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Carbofuran Residues from Banana and Potato

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ABSTRACT

Residues of carbofuran were estimated under field conditions from banana cv. Basrai, following the soil incorporation of carbofuran @ 1.5 g/plant twice at 6 and 7 1/2 months after planting and from potato cv. Kufri Chandramukhi by applying carbofuran @ 3.0 kg a.i./ha, half at planting and half at earthing up stage. At harvest time the residues in peeled banana were 0.357 ppm, which were above the tolerance limit of 0.1 ppm, whereas in potato tubers residues were below detectable limits at the time of harvest.

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INTRODUCTION

Banana (*Musa paradisiaca* L.) is attacked by plant parasitic nematodes. Sasser (1988) reported 19.7% loss due to plant parasitic nematodes in banana on world basis. Patel *et al.* (1991) tested phenamiphos, phorate, ethoprophos and carbofuran under field conditions in banana crop and reported superiority of carbofuran. Nair (1979), Fagan (1989) and Ternisien (1989) have also reported reduction in nematode population due to application of carbofuran in banana. Potato (*Solanum tuberosum* L.) an important staple vegetable crop is also attacked by root-knot nematodes. In an experiment carried out at Deesa during 1987-88, for the control of root-knot nematodes, application of carbofuran significantly produced more healthy tubers compared to ethoprophos and phorate (Anon., 1987). However, the information regarding residues of carbofuran from banana and potato is not generated under Gujarat conditions. Therefore, the present experiments were carried out to know the magnitude of residues of carbofuran from peeled banana and potato tubers.

MATERIALS AND METHODS

Field experiments

Banana

The experiment was carried out in a randomized block design with three replications on a farmer's field at Jabugam village in Vadodara district of the Gujarat State during 1986-87. Carbofuran was applied in the rhizosphere of standing crop @ 1.5 g/plant at 6 and 7 1/2 months after planting. The banana variety Basrai following recommended agronomic practices for the region was cultivated. The raw banana fruit samples at harvest were collected from bunches and kept for natural ripening. The residues were determined from ripe banana fruit peeled pulp.

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Potato

A field experiment on potato variety 'Kufri Chandramukhi' was conducted at Potato Research Station, Gujarat Agricultural University, Deesa (Dist. Banaskantha) during 1987-88. All the recommended agronomic paractices were followed for the experiment. Carbofuran @ 3.0 kg a.i./ha, half at planting and half at the time of earthing up was applied to the crop. At harvest, potato tuber samples were collected for residue analysis.

Residue analysis

Extraction

The method described by Thomas and Cook (1980) was used for residue analysis of carbofuran from banana and potato. Ten gramme each of representative peeled banana pulp and potato tuber samples were taken for residue analysis. The sample was extracted with 300 ml 0.25 N HCl and a pinch of celite as filter aid. From the filtrate, 30 ml aliquot was further extracted four times with n-hexane using 60 ml each time. The emulsion formed during extraction was removed using 4% aqueous sodium lauryl sulphate. The combined hexane extract was extracted with anhydrous diethyl ether. The latter was decanted through the bed of anhydrous sodium sulphate which was pre-washed with ethyl acetate and air dried. The dried extract was concentrated to 5 ml in a vacuum rotatory evaporator, which was concentrated to 1 ml under nitrogen stream.

Florisil column clean-up

Ten gramme of 100-200 mesh Florisil deactivated to a moisture content of 2.5 ± 0.3 % on weight basis was taken in a 30 cm x 19 mm column topped with 0.5 cm of sea sand. The column bed was approximately 11 cm. The column was prewetted with 20-30 ml of hexane. The sample was transferred to the column by giving several rinses of 1:9 ethyl acetate : hexane (v/v). Elution was performed with 100 ml of 1:9 ethyl acetate : hexane (v/v) as a wash and discarded. Further eluated with 60 ml of 3:7 ethyl acetate : hexane (v/v) and the eluant was collected. Two ml of toluene was added to the eluant which served as a keeper and injection solvent. The eluate was concentrated under vacuum rotatory evaporator and further concentration was done under nitrogen stream.

GLC parameters

Carbofuran residues were analysed by GC-TSD (Varian Model 3700) having 200 cm x 6 mm glass column packed with 2.5% OV-17 on 100- 200 mesh W (HP). Temperatures (^{0}C) of column, detector and injector were maintained at 220, 240 and 270, respectively. The flow rate of carrier gas (nitrogen), hydrogen and air was maintained at 30, 5 and 300 ml per minute, respectively. At these parameters, the retention time of carbofuran was 3 minutes (Figure 1). The recovery study carried out by fortifying samples at 1 ppm concentration indicated 111% recovery. Data reported have not been corrected for recovery.

