

Pesticide Residue and Their Management

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Abstract:

Pesticides are potentially harmful compounds that have previously shown themselves to be very beneficial to the crops. These chemicals have been used carelessly, which has resulted in a wide range of contamination and consequent environmental damage. High concentrations of such harmful chemical residues on agricultural food can have a negative impact on a consumer's health. The presence of these harmful substances in food products is a significant barrier to import and export. Different management strategies are routinely being attempted and evaluated to fight this calamity of the modern day. In this article, we analyzed the methods that may be used to lessen the hazardous residue on agricultural goods.

Introduction:

According to the WHO, pesticide residue refers to any chemical substance or a combination of substances present in food for animals or man that comes from the application of pesticide including various derivatives like conversion and degradation products, impurities and metabolites that have toxicological significance.

Due to the rising global population, demand for food is increased, which has resulted in the explosive usage of chemicals, mainly pesticides and fertilizers, to increase food production. However, indiscriminate misuse of pesticides allows for the contamination of the environment, bioaccumulation in the food chain, and a major hazard to public health from the harmful residues. Additionally, the "Maximum Residue Limit (MRL)" on certain food items is a significant obstacle to global commerce. Although there has been significant progress in recent years towards developing bio pesticides that are less harmful to the environment and unintended organisms. Farmers in developing country like India continue to heavily rely on older, less expensive molecules that pose acute and chronic health risks through direct contact or through the impact of residues on food commodities.

Management of Pesticide Residues:**Ozonation:**

Ozone (O₃) is a potential agent for oxidizing hazardous xenobiotics, one of the several methods used to decontaminate food. Unstable ozone quickly breaks down to produce diatomic oxygen (O₂) and liberates a free oxygen atom (O) quickly oxidizes dangerous toxic residues to produce safe byproducts.

Gamma irradiation:

The use of gamma irradiation as a method to remove or degrade pesticide residues from agricultural products, particularly from vegetables and fruits destined for export, has enormous potential. When radioisotopes like Cobalt 60 decay, gamma radiation is produced. This high energy photon flux may be used to break down a variety of contaminants, including pesticide residues. Ionizing gamma radiation decreased the residues of pirimiphos-methyl, Malathion, and cypermethrin to levels below the maximum residue limits (MRLs) (0.05% in potatoes at 1 kGy, 1% in grapes at 2 kGy, and 0.1 ppm in dates at 1 kGy).

Food processing:

Treatments used during food processing, such as washing, peeling, canning, or cooking, can significantly reduce pesticide residues. Baking, bread making, dairy product production, drying, thermal processing, fermentation, freezing, infusion, juicing, malting, milling, parboiling, peeling, peeling and cooking, storing, storing and milling, washing, washing and cooking, washing and drying, washing and peeling, washing peeling and juicing, and winemaking are among the processes.

A future solution for lowering residues from food products may involve freezing as opposed to cooking. After six days and 12 days of pesticide contamination, the residual in refrigerated tomatoes steadily decreased from 5 to 26 percent and 10 to 31 percent, respectively. The amount of pesticide residues gradually decreases when refrigeration time is extended.

Organic Agriculture:

The technique of organic farming has its origins in India's traditional agricultural methods, which rural farmers had used for millennia but whose productivity was insufficient to feed the whole country. Though the Green Revolution helped transform India from a food-insecure nation to one that was self-sufficient, the intensification of agriculture over the years



seriously undermined the delicate balance between various ecosystem components, one of which was the buildup of dangerous pesticide residues. Reintroducing organic farming, which forgets the use of synthetic pesticides and provides a comprehensive sustainability of the economy and nature, is crucial at this point.

Measures to minimize pesticide residues in the environment

- Use pesticides only when necessary. Preference should be given to the use of bio pesticides and non-chemical methods of pest control, wherever feasible.
- Apply only the appropriate pesticides at the recommended dosages.
- Avoid using persistent pesticides on vegetables, fruits and fodder crops and directly on animals for veterinary purposes.
- Never mix non-recommended pesticides directly with stored grain or use them to disinfest storage premises.
- Pluck ripe fruits and vegetables before pesticide application. After pesticide spray harvest the crop only after the recommended waiting period.
- Thorough washing followed by rubbing can help in reducing pesticide residues on the produce. Peeling of vegetables and fruits also results in lowering the levels of pesticide residues.

Conclusions

The need for food will continue to increase along with the human population. Organic farming without the use of synthetic chemicals is undoubtedly an excellent way to restore ecological sustainability and support economic growth through the national and international marketing of residue-free organic products, but scientists and policymakers are concerned about its ability to meet the world's steadily rising food demand. The accumulation of harmful chemicals in both the environment and food can be slowed down by increasing the use of safer green chemicals in an integrated pest management strategy, using microbes and plants to degrade chemicals, and adopting the aforementioned post-harvest technologies, but the changing climate and high rate of chemical resistance can exacerbate the current issue.