

dinitroanilines, an increase (Duke and Biswas<sup>5</sup>, Diem *et al.*<sup>7</sup>) and also a decrease (Duke and Biswas<sup>5</sup>, Schultz *et al.*<sup>9</sup>) have been reported. Here also, AC 92553 increases the RNA content while Planavin decreases it. The role of aliphatic acid herbicides in nucleic acid metabolism has not been worked out in detail. The findings presented here indicate an increase with 5-25 ppm of Nata. Ross<sup>12</sup> without mentioning about the nucleic acid contents, reported an increase in ATP level with Dalapon, which in this investigation appeared as one of the strong inhibitors of RNA synthesis.

These herbicides can be divided into three groups: those which elevate the RNA levels (amides, urea, xyldine and phenoxy compounds) and those that lower the RNA level (propionic acid, dinitroanilines, triazoles, triazines). A third group like TCA and carbamate appeared ineffective at the concentrations tried. It can be concluded that irrespective of the primary site of action, most of the herbicides have affected the RNA synthesis directly or indirectly.

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## CARBOFURAN RESIDUES IN BRINJAL

CARBOFURAN, (2, 3-dihydro-2, 2-dimethyl-7-benzofuranyl-N-methyl carbamate) is a broad spectrum systemic insecticide and nematocide used widely against various crop pests for soil or seed treatment<sup>1</sup>. Brinjal (*Solanum melongena* L.) is an important vegetable on which Furadan\* 3G is widely used in West Bengal for the control of fruit borer, (*Leucinodes orbonalis* Guen). However, there is little information available on the residues of this insecticide in brinjal fruit, which is consumed as the vegetable. In order to find out the residue levels of the toxicant in brinjal (var : Surti) an experiment was conducted by treating the plants with Furadan 3G at the rate of 0, 1, 3 and 10 g per plant (corresponding to 0, 0.26, 0.78 and 2.61 kg a.i. per acre) in different rows. Fruits of brinjal were harvested 7, 21, 37, 52 and 75 days after treatment and were analysed for carbofuran residues by the method of Gupta and Dewan<sup>2</sup>. Some of the fruits were harvested 58 days after treatment, and the effect of cooking on the residue level was also determined. For this purpose, fruits were boiled in water for 20 minutes followed by the addition of common salt at the rate of one per cent by weight of the fruit, and again boiled for 10 minutes. After this they were analysed for carbofuran residues.

From the data on residue levels of carbofuran in fruits furnished in Table I, it can be seen that there is an increase in the level of carbofuran residue in fruits with the increase in dosage of Furadan 3G applied. The values, however, include carbofuran and its 3-hydroxy, 3-keto and phenol metabolites since the method cannot distinguish between them.

The concentration of carbofuran in the fruit was highest 7 days after treatment and it gradually decreased with time. There was a reduction in the residue to an extent of 63 to 77% from 7 to 52 days after treatment, the rate of disappearance being faster at lower doses. At the end of 75 days the residue levels were almost reduced to traces. In crops like soybean also, carbofuran does not persist for more than 65 days after application<sup>3</sup>. Even in the first sampling period of 7 days, the residue levels of the insecticide were low, being less than the tolerance limit of 0.2 ppm. This is so even at the highest dose of application (*i.e.*, 2.61 kg a.i. per acre).

Boiling the fruits successively in water and salt solution, reduced the residue considerably to levels below the detectable limit of the method of estimation employed, as compared to 0.021 ppm and 0.074 ppm in the raw fruits. Therefore, it may be considered as safe to use carbofuran on brinjal without any deleterious effects from residues in fruits.

TABLE I  
Carbofuran residues in brinjal

Time lag after application (days)	Dose of furadan 3G (g/plant)	Residues of Carbofuran (ppm)
7	1	0.088
	3	0.097
	10	0.171
21	Control	Traces
	1	0.055
	3	0.076
	10	0.099
37	Control	N.D.
	1	0.021
	3	0.040
	10	0.045
52	Control	Traces
	1	0.020
	3	0.057
	10	0.064
75	3	Traces
	10	0.027
58	3 (raw)	0.021
	3 (cooked)	N.D.
	10 (raw)	0.074
	10 (cooked)	N.D.

N.D. = Not detectable.

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\* Furadan is the registered trade mark of FMC Corporation for Carbofuran.

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## THE EFFECT OF PRE-SOWING HARDENING AND FOLIAR APPLICATION WITH GROWTH REGULATORS IN ORACH (*ATRIplex HORTENSIS* L.)

### Introduction

THE pre-sowing hardening and foliar application with growth regulators are known to result in early emergence<sup>2</sup>, enhanced growth rate<sup>1-3, 5</sup>, and increased yield<sup>3, 7</sup>. Studies were undertaken on orach (*Atriplex hortensis* L.) a common leafy vegetable, to determine the efficacy of seed hardening and foliar application with indole-acetic acid (IAA), gibberellic acid (GA<sub>3</sub>), (2-chloroethyl) trimethyl ammonium chloride (CCC), kinetin, (2-chloroethyl) phosphonic acid (ethrel), and ascorbic acid (AA).

### Experimental

The seeds of orach obtained from Kissan Seeds Corporation, Bangalore, were subjected to 3 cycles of hardening with distilled water and 25,100,250 and 500 ppm each of GA<sub>3</sub>, ethrel, CCC, AA and 100 and 500 ppm of Kinetin. Each cycle was constituted of 3 h soaking in the respective media followed by 40 h air-drying to the original weight. The treatment was given under laboratory conditions of light and temperature (26° to 28° C). The treated seeds were set for germination in petri dishes of 10 cm. dia. lined with moist blotters in 5 replications of 10 seeds each. The unhardened seeds were used as control. The mean maximum and minimum temperatures during test period were 28° C and 25° C respectively and mean relative humidity was 52%. Data on the length and dry weight of root and shoot and reducing sugar content by DNS method (Clark J. M.)<sup>1</sup>, of 72 h old seedlings were recorded. In another trial orach seeds were hardened with 20 and 200 ppm of GA<sub>3</sub>, kinetin, ethrel, and IAA each in 3 cycles. Each cycle consisted of 4 h soaking and 40 h air drying. Water hardened and unhardened seeds were also included in the experiment for comparison. Plants were raised in 1.8 × 1.2 meters plots in Lalbagh, Bangalore, in five replications of nine plants each in randomized block layout. The mean maximum and minimum temperatures during the test period were 28.4° C and 19.7° C respectively and the mean relative humidity was 68%. Data on dry weight of root and shoot systems of the 15-day old and 30-day old plants were recorded.

20-day old plants of orach grown in 1.8 × 1.2 meters plots in Lalbagh, were given a foliar spray with GA<sub>3</sub>, kinetin, AA and CCC each at 25 and 250 ppm. Other details were as for the above field trial. The maximum and minimum temperatures were 28.4° C and 16.3° C respectively and mean relative humidity was 60%. The dry weight of shoot and root of the 35-day old plants was recorded.