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Assessment of Health Hazardous Pesticide Residues by GCMS in Langra Variety of Mango (*Mangifera indica* L.) in Modinagar (Ghaziabad) Area Orchards

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A B S T R A C T

The use of pesticide residue in Langra variety of mango by farmers of local area was studied. The pesticides residual loads assessments were seen in the soil and orchard during the cultivation. The farmers used the pesticide viz. Dichlorovos, Phorate, Diazinone, Fenitrothion, Malathion, Chlorpyrifos and Ethion to obtain high production. Three samples of Langra variety were collected from different orchards of Modinagar region. About 1 kg sample of each field (orchard) was sealed in polythene bag and there after cleaning the pulp it was analysed by GCMS. The validity was checked by standard solution. The entire sample was found under the MRLs limit recommended by FSSAI. The over use of chemicals was seen bad effect on the health of community. The present study concluded that the regular monitoring is must for the public health.

Introduction

The Mango (*Mangifera indica L.*) is a popular fruit all over the world. It is grown extensively in India and stand first in production of fruits. The production of mango is produced about 10.99 million tonnes, it more than 55 percent of the world's total production the popular verities remained the prerogative of the "Raja" and "Nawabs" for a very long time. The origin and native place of common mango (*Mangifera indica* L.) is a matter of discussion as some researcher suggests it to be as Eastern India, Assam to Burma or possibly further in the Malay region (Vavilov, 1949; Maqbool *et al.*, 2007) The mango originated is Indo-Burma region since civilisation (Mukherjee, 1951; Salunkee *et al.*, 1991).

It has an excellent flavour, attractive fragrance, delicious taste and high nutritional value that have made it one of the best fruit. The fruits are very much relished for their succulent, exotic flavour and delicious taste. Mangoes are rich source of β-carotene, pro-vitamins (carotenoid) that is converted to vitamin A in the body. Vitamin-A is an essential nutrient required for normal growth, reproduction,

vision and immune health. Mango, the choicest fruit of India, occupies a prominent place amongst fruit crops and is acknowledged as the "king of fruits" in this country (Negi, 2000).

Langara is very popular variety in India. The tree bears biennial and its fruits are oblong with lime green in colour. Pulp is lemon yellow with scanty fiber. The Fruit quality is very good. The flavor is mild with sweet melting character aroma and sweet taste. Mango has high nutritive value but losing nutritive values due to extra amount load of toxic chemicals by farmers (Sharma *et al.,* 2020). The Bad effects can be seen on health. (Valavanidis, 2016).

That's why some toxic chemicals should not be used from time to time. Its investigation is very necessary. (Fenik *et al.,* 2011). It is very important to monitor time to time. (Nie *et al.,* 2018). They also make some rules for the government and /FSSAI,WHO. (Arif *et al.,* 2018). We all have to follow them too so that everyone can also healthy but in some of our greed, we all break these rules which affects our health. (Chourasiya, 2015.)

Materials and Methods

Sample Collection

Three Samples of Langra Variety were collected from different orchard of the local area of Modinagar Ghaziabad U.P. (near to Delhi). (Fig.1). All these samples were analyzed and studied on pesticides which were used by farmers. (Mozzaquatro *et al.,* 2022) after collecting 1 kg of sample was separated in polythene bag and chopped after washing and cleaning to prepare the sample for analysis of GCMS.

Reagents and material

Combined stock Standard solution for seven pesticides such as Dichlorovos, Phorate, Diazinone, Fenitrothion, Malathion, and Chlorpyrifos were prepared. In n-hexane (HPLC grade) working standard solution were prepared of five concentration 0.001, 0.0025, 0.05,0.01 and 0.02, mg / kg all the working solution were store at 4^{o}C and inject in GCMS, obtained retention time (Table -1) a multiple component Curve (Fig. -1).

Chopped 1 kg of mango pulp and mixed thoroughly take 5 gm sample in 50 ml centrifuge tube and spike 100 ppb. Add 10 ml milli Q water and add 10 ml acetonitrile (ACN). Shake 10 minutes with mechanical shaker. Add 6 gm anhydrous magnesium sulphate and 1.2 gram Sodium Citrate in centrifuge tube. Vortex centrifuge tube for 1 minute, centrifuge it for 15 minute at 4500 rpm, take 5 ml upper solvent layer in to 15 m centrifuge tube., Add 250 mg magnesium sulphate, 125 mg PSA and 125 mg C18. Vortex for 1 minute, Centrifuge for 15 minute at 5000 rpm than take 2 ml upper layer in to test tube and dry under nitrogen, reconstitute up to 0.500 ml (500 µL) with Acetonitrile and inject on GC.

