the concern of Codex Alimentarius Commission and Bureau of Indian Standards for human health
- Maximum residue limits of pesticides
- Points for safety of operators and consumers

INTRODUCTION

In the previous chapters, you have read about production technology of different fruits crops. In fruit production, role of pesticides (weedicides, fungicides, insecticides) can't be ignored. However, you might have read in newspapers or heard on television or radio about tremendous rise in serious diseases like cancer, diabetes and cardio-vascular arrests in our country, and also about the role of pesticides in these diseases. It is now proven that sudden rise in such serious diseases in India is due to high use of pesticides in crop production. The residues of these pesticides enter into our body and become one of the reasons for the cause of risk diseases. As a result, people in India have become health cautious. Due to this concern only, Codex Alimentarius Commission of World Health Organization (WHO) and Bureau of Indian Standards (BIS) are emphasizing on adoption of Good Agricultural Practices (GAP) for fruit production. These practices emphasize least use of pesticides, as a result, the residues of pesticides will be less, and consumers will also be safe or will take less amount of pesticide into their bodies, which will save them from risky diseases. In this chapter, you will come to know about GAP, maximum residue limits for pesticides and points for safety from pesticides.

Codex Alimentarius Commission and Bureau of Indian Standards (BIS) and their role

The consumption of fresh fruits has increased substantially over the last decades. However, there are instances of food borne illness associated with fresh fruits, which have raised concerns from public health agencies and consumers about the safety of these products. In order to assure the consumer that the food consumed is safe and nutritious, it is important to develop a comprehensive and effective food system, which ensures both safety and nutrition. This has led to development of various guidelines for cultivating fruits and also commodity standards by Codex Alimentarius Commission. The Codex Alimentarius Commission, established by Food and Agricultural Organization (FAO) and World Health Organization (WHO) in 1963 develops harmonised international food standards, guidelines and codes of practice to protect the health of the consumers and ensure fair practices in the food trade. Codex Alimentarius Commission has given guidelines about Good Agricultural Practices (GAPs), which help control microbial, chemical and physical hazards associated with all the stages of the production of fresh fruits from primary production to packing. Good Agricultural Practices (GAP) have been defined as practices, which address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food agricultural products by the Food and Agriculture Organization.

Points to remember

Several countries of the world have developed Good Agricultural Practices (GAP) for growing fruit crops. In this context, 'IndiaGAP' has been developed in our country, which aims at introducing a certifiable system for recognizing farmers who have implemented good agricultural practices as per design.

In India, the Bureau of Indian Standards (BIS) adopted the 'Requirements for Good Agricultural Practices' in

2010. It recommends practices for every stage of farming from land preparation to post harvest supply chain such as quality of water for irrigation, washing, contamination from unsterilized manures, biosolids, pesticide residues, safety of agricultural workers, personnel hygiene and sanitary facilities, cleanliness and sanitation of post-handling equipment, machinery, etc. so as to produce safe food for human consumption. Safe food is one which has minimum pesticide residues, metals and other contaminants and is practically safe in the hands of consumer without any harmful effects.

On the other hand, pesticides are the chemical products used for plant protection. They include insecticides, fungicides, herbicides and plant growth regulators. Residues of pesticides may remain in treated products and get into human food chain. These residues should not exceed a limit above which they may pose risks to human health. The concepts of Maximum Residue Limits (MRLs) for pesticides have been devised to keep a check on the pesticides' residues in food chain and keep them within safe limits. MRLs are the maximum residues of pesticides, which may be expected in a product treated with them, considering that Good Agricultural Practices have been followed.

Status of Maximum Residue Limits in India

Food Safety and Standard Authority of India (FSSAI) is responsible for setting MRLs for the pesticides, which have been registered by Central Insecticides Board and Registration Committee (CIBRC), an organization responsible for registering pesticides recommending them for various crops in India. The exceptions for which MRLs are not required include neem based products, biopesticides and few chemical pesticides like sulphur. A total of 234 pesticides have been registered by CIBRC (including endosulfan, the use of which was banned in India in May 2011). The 20 pesticides namely, phorate, mMancozeb, methyl parathion, cypermethrin, carbendazim, monocrotophos, malathion, quinalphos, acephate, triazophos, dichlorvos, fenvalerate, dimethoate, captan, zineb, paraquat dichloride, chlorpyrifos, phosalone and carbofuran have been considered as some of the most used and widely recommended pesticides in India.