RESULTS AND DISCUSSION

Residues from banana

The data on residues of carbofuran from peeled banana pulp at harvest are given in Table 1. The residues were not detectable from the control plots. At harvest, in peeled banana pulp, the residues of carbofuran were 0.357 ppm with an application of carbofuran @ 1.5 g/plant twice at 6 and 7½ months after planting which was above the maximum residue limit (MRL) of 0.1 ppm. Venugopal *et al.* (1978) also reported 0.15 ppm residues of carbofuran with the application of carbofuran @ 80 and 40 g/sucker at planting and five months after planting, respectively. However, the experiment conducted at Coimbatore on banana variety Dwarf Cavendish with one application of carbofuran @ 1.2 g/sucker at planting indicated

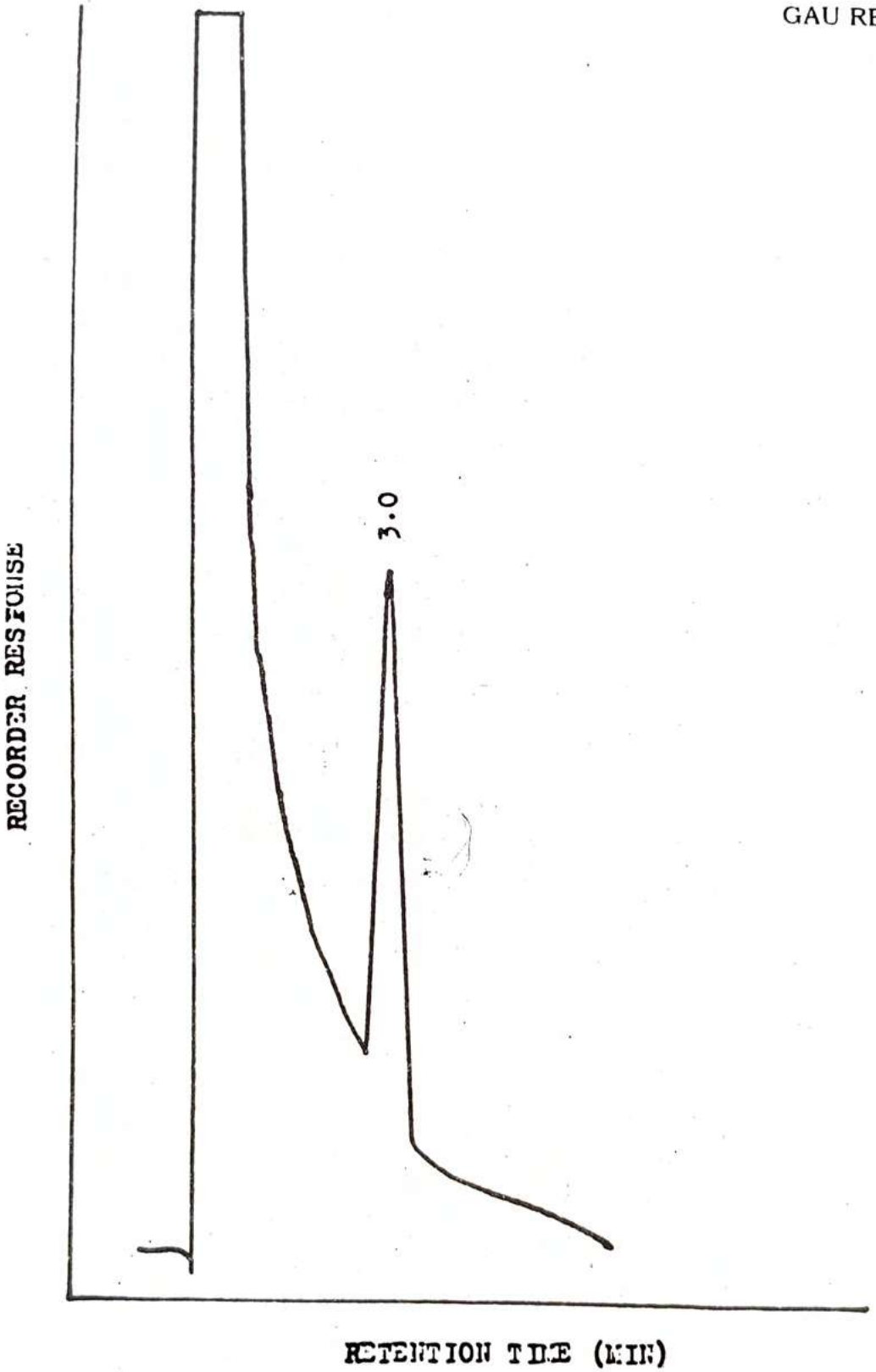

Fig. 1 : GLC Chromatogram of Carbofuran

TABLE 1

Residues of carbofuran from banana and potato.

Treatment	*Residue level (ppm)*	
	Banana pulp	*Potato tubers*
Non-treated	BDL	Nil
Treated	0.357	BDL

BDL : Below detectable limit

ND and 0.005 ppm carbofuran residues from fruits and peel, respectively (Anon., 1977). However, in the present experiment, the residues were above MRL which may be due to the application of nematicide at higher dose and later stage of the crop growth. Therefore, if application of carbofuran is given at the time of planting residue problem could be avoided.

Residues from potato

Data presented in Table 1 indicate carbofuran residues obtained in potato tubers, variety Kufri Chandramukhi with the application of carbofuran @ 3 kg a.i./ha half at planting and half at the time of earthing up. The residues were below detectable limit from the treated plots. Mithyantha *et al.* (1977) also reported carbofuran residues from potato tubers below the tolerance limit with different rates applied at planting. The experiment conducted at Bangalore (Anon., 1977) by soil application of carbofuran at planting also indicated that residues in potato tubers were below the tolerance limit.

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