Instrument condition

GC condition for analysis of pesticide by GC model number AGILENT 19091J-443,HP (5 % Phenyl methyl siloxane) was used it contain capillary column maximum temperature 325 ^{O}C normal length 30 m, diameter 250 µL, initial flow 1.0 ml/minute, back inlet, back detector (FPD) hydrogen flow 75.0 ml/minute oxidiser flow 100.0 ml per minute air oxidiser gas type, Oven initial temperature 100 ^{O}C maximum temperature 350 ^{O}C with initial time 2.00 minute and equilibration time is 1.00 minute, mode is split initial temperature was 200 ^{O}C, split ratio 5:1 total flow 53.4 ml /minute gas type nitrogen was used.

Results and Discussion

The observations of data was obtain after calculation by GCMS (Table-1) this data can be draw calibration curve and for the use of validity of sample is used. (Mozzaquatro *et al.,* 2022)

The validification of the analysed methods was used by the acuuracy, precision and linearty. The Limit of detectrion (LOD) and Limit of quantification (LOQ)

of multiple pesticides was determined by injecting standered solutions of different concentration levels. (Constantinou, 2021). Linearity were determine by using calibration curve with standard solution in hexane five concentration (0.001, 0.0025, 0.05, 0.01 and 0.02) of seven pesticides were determined. (Table -2)

LOD value is obtained from seven, pesticide standard solution viz. Dichlorovos, Phorate, Diazinone, Fenitrothion, Malathion, Chlorpyrifos, Ethion 0.02, 0.00016, 0.003, 0.002, 0.002, 0.001 and 0.002 respectively. The LOQ value is obtained from standered solution of Dichlorovos, Phorate, Diazinone, Fenitrothion, Malathion, Chlorpyrifos, Ethion was obtain 0.006, 0.00049, 0.01, 0.009, 0.007, 0.004, 0.008 respectively (Table -2). in order to maintained quality control for each sample was analysed. In GCMS graph retention time of Dichlorovos, Phorate, Diazinone, Fenitrothion, Malathion, Chlorpyrifos, Ethion was obtain were obtain 10.65, 21.68, 23.85, 26.73, 27.38, 27.52 and 34.02 respectively (Fig.-3).

After dataanalysis sample-1 contained Dichlorovos,Phorate, Diazinone, Fenitrothion, Malathion, Chlorpyrifos, Ethion 0.03 0.00021, 0.004,0.0027, 0.0051, 0.0045 and 0.0002 mg /Kg respectively. The Sample -2 obtained Dichlorovos, Phorate, Diazinone, Fenitrothion, Malathion, Chlorpyrifos, Ethion 0.0025, 0.00032, 0.0081, 0.0034, 0.0039, 0.0078 and 0.0005 mg /Kg and sample 3 obtained Dichlorovos, Phorate, Diazinone, Fenitrothion, Malathion, Chlorpyrifos, Ethion 0.0032, 0.00022, 0.0062, 0.0021, 0.0071, 0.0068 and 0.001 mg/kg.

In the present time, many types of chemicals are being used to increase the yield of fruits and vegetables. The fertility capacity of the soil is being increased day by day by the using of different types of chemicals and fertilizer. At the same time, the fruits and vegetables production is increasing.

It's bad effect is in human race due to intake the fruits and vegetables. (Eslami, 2021) It is necessary to check these toxicity levels in fruits and vegetables. (Cheng *et al.*, 2017), So that most of the diseases which are affecting the health of the body can be prevented in time. (Kne, 2012) The present study observed that, Dichlorovos was maximum residue in sample -3 (0.0032 mg/kg) and minimum residual value in sample 2 (0.0025 mg / kg), Phorate was maximum in sample 2 (0.00032 mg / kg), minimum in sample 1(0.00021 mg / kg), Diazinone was maximum in sample 2 (0.0081 mg/ kg) and minimum in sample 1,(0.0040 mg / kg) Fenitrothion was maximum in sample 2 (0.0034 mg/kg) and minimum in sample 1(0.0021 mg/ kg), Malathion was present maximum in sample 3 (0.0071 mg / kg) and minimum in sample 2 (0.0039 mg / kg), Chlorpyrifas was present maximum in sample 2 (0.0078 mg / kg) and minimum in sample 1 (0.0045 mg / kg), ethion was present maximum in sample 2 (0.0005 mg/ kg) and minimum in sample 1 (0.0001 mg /kg) (Fig.-4), (Table-3). It was observed that all the samples were contaminated with pesticides under the MRLs (Maximum Residual Limit).of different sample of Langra varieties of mango. Many scientist did the work on the pesticides on different fruits and vegetables and showed their effects on human body (Frenik *et al.*, 2011; Arif *et al.*, 2018)

