

## Determination of Pesticides Residues in Selected varieties of Mango

Saqib Hussain, Tariq Masud and Karam Ahad\*

Department of Food Technology, University of Arid Agriculture, Rawalpindi,

\* Toxicology Research Center, NARC, Pakistan

**Abstract:** The present study was undertaken to access the residue of commonly used pesticides viz Cypermethrin, Methamedophos, Monocrotophos, Cyfluthrin, Dieldrin and Methyl Parathian respectively in three varieties of Mango being collected from the grower fields in Multan division. The samples were treated with organic solvent Cyclohexane and ethylacetate (1:1), cleaned on Gel Permeation Chromatograph (GPC) and analyzed on auto system Gas Chromatograph (GC) with electron capture detector (ECD). All the samples were found to be contaminated with a degree of variation of pesticides residue studied. However, all the samples were within permissible limits being set by FAO/WHO with reference to public health.

**Key Words:** Pesticides, residue, mango varieties

### Introduction

Mango (*Mangifera indica*), a member of family Anacardiaceae, is known as King of fruits. Its popularity is mainly due to its excellent flavour, delicious taste and high nutritive value. It is the choicest fruit of the sub-continent. Its original home is believed to be south Asia where it has been cultivated for the last four thousand years (Salunkhe and Desai, 1984). It is now an important fruit of the tropic and mild sub-tropical parts of the world like Pakistan, India, South China and Malaya. It is a rich source of vitamin A and vitamin C. Ripe pulp of mangoes provides 74 Kcal of energy per 100 grams of edible portion. Its general composition is, moisture (79.2 - 82%) total soluble solids (12.9 - 20.8%) total sugars (10-17.3%), non-reducing sugars (7.27 - 12.35%), ash content (0.49 - 0.58%) and crude protein (0.38 - 0.62%) on fresh weight basis. Agriculture sector contribute 25% to GDP in which the share of fruits and vegetables is upto Rs. 5353.6 millions (Anonymous 1999). For more quantity and cosmetic quality of these commodities our farmers rely on pesticides. About 27% of the pesticides being consumed in the country are used on fruits and vegetables. Here mango is planted over an area of about 83300 hectares producing about 883700 tones of fruits (Ijaz and Inayat, 1997). Its cultivation is on the increase and vast tracts of land in Multan, Bahawalpur, Khairpur and Hyderabad divisions have been planted with Mangoes. Here about 250 varieties are known. Few important varieties of mango are Dusehri, Aphanso, Chaunsa, Anwar Retual and Sindhri. About 86 species of mango insect pests have been recorded in the country (Giani, 1968). Of these, fruit flies, mango mealy bug, scale insects, and mangooppers causes more damage to this crop. To minimize the economic losses caused by these noxious insects, fungi, weeds etc., various Insecticides, Fungicides and Herbicides are used over this fruit on a massive scale. When applied improperly, residues of some of these pesticides can remain on foods and as such can pose a significant hazard to human health.

There is great demand for Pakistani mangoes in the country as well as in abroad. This delicious fruit is highly appreciated in many of the European, Middle Eastern and Far-Eastern Countries, thus opening tremendous opportunities for its exports and fetch premium prices in the world markets. Today's market demands for not only the quality of agricultural produce but also the safety and environment friendly production practices. In the year 2004 when the rules and regulations of WTO will be promulgated and implemented, the FAO/WHO Codex Alimentarius Commission standards for

pesticide residues will act as reference points for Sanitary and Phytosanitary (SPS) measures. Thus certification with regard to residue limits, good agriculture practices (GAP) and environment friendly production processing will be a prerequisite for agricultural produces. To cope with the contemporary international market there is a dire need to carry out systematic research for determination of pesticide residues in different fruits.

Keeping in view of this subject, this study was designed to determine Pesticide residues in different varieties of mango fruits collected from Multan division with special reference to public health significance according to FAO/WHO Codex Alimentarius Commission.

### Material and Methods

**Collection of sample :** The samples were collected from the fields' farmers of Multan division. Samples were taken from randomly selected tree. The samples were from different parts of canopy. After collecting samples, about 1 kg sample was separated and sealed in polythene bag.

**Extraction and clean-up:** Chopped 1 Kg of the mango and mixed thoroughly. A subsample of 25 gm was taken out and blended with 50 ml of acetone, 50 gm of anhydrous sodium sulphate and 50 ml of a mixture of cyclohexane and ethylacetate (1:1). Allowed the mixture to stand for some time till a clear supernatant is formed. Took 30 ml out of the supernatant into a round bottom flask. A few drops of 10% propandiol in ethylacetate and about 4-6 glass beads were added. The solvent was evaporated to dryness at 40 °C under vacuum and nitrogen stream in rotavapor. The contents were reconstituted in 6 ml of cyclohexane and ethylacetate (1:1) and then passed through highflow super cells. Applied 2 ml of this sample on Gel Permeation Chromatographic (GPC) column for further cleanup. After passing through GPC column, the samples were dried under vacuum and reconstituted in 1ml ethylacetate for analysis on Gas Chromatograph (GC).

