

Effect of Carbofuran on Okra (*Abelmoschus esculentus* (L.) Moench).

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ABSTRACT

Pot culture studies were made on the effect of treating the seeds of Okra with three doses of carbofuran (4, 5, and 6 parts of seed). The effect of treatments was studied on germination, growth, yield and fruit composition. A marginal reduction in germinability was observed at the highest dose. The plants as a result of treatment grew vigorously, flowered earlier by 2-3 days, and yielded more number of fruits. The fruits from treated plants had higher soluble nitrogen, phosphorus calcium and magnesium accompanied by a reduction in total nitrogen content of fruits. The results indicated the relative safety and utility of 4 and 5 parts of carbofuran per 100 parts considering the attributes studied.

INTRODUCTION

Application of plant protection chemicals has direct and indirect influences on growth and development of plants. This aspect deserves attention in the context of the currently increased emphasis on systemic insecticides which enter the sap stream for their functioning.

Thirmala Rao *et al.* (1954) found that the application of DDT to brinjal and bhendi (Okra) resulted in an increased vegetative growth. Application of systemic insecticides have been reported to result in perceptibly improved plant growth in cotton (Sithanantham, 1968; Swamiappan, 1969) and in Okra (Navaneethan, 1970). Yield increments as a result of application of insecticides have been reported in many crops as in potatoes (Harding, 1962)

cabbage (Young and Ditman, 1959), beet (Steimerling, 1966) as well as Okra (Navaneethan, 1970).

Improved quality of tobacco following application of dimethoate and menazon has been reported by Legge (1965) while in Okra, Perumal *et al.* (1971) observed an enhanced quality of fruits due to foliar application of four insecticides.

The scope of seed treatment as a method of providing built in protection to Okra was pointed out by Jotwani *et al.* (1966). Recently, Carbofuran (2, 3-dihydro-2, 2 - Dimethyl 1-7 - benzo-furanyl 1 methyl carbamate) has been reported to be effective chemical for protection against sucking pests on a number of crops. The aphicidal efficacy of Carbofuran seed treatment was worked out by Shanthakumar and Perumal (1973) and further studies

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were taken up on the effect of carbofuran seed treatment on germination, growth, yield and composition of fruits, under controlled conditions and the results are presented in this paper.

MATERIALS AND METHODS

Seeds of Okra (Variety: Pusa Sawani with seed moisture of 9.8 per cent) were coated with Carbofuran (Furadon 50 per cent W.P.) to provide 4.5 and 6 parts of active ingredient per 100 parts of seeds, using Carbowax as an adhesive. Appropriate untreated control was maintained and the treatments were replicated five times and two such sets were maintained for growth studies. Observations were made on the viability of seeds by sowing 100 seeds in petridishes with sand medium observations till 14 days after sowing were recorded in two replications. Seeds were then sown in pots filled with soil at the rate of 3 per pot and the plants were thinned to one per pot 15 days after sowing. Plants in one set were carefully removed without root injury at the 30th day

after germination and the shoot root ratio on fresh weight basis, leaf area and petiole length were recorded. In another set data on the number of days for flowering, number of flowers put forth, number of fruits set per plant, length and girth of representative fruits were recorded.

At 30th day after germination the total chlorophyll content of the third fully opened leaf from the shoot tip was estimated (A.O.A.C., 1960). Sample of fruits of nearly uniform maturity were drawn from the treatment at 60 days after germination and were analysed for the content of total nitrogen, soluble nitrogen, phosphorus, (Jackson, 1962), calcium and magnesium (Ward and Johnston, 1962).

RESULTS AND DISCUSSION

The data on germination, plant growth and yield are furnished in Table 1. The germination per cent of the treated seeds was reduced as the

TABLE 1. Effect of carbofuran on germination, plant growth and yield of Okra
(Values are means of two replications)

Treatments	Per cent germination	Shoot/root ratio (by weight)	Leaf area (cm ²)	Petiole length (cm)	No. of days for first flowering	No. of flowers per plant	No. of fruits per plant	Fruit size	
								Length (cm)	Girth (cm)
Carbofuran-4 parts per 100 parts of seeds	78.0	5.55	107	22.2	32	19	16	14.0	6.3
Carbofuran-5 parts per 100 parts of seed	70.0	5.77	124	15.4	33	17	12	14.6	5.6
Carbofuran-6 parts per 100 parts of seeds	64.0	5.87	102	16.4	32	16	14	15.6	5.0
Untreatment (control)	82.0	3.10	76	12.3	35	14	11	13.3	4.0

dosage of carbofuran increased. Such dosage dependent reduction in seed germination due to systemic insecticides was observed in cotton by Sithanatham (1973) who indicated that such marginal reduction in the lower dosages did not result in reduced plant stand. Except for the highest dose the other doses tried in the studies were not adverse to seed germination. The root growth did not differ markedly among the treatment, and as such it is apparent that the insecticidal application has induced vigorous shoot growth. The leaves were distinctly larger in the treated plants, their mean area ranging between 102 to 124 cm² among the three doses while in the untreated plants it was as low as 72 cm². The length of the petiole varied, the trend being similar to leaf area. Such observations are in confor-

mity with the reports of Sithanatham (1968) on cotton and Perumal *et al.* (1971) on Okra.

The plants applied with insecticide were earlier by 2 to 3 days and the number of flowers were 19, 17 and 16 at 4, 5, and 6 parts treatment while 14 flowers alone could be recorded in the untreated plants. A maximum number of 16 fruits were borne at the lowest dose while it was 14 fruits with the highest dose.

In the leaves the content of chlorophyll 'a' and 'b' was higher in the treated plants and thus Carbofuran treatment contributed to increased total chlorophyll content of the leaves (Table 2). This is considered as a desirable response in the protected plants. A maximum content of total nitrogen in the

TABLE 2. Effect of Carbofuran on leaf chlorophyll and fruit composition in Okra

Treatment	Leaf chlorophyll content ² (mg/g)			Total nitro- gen ¹ (%)	Soluble nitro- gen ² (%)	Phosphorus ¹ (%)	Calcium ¹ (%)	Magnesium ¹ (%)
	a	b	Total					
Carbofuran-4 parts per 100 parts of seed	0.707	0.652	1.359	1.68	0.055	0.44	0.72	0.67
Carbofuran-5 parts per 100 parts of seed	0.706	0.669	1.375	1.29	0.055	0.41	1.16	0.56
Carbofuran-6 parts per 100 parts of seed	0.701	0.564	1.275	1.07	0.057	0.40	0.64	0.70
Untreated (control)	0.665	0.471	1.136	1.43	0.054	0.31	0.46	0.50

1=Dry weight basis

2=Fresh weight basis

fruits was noted due to treatment with 4 parts of Carbofuran, whereas the other two higher doses resulted in lesser total nitrogen than the untreated plants. The soluble nitrogen content was however higher in all the treatments as compared to control. In general the mineral content was on the increase due to treatments.

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