Table.1 Values of calibration curves of selected seven pesticides

Sr. No.	Concentration	Dichlorovos	Phorate	Diazinone	Fenitrothion	Malathion	Chlorpyrifos	Ethion
1	0.001	813	1467	1066	1023	3466	1054	1468
2	0.0025	1560	2843	2156	2232	6467	2164	2845
3	0.005	3666	5621	4189	4678	12578	4378	5628
4	0.01	7760	10474	8676	8465	24795	8468	10489
5	0.02	15167	21357	16064	16478	47389	16578	21399

Table.2 Values of Retention Time (RT), LOD and LOQ.

Sr. no	Pesticide	RT	LOD(mg/kg)	LOQ(mg/kg)	Max. intake limit (mg/kg)
1.	Dichlorovos	10.65	0.002	0.006	0.005
2.	Phorate	21.68	0.00016	0.00049	0.0005
3.	Diazinone	23.85	0.003	0.01	0.02
4.	Fenitrothion	26.73	0.002	0.009	0.005
5.	Malathion	27.38	0.002	0.007	0.02
6.	Chlorpyrifos	27.52	0.001	0.004	0.01
7.	Ethion	34.02	0.002	0.008	0.002

LOD – Limit of detection, LOQ – Limit of quantitation , RT – Retention time

Table.3 Observed Values of sample mg/kg

Sr. No	Pesticide	Max. intake limit (mg/kg)	Observed value (mg/kg)		
			Sample -1	Sample -2	Sample-3
1.	Dichlorovos	0.005	0.0030	0.0025	0.0032
2.	Phorate	0.0005	0.00021	0.00032	0.00022
3.	Diazinone	0.02	0.0040	0.0081	0.0062
4.	Fenitrothion	0.005	0.0021	0.0034	0.0027
5.	Malathion	0.02	0.0051	0.0039	0.0071
6.	Chlorpyrifos	0.01	0.0045	0.0078	0.0068
7.	Ethion	0.002	0.0001	0.0005	0.0002

