Determination of certain chlorinated and organophosphorus pesticide residues in vegetables and fruits

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This work was carried out to investigate the following :• Persistence of three organophosphorus insecticides, namely, malathion,pirimiphos-methyl and diazinon on and in some vegetable crops, i.e. tomatoes, cucumbers, green peppers, eggplant, olcra, cabbage and snap beans. Also persistence of these insecticides was studied on and in the following fruits; grape fruits and leaves, fruits of peach, pear, apricot, fig and guava.Detection of the organochlorine pesticides [alpha, beta-HCH, gamma-HCH (lindane), aldrin, dieldrin, endrin, and total DDT] and the most persistent organophosphorus insecticides -malathion and pirimiphos-methyl- in some agricultural products, collected during 1995 from the local markets in Shobra, Tulch and Benha, Kalyubia Govemorate. Samples were analysed at the Plant Protection Department, Faculty of Agriculture, Moshtohor, Zagazig University. Thus, two sets of experiments were carried out. The furst one included determination of the three organophosphorus insecticide residues on and in the seven vegetables and six fruit crops. the second set included monitoring of the aforementioned organochlorine and oragnophosphorus insecticides in two types of grains, six vegetables and three fruit crops. In this respect, ninety nine samples of the various foodstuffs were collected from the markets. The insecticides malathion, pirimiphos-methyl and diazinon were used at the rates of 1.5, 1.5 and 1 L/fed., respectively. The corresponding active ingredient per feddan were 855, 750 and 600 g. The amount of the formulated insecticide was diluted with canal water using 200 or 400 L/fed. l[n case of vegetables, the insecticides were used once or more onto tomato, cucumber, green pepper, eggplant, okra, snap bean and cabbage plants grown either under greenhouse or normal open field conditions. Crop fruits (grape, peach, pear, apricot, fig and guava) were sprayed once at time of fruiting. Representative samples of the insecticide-treated vegetables or fruits and untreated ones were taken 1 hr as well as 1, 3, 7 and 14 days post insecticidal treatment after which analysis of insecticide residues was performed.With monitoring, the possibility of contaminating two types of grains (wheat and shelled rice), six vegetables (potato tubers, tomato, cucumber, green pepper, eggplant fruits; and cabbage leaves) and three fruits (peach, apricot and guava), with the pesticides, a, [3 and y-HCH, total DDT, aldrin, dieldrin and endrin as well as malathion and pirimiphos-rnethyl was detected. The obtained results showed the following :I- Persistence of malathion, pirimiphos-methyl and diazinon on and invegetables : Residues of the three used insecticides in tomato and cucumber fruits increasedwith increasing number of insecticidal application; the initial deposits ranged between 2.2 to 2.8 and 2.38 to 4.10 mg/kg fruits after the 1st and 3rd spray, respectively. The highest amount of residues was detected in malathion-treated fruits and the lowest amount with diazinon-treated ones.•In all cases, residues decreased progressively as time lapsed from the onset of insecticidal treatment.•As has been found with fruit crops, the residues of the insecticides differed fromcrop to another although the same amount of each insecticide was used onto the different crops.•The pattern of loss in residues was, however, similar to that with fruit crops. The period after which the sprayed crop could be harvested differed greatly depending on the number of sprays, the plant species, and the used insecticide. With the MRL of the used insecticides in some crops which are not included in the CAC, the contaminated crops must not be harvested

until they were found to be free from any detectable residues.II- Persistence of malathion, pirimiPhos-methyl and diazinon in fruits : The amounts of each insecticide detected one hour after spraying differed greatly from crop to another although the same amount of active ingredient was used onto the six crops which show the differences between the fruits in pickingup the used insecticides.•Amounts of malathion, pirimiphos-methyl and diazinon present in kg fruitsranged between 3.3 to 35.5, 2.7 to 20.20 and 1.20 to 20.20 mg. Samples ofinsecticide- sprayed g-ape leaves, either the fresh or boiled ones containedmagnitude amounts of insecticides compared with those obtained in the fruits.The six fruits could be arranged descendingly according to picking up thepreceding insecticides as follows : apricot, grape, fig, peach, guava and pear.The rate of loss in insecticide residues increased, however, with increasing the time lapsed between the onset of insecticidal spray and the assessment of residues. Loss percentages one day after insecticide spray onto the six crops differed greatly from crop to another which reflect the capacity of each plant species to metabolize insecticides. Fig fruits displayed the highest capacity to metabolize the used insecticides, whereas peach ones revealed, however, the lowest bioactivity (loss was less than 20 %). The capacity of the fruits to degrade the three insecticides differed from the period at which detection of residues was carried out to another, the six crops behaved different in this respect. Such irregularity in the bioactivity of the six. crops refers to the fluctuation of the metabolizing enzymes as well as the interference of the present metabolites.•The 1st three days from spraying was the most critical period at whichdissipation differed from fruit to another. The differences between fruit species, as regards the rate of dissipation, after the 7th day were greatly narrowed andwere negligible after the 14th day, and ranged between 96.5 to 98.9.Boiling grape leaves resulted in loss of insecticide residues. The loss of residues differed from insecticide to another during the whole experimental period as well as from period to another with each insecticide.III- Monitoring of insecticide residues in some foodstuffs :•All the collected foodstuff samples (grains, vegetables, and fruits) were contaminated with cc- and P-HCH, as compared with 93.9 % in case of y-isomer; total contamination with the three HCH isomers were 96.96 %.•With DDT, 87.9 % of the samples contained different levels of DDTderivatives.Contamination percentages with the cyclodiens aldrin, dieldrin and endrin were 54.5, 51.5 and 42.4, respectively, with a total contamination of 49.5 %.•Ca. 90 % of the sanaples were contaminated with inalathion whereas 60.6 % of the samples were contaminated with pirimiphos-inethyl.•Amount of residues in the same foodstuffs differed from market to another. Shelled rice; potatoes, cucumber and pepper fruits, eggplant fruits, and cabbageleaves as well as peach, apricot and guava fruits collected from all markets were found to be free from contamination with endrin and pirimiphos-methyl ; aldrin,dieldrin, endrin and pirimiphos-methyl; cyclodiens, pirimiphos-methyl; endrinand; cyclodiens and pirimiphos-methyl, respectively. Amounts of OP residues were much higher than those of chlorinated hydrocarbons and ranged between zero to 500 ps/kg.•Although the majority (75.8 %) of the conunodities obtained from the three markets located in Kalyubia Governorate were contaminated with the mentioned insecticides, residue values were below the maximum residue limits (MRLs).