RESPIRATORY RESPONSE OF *GLOEOSPORIUM PAPAYAE* INDUCED BY VARIOUS SUBSTANCES

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Effects of various carbohydrates, amino acids, hormones, fungicides and antibiotics on the endogenous mycelial respiration of *Gloeosporium papayae* were investigated. Among the carbohydrates, xylose, trehalose and arabinose were used as good respiratory substrates by the fungus. The endogenous respiration was greatly stimulated in presence of threonine. All the hormones at lower concentrations caused a progressive stimulation of fungal respiration, while at higher concentrations these substances produced inhibitory effects. Of the ten fungicides used, thiovit, cosan, thiram, sultaf and captan were more effective. The mycelial respiration was considerably increased by terramycin and streptomycin while amphotericin and gramicidin produced the inhibitory effects.

INTRODUCTION

Gloeosporium papayae causes a very severe soft rot of papaya fruits at Sagar (Rai 1971). The present paper deals with the effect of various carbohydrates, amino acids, plant growth regulators, fungicides and antibiotics on the endogenous mycelial respiration of *G. papayae*.

MATERIALS AND METHODS

The culture of *Gloeosporium papayae* P. Henn used in the present study was isolated from diseased papaya fruits. The basal medium contained dextrose, 50g; malt extract (Difco), 50g; K_2HPO_4, .012M; KH_2PO_4, .02M; NH_4NO_3, .0375M; $MgSO_4.7H_2O$, .009M and 1000ml distilled water (Darby and Goddard 1950).

Mycelial suspension for respirometric studies was prepared as previously described (Soni and Vyas 1973). Determinations of oxygen consumption were made following the techniques described by Umbreit *et al.* (1964). Hormonal solutions except kinetin were prepared by dissolving the required amount of the hormone in one ml of ethanol which was then diluted with distilled water. In case of kinetin, slightly heated .05M NaOH solution was used in place of ethanol. All the fungicides were used as suspension because of their insolubility in water. The rate of oxygen uptake was measured as QO_2: μl of O_2 consumed/hr/g dry wt.

RESULTS AND DISCUSSION

Carbohydrates—Out of the eleven carbohydrates tested, seven werefound to increase the rate; among these xylose, trehalose and arabinose were more effective

TABLE I

Effect of carbohydrates and amino acids on endogenous mycelial respiration of G. papayae

Carbohydrates (0.01M)	QO_2*	% change	Amino acids (0.005M)	QO_2	% change
Control	15800	0.0	Control	17100	0.0
			DL-arginine	16800	—1.7
Arabinose	26600	68.3	DL-ornithine	16509	—3.4
Rhamnose	13351	—15.5	Threonine	24752	44.7
			Tyrosine	10260	—40.0
Xylose	28600	81.0	DL-methionine	18006	5.2
Glucose	19000	20.2	DL-serine	12825	—25.0
			Glutamic acid	17421	1.8
Fructose	19068	20.6	Glycine	17700	3.5
Galactose	19080	20.7	DL-aspartic acid	18699	9.3
			DL-α-alanine	17502	2.3
Mannose	21050	33.2	β-alanine	18000	5.2
Lactose	15960	1.0	α-amino-n-butyric acid	18408	7.6
Raffinose	15500	—1.8	DL-lysine	18700	9.3
			DL-histidine	18000	5.2
Ribose	17120	8.3	DL-valine	13700	—19.8
Trehalose	27556	74.4	L-leucine	18690	9.2
			L-proline	21900	28.0
			L-cysteic acid	16140	—5.6
			L-(—) cystine	21525	25.8

*μl of O_2 consumed/hr/g dry wt.

than others (Table I). The utilization of various carbohydrates as good respiratory substrates is also known for various other fungi (Al-Doory 1959; Bechtol and Throneberry 1960; Thakurji 1969).