**Instrumental analysis:** All the extraction steps mentioned above and the clean up on Gel permeation chromatography (GPC) were standardized and checked for optimum behaviour and quantitative recoveries. Perkin Elmer Autosystem Gas Chromatograph equipped with electron capture detector (ECD-Ni<sup>63</sup>) and capillary column was used through out the study under specific operational conditions (temperature programming).

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Table 1: Quantitative analysis of residues in different varieties of mango (mg/Kg)

Pesticides	Insect/Pest	MRLs	Sample I (Dusehri)	Sample II (Chaunsa)	Sample III(Sindhri)
Cypermethrin	Tip Borer	0.50	0.25	0.38	0.19
Methamedophos	Mango hopper	1.00	0.18	0.41	0.38
Monocrotophos	Fruit fly	1.00	0.48	0.25	0.69
Cyfluthrin	Mealy bug	0.50	0.24	0.18	0.39
Dialdrin	Termites	2.00	-	-	0.58
Methyl Parathian	Thrips	1.00	0.15	-	-

(-) Stands for not detected. Source: FAO/WHO Codex Alimentarius Commission (1993).

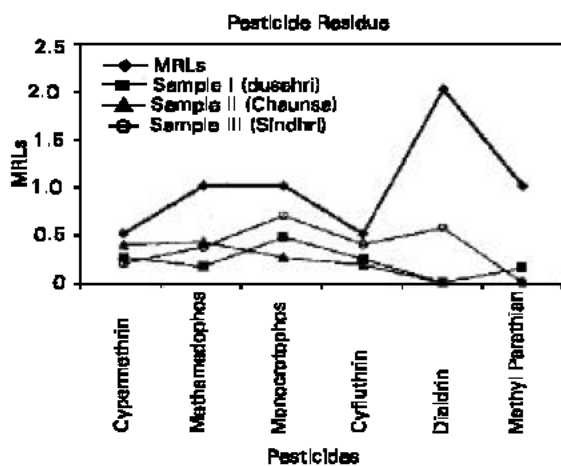


Fig. 1: Residue limits in Mango

Residues of insecticides in the samples were identified on the basis of their respective retention times, quantified on the basis of respective peak areas, reported on the basis of sample weight and are expressed as mg/Kg. Since percent recoveries were optimum, therefore no corrections were made while calculating the concentrations in the samples.

### Results and Discussion

A number of chemicals are in use today in the production of agricultural commodities. They are essential to modern agriculture. Pesticides are chemicals developed and produced for use in the control of agricultural and Public health pests. Contamination of fruits and Vegetables may results from treatment as well as form conditions such as improper use of pesticide from preceding treatments in the soil and cross contamination. Prevention of health risks, including toxicological risks, due to food intake is central in food safety policy (Miller, 1987).

In the present investigation an attempt has been made to determine the pesticide residues in mango samples collected from the fields of farmers in Multan division. In this, study three varieties of mango samples, sample I (Dusehri), sample II (Chaunsa) and sample III (Sindhri) were analyzed for 6 pesticides namely Cypermethrin, Methamedophos, Monocrotophos, Cyfluthrin, Dialdrin and Methyl Parathian. It was observed that all the samples were contaminated with pesticides. MRLs (Maximum Residual Limits) of different pesticides are presented in Table 1., which are taken form FAO/WHO Codex Alimentarius Commission (1993). Since the residual levels of all pesticides in the samples were within the permissible limits being set by FAO/WHO Codex Alimentarius Commission, (1993) hence are harmless and can safely be used for human consumption.

The result further revealed that concentration of Cypermethin and Methamedophos in Sample II (Chaunsa) was

comparatively higher as compared to other two samples. Whereas concentration of Monocrotophos and Cyfluthrin were higher in Sample III (Sindhri) as compared to other tested samples. Dialdrin and Methyl Parathian are only detected in sample III (Sindhri) and sample I (Dusehri) respectively. The variation of pesticide residues among the different varieties of mango is mainly due to use of different pesticide in different concentrations in different localities depending upon the pest attack. These observations are in accordance to the finding of (Rup and Dhanaraj 1989).

The result of present investigation further supports the findings of the previous surveys conducted in Pakistan by Masud and Hassan (1992). They reported the residues of organochlorine, organophosphate and pyrethroid insecticides in fruit and vegetable samples, collected from retail market of Karachi. Moreover these results negate the findings of Masud and Akhtar (1997) who monitored samples for fruit, vegetable, oil, milk and water brought from Gadoon Amazai. All the samples were free from pesticides residues. The possible reason for this difference may be that pesticides in that area are being used in accordance with good agricultural practice

Based on these observations it may be assumed that though all the assumed samples of mango varieties are within the permissible range of MRLs proposed by FAO/WHO and may no pose a serious threat to public health. In this regard a recent published work of Perveen and Masud (2001) revealed that 85% of blood samples were found to contain residue of tested pesticide. However this situation is particularly worrying in view of lack of reliable data on the long-term consequences of exposure to pesticides. It is therefore suggested that continuous monitoring systems of pesticides is needed of all food commodities in order to protect the end user for the indiscriminate use of pesticides.

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