Classification of pesticides	Medium lethal dose by the oral route (LD ₅₀ : mg/kg of the body weight of test animal)	Colour of the identification band on the level
Extremely toxic	1 – 50	Bright red
Highly toxic	51 – 500	Bright yellow
Moderately toxic	501 – 5000	Bright blue
Slightly toxic	More than 500	Bright green

Points for safety of operators and consumers

Despite these recommended pesticides considered safe, the direct contact with them may cause poisoning. In order to prevent pesticide from getting in to contact with human body, following points should be kept in mind;

- Levels and instructions enclosed with the container should be carefully read; e.g., colour indicators of the pesticide toxicity.
- Operators should bear appropriate clothes. For this, overcoat, gloves and boots are used to protect the skin. When working with dusty substances, one must use overall of a dust proof fabric with a smooth surface such as moleskin, while for spraying or working with liquid pesticides one must use clothing made from acid proof fabrics. Similarly, canvas footgear is used for protection when working with dusty toxicant and rubber boots when spraying. Rubber gloves are to protect the hands when working with liquid forms of pesticide

use



Pesticide spraying with all precautions

and cotton gloves with film coating and acid proof impregnation when working with dusty toxicants. Likewise, to protect the eyes from pesticides, one must use the dust proof goggles. Antidust or antigas respirators and gas masks can also be used to protect the respiratory organs.

- Application equipments should be checked for leaks or any other defects and they should be kept in proper working condition.
- Clogged nozzles or hoses must not be blown out with mouth for cleaning.
- The working solutions are poured into the tanks of the machines through filters to prevent clogging.
- Spraying and dusting should be performed in the morning and evening and in dull weather in the daytime too. Treatment must never be performed before or during a rainfall. Do not spray in high wind and high temperature. Avoid drift by selecting proper direction of spraying and also holding nozzle and boom at a proper height. And to achieve this, start spraying near the downwind edge of the field and proceed upwind so that operator moves into unsprayed area.
- Pesticide should not be left unattended in the field.
- Plenty of clean water and soap should be made available, as well as clean clothing for change.
- Upon the completion of work, all the apparatus must be cleaned, washed with the soda solution and water, dried and then placed properly in store. After use, crush and bury the pesticide containers preferably in a land filled dump.
- Warning signs, such as red arrows are setup on the treated areas to protect poisoning incidence, of children and livestock.
- Children, pets and farm workers must not enter the sprayed field for the specific period mention by the manufacturer of the pesticide sprayed. Even with safe period pesticide, at least spray deposit should be allowed to dry up before entering the field.
- Always keep recommended antidote or drug recommended for the safety of a particular pesticide.



A safe insecticide, malathion



ACTIVITIES/EXERCISES

- Go to some shop dealing with pesticides. Make a list of pesticides and note down the precautions written on them for safe use.
- Go to some fruit orchard. Ask the grower about the safety measures they adopt for spraying pesticides in the orchard.

CHECK YOUR PROGRESS

1. Define roles of Codex Alimentarius Commission and BIS.

2. What do you mean by maximum residue limit? Write LD50 for extremely toxic, highly toxic or least toxic pesticides.
3. What points will you keep in mind while using pesticides?

WRITE YES (Y) OR NO (N) FOR THE FOLLOWING STATEMENTS

1. Pesticides should be sprayed during morning or evening hours.
2. Good Agricultural Practices are mandatory for organic fruit culture.
3. Among insecticides, malathion is considered as most dangerous one.
4. Food Safety and Standard Authority of India (FSSAI) is responsible for recommending the use of pesticides on fruit crops.
5. The Bureau of Indian Standards (BIS) adopted the requirements for good agricultural practices in 2012.

SUGGESTED FURTHER READINGS

1. <http://www.fssai.gov.in/AboutFSSAI/introduction.aspx>
2. <http://www.fao.org/prods/gap/>
3. Requirements for Good Agricultural Practices – IndiaGAP. Bureau of Indian Standards, 2010.
4. ec.europa.eu/food/plant/protection/resources/intro_en.pdf
5. Chandra Bhushan, Avimuktesh Bhardwaj and Savvy Soumya Misra 2013, State of Pesticide Regulations in India, Centre for Science and Environment, New Delhi