Amino acids—Amino acids produced both stimulatory and inhibitory effects (Table I). Out of the eleven stimulatory amino acids threonine was most effective (44.7 per cent), which was followed by L-proline and L-cystine respectively. Stimulatory responses by others were, however, not significant because none of them could show more than 10 per cent stimulation from the control. Among the eight inhibitory amino acids, tyrosine showed a greater amount of activity than others. The stimulation of fungal respiration by added amino acids has been reported in several fungi (Al-Doory 1959; Bechtol and Throneberry 1966); the reports of respiratory inhibition by some of these substances are, however, scanty (Vyas 1971; Vyas *et al.* 1972).

Plant growth regulators—The rate of respiration was increased with lower concentrations of all the hormones; their higher concentrations, caused respiratory inhibition (Table II). The maximum respiratory stimulation was brought about

TABLE II

Effect of plant growth regulators on endogenous mycelial respiration of G. papayae

Plant growth regulator	Conc. ppm	QO_2	% change	Plant growth regulator	Conc. ppm	QO_2	% change
Control	—	17204	0.0	GA	0.1	20600	19.7
IAA	0.1	17670	2.7		1.0	27860	61.9
	1.0	20585	19.6		2.0	19400	12.7
	2.0	19346	12.4		5.0	14000	—18.6
	5.0	18108	5.2		10.0	13200	—23.2
	10.0	17100	—0.6		20.0	12820	—25.4
IBA	0.1	21208	23.2	2, 4-D	0.1	17630	2.4
	1.0	22400	30.2		1.0	18000	4.6
	2.0	21836	26.9		2.0	22209	29.0
	5.0	19962	16.0		5.0	17945	4.3
	10.0	18400	6.9		10.0	16915	—1.6
	20.0	16040	—6.7		20.0	16910	—1.7
IPA	0.1	17940	4.2	Kinetin	0.1	18820	9.3
	1.0	19500	13.3		1.0	22040	28.1
	2.0	21432	24.5		2.0	19300	12.1
	5.0	21800	26.7		5.0	19550	13.6
	10.0	21200	23.2		10.0	17500	1.7
	20.0	18300	6.3		20.0	16865	—1.9

TABLE III

Effect of fungicides and antibiotics on endogenous mycelial respiration of G. papayae

Fungicides (200 ppm)	QO_2	% inhibition	Antibiotics (10 ppm)	QO_2	% change
Control	14800	0.0	Control	14400	0.0
Blimix	14000	5.4	Streptomycin	24393	69.3
Captan	9400	36.4	Terramycin	25290	75.6
Cuman	12000	18.9	Penicillin	15600	8.3
Cosan	6808	54.0	Neomycin	13000	—9.7
Blitox	12624	14.7	Gramicidin	10620	—26.2
Brassicol	11384	23.0	Nystatin	15000	4.1
Thiovit	4280	71.0	Amphotericin	10040	—30.2
Blitane	11760	20.5			
Thiram	7260	50.9			
Sultaf	8480	42.7			

by GA (61.9 per cent at 1 ppm) which was followed by IBA (30.2 per cent at 1 ppm), 2, 4-D (29 per cent at 2 ppm), Kinetin (28.1 per cent at 1 ppm), IPA (26.7 per cent at 5 ppm), and IAA (19.6 per cent at 1 ppm). Recently Vyas (1971) has also studied the influence of these growth promoting substances on the oxidative metabolism of *S. rolfsii* and has reported a high increase in the endogenous mycelial respiration with the addition of IAA and IBA.

Fungicides—During this study ten fungicides were used. All the fungicides were found to inhibit the mycelial respiration except blimix. Amongst these thiovit, cosan, thiram, captan and sultaf showed significant inhibitory effects (Table III). These results support the findings of Rai (1971) who has observed the control of papaya fruit rot by these fungicides.

Antibiotics—Out of the seven antibiotics tested, terramycin and streptomycin increased the respiratory rate up to 75.6 per cent and 69.3 per cent over control respectively. Amphotericin and gramicidin, however, showed substantial inhibitory effects (Table III). All these antibiotics excepting nystatin, were found to increase the mycelial respiration of *S. rolfsii* (Vyas 1971). However, the respiratory rate of *F. oxysporum* could not be affected significantly by any of these antibiotic substances (Soni and Vyas 1973).

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