Fig.1 Mango sampling Modinagar area-region

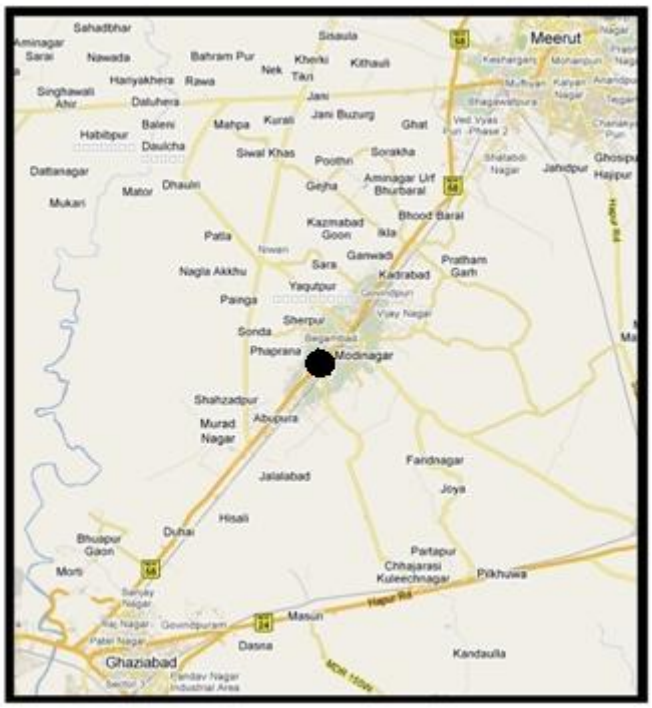


Fig.2 Calibration curves of selected seven pesticides

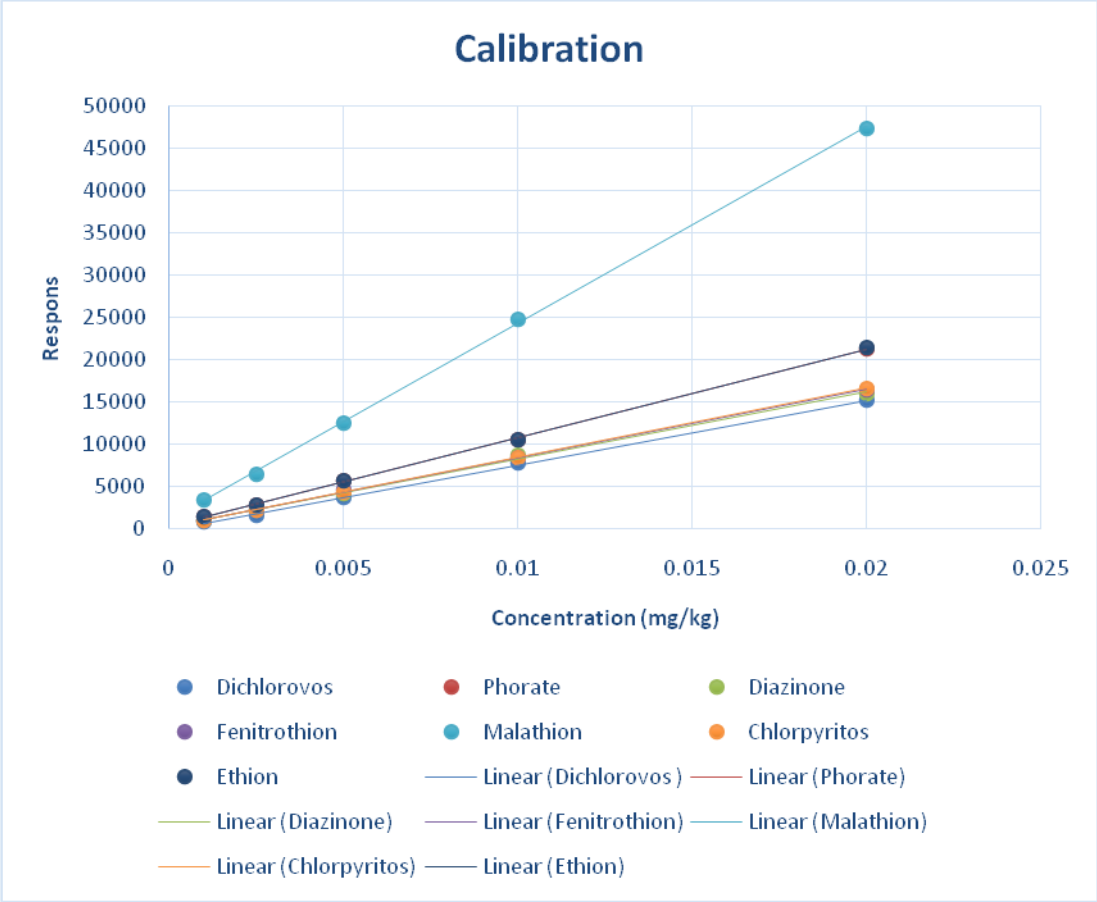


Fig.3 GCMS retention time Graph of selected Pesticides

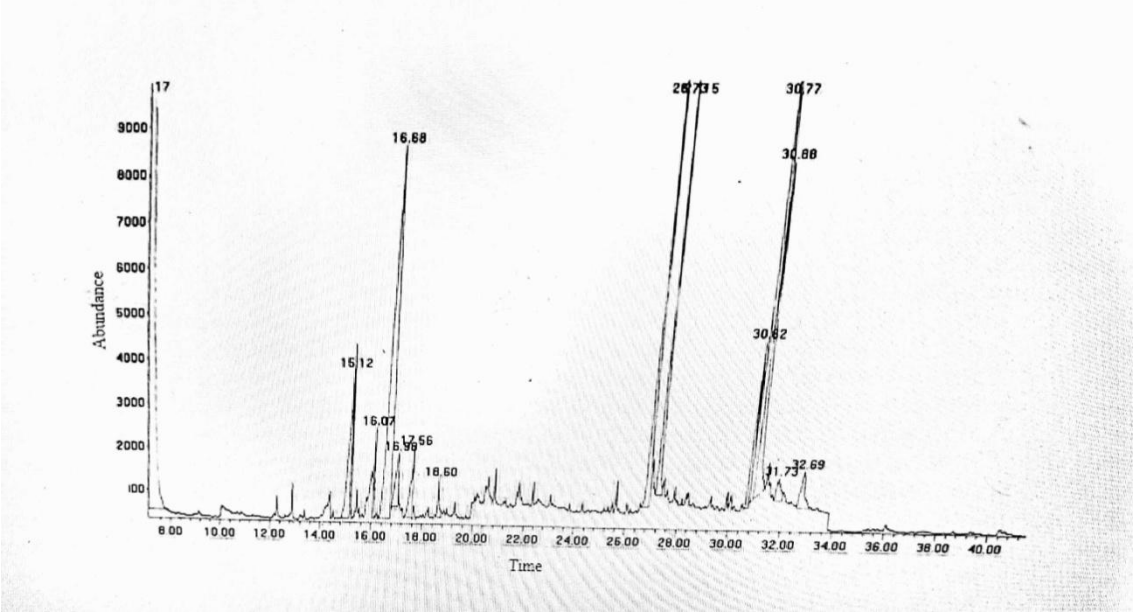
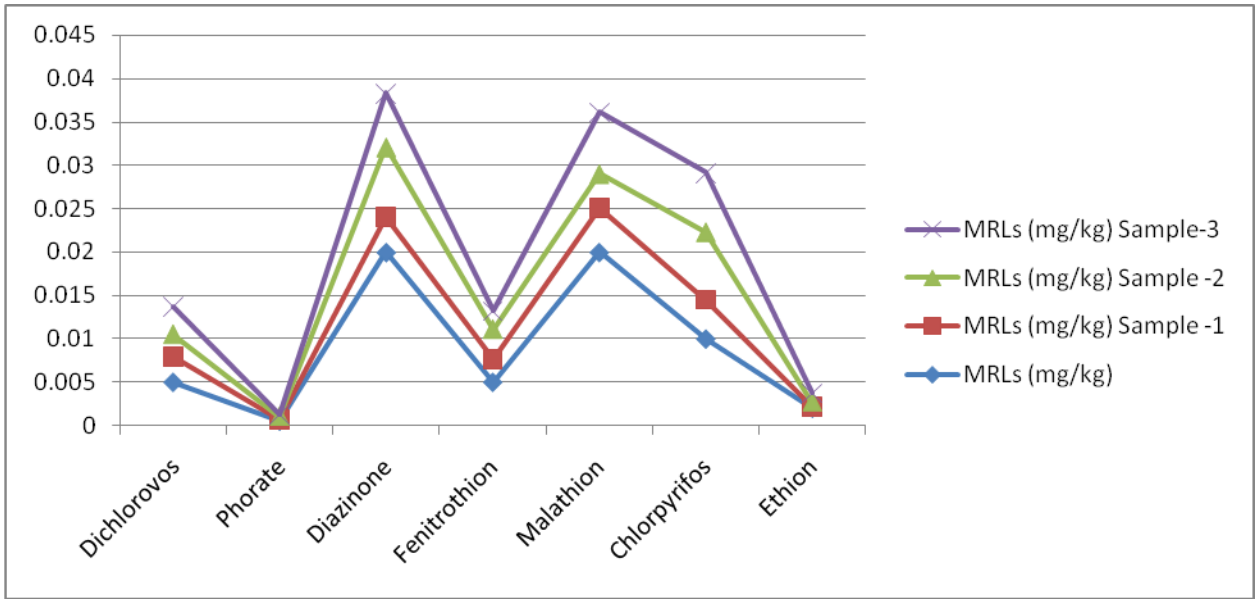


Fig.4 Graphical representation of selected pesticide resdues in sample



Present study of seven pesticides analysis in mango variety based upon Community Health Risk Assessment**.** In this study pesticides residual level is found in the under MRLs (Maximum residual limit) of FAO/WHO. The results to support of the previous research. We have to consumed and take care for their issues and health. There is a need extra precautionary requirement for such monitoring of fruits and vegetables.

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