

TOXICITY OF FUNGICIDE DITHANE M-45 TO *CLADOPHORA CRISPATA* (ROTH) KUETZ.

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Cultures of *Cladophora crispata* (Roth) Kuetz were treated with different concentrations of fungicide, Dithane M-45 (Mancozeb) and its effect was recorded on growth, survival and cellular metabolites. Growth and survival of the alga was completely inhibited at 1.0% Dithane M-45. The growth, survival and metabolites of the alga correspondingly decreased with increasing concentrations of Dithane M-45 except at lower concentrations.

Keywords : Dithane M-45; *Cladophora crispata* (Roth) Kuetz.

Use of pesticides is a wide spread practice in maintaining crop health, but at the same time they are dangerous to the beneficial micro-organisms of the soil. Effect of large number of fungicides have been studied on various cyanobacteria but very few studies exist pertaining to green algae. In the present study an attempt has been made to study the effect of Dithane M-45 on growth, survival and cellular metabolites of *C. crispata*.

The test alga, *Cladophora crispata* a member of Cladophorales (Chlorophyceae) was collected from a cistern in the Department of Botany, Kakatiya University, Warangal and was maintained as unialgal culture in Chu 10 medium¹ at $22 \pm 2^\circ\text{C}$ temperature and illumination with a light intensity of 2800 lux in a 16/8 hours light/dark cycle. Filaments from actively growing healthy cultures were transferred to fresh medium one day prior to the treatment with fungicide. After 96 hours incubation, growth (dry weight) and survival studies were done². Quantitative estimation of pigments³,

proteins⁴ and carbohydrates were estimated by employing standard methods.

Effect of different concentrations of the fungicide on the growth of *Cladophora crispata* is shown in Table 1. Stimulation of growth was noticed at lower concentrations (0.0001 and 0.001%) of the fungicide. But the growth rate decreased gradually with increasing concentrations of dithane M-45 and at 1% it proved to be algicidal. Stimulation in growth of certain algae due to fungicides have been reported⁵⁻⁷. Lower concentrations of the fungicide present in the medium may get attached to cell wall membrane and thereby damaging the membrane or altering the nutrient flow to direct enzyme stimulation thereby promoting the growth of the alga. Similar observations were reported in *Chlorella* and other green alga^{8,9}. The study indicates that Dithane M-45 apart from its known fungicidal activity promotes the growth in *C. crispata* when used in lower concentrations and is compatible with growth promoters like gibberelic acid.¹⁰

Table 1. Short term effect of Dithane M-45 on survival percentage, dry weight, pigments and metabolites of *Cladophora crispata*.

	Basal medium + Fungicide concentration (%)					
	Control	0.0001	0.001	0.01	0.1	1.0
Healthy cells	79	88	83	65	45	-
Dead cells	21	12	17	35	48	-
Dry weight (mg)	85.0	92.5	89.0	82.5	44.5	-
Chlorophyll-a (mg/g)	0.4150	0.5354	0.4765	0.3684	0.2128	-
Chlorophyll-b (mg/g)	0.2214	0.2433	0.2234	0.1779	0.1282	-
Total chlorophyll (mg/g)	0.6364	0.7787	0.6999	0.5463	0.3410	-
Carotenoids (mg/ml)	0.0026	0.0030	0.0028	0.0018	0.0010	-
Carbohydrates (μ g/100 mg fresh wt.)	800	1000	840	520	280	-
Protein (mg/100 μ g fresh wt.)	60	86	64	48	22	-

The percentage survival of the alga decreased with increasing concentrations of dithane except in lower concentrations (Table 1).

An increase in cellular metabolites viz. pigments, proteins, and carbohydrate content over the control was noteworthy in 0.0001% and 0.001% concentrations compared to higher concentrations of the fungicide tested in the present study (Table 1) Even though some alga are tolerant to higher levels of pesticides¹¹, *Cladophora crispata* which is a primary producer in aquatic system tolerates upto 1.0% of dithane. Short term toxicity studies will be valuable as they can provide maximum amount of comparative data within a short span of duration¹² and will be useful to assess their responses to different pollutants.

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