EFFECT OF SOME PHENOLIC COMPOUNDS ON SPORULATION AND GROWTH OF *PYRICULARIA* SPP.*

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ABSTRACT

Sporulation of *Pyricularia* isolates were generally depressed by most of the phenolic compounds under the experimental conditions. However, many of the compounds tended to induce conidial formation in the otherwise non-sporulating isolate from *B. mutica*. Caffeic acid and guaiacol for the isolate from *O. sativa*, coumarin for the isolate from *E. coracana* and cinnamic acid for the isolate from *P. repens* were stimulatory for sporulation. As judged by their growth response, the isolates from *O. sativa* and *B. mutica* tolerated a wider variety of phenols than the isolates from *L. hexandra* and *P. repens*. The isolates from *E. coracana* and *S. italica* showed an intermediate response.

INTRODUCTION

THE beneficial effect of chlorogenic acid on sporulation of certain isolates of *Pyricularia* was previously reported (Narayanarao *et al.*, 1972). Kato and Dimond (1966) observed that besides chlorogenic acid, caffeic acid and catechol also stimulated sporulation of *P. oryzae*. Presently, the effect of some phenolic compounds on sporulation of six isolates of *Pyricularia* was examined. Incidentally, the effect of the compounds on growth of the isolates was noted. The intensity of browning was also assessed.

MATERIALS AND METHODS

The materials used, cultural and other methods were as described previously (Narayanarao *et al.*, 1971). The compounds were added singly to the basal medium so as to give the final concentrations of 0·5 mM and 2·0 mM.

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Results and Discussion

The effects of the compounds on sporulation of the six isolates of *Pyricularia* are shown in Table I. Growth and the attendant browning as assessed visually are recorded in Table II.

Table I

Effect of phenolic compounds on sporulation of Pyricularia *spp.*

Phenolic compound	Conc. mM	Number of conidia × 10^4/tube					
		Isolate from					
		O. sativa	*E. coracana*	*S. italica*	*P. repens*	*B. mutica*	*L. hexandra*
Basal medium ..	..	200	65	170	15	0	50
Salicylic acid ..	0·5	25	7	148	*	*	21
	2·0	40	10	125	*	0	12
p-Hydroxy benzoic acid ..	0·5	46	*	90	0	0	40
	2·0	10	*	80	0	0	7
Guaiacol ..	0·5	274	21	73	7	*	15
	2·0	35	40	10	7	*	5
Catechol ..	0·5	45	*	2	—	*	—
	2·0	—	—	—	—	*	—
Resorcinol ..	0·5	100	17	25	*	*	*
	2·0	20	10	*	*	0	0
Hydroquinone ..	0·5	80	58	113	*	*	20
	2·0	17	*	—	—	*	*
Protocatechuic acid ..	0·5	43	30	47	*	0	7
	2·0	35	7	82	*	0	8
Caffeic acid ..	0·5	285	15	40	*	0	10
	2·0	80	17	74	*	0	5
Pyrogallol ..	0·5	43	12	45	10	0	—
	2·0	—	—	15	3	—	—
Phloroglucinol ..	0·5	66	15	55	*	*	2
	2·0	31	6	31	*	*	7
Coumarin ..	0·5	50	140	70	2	*	14
	2·0	—	—	—	—	*	*
+ Cinnamic acid ..	0·5	94	25	45	43	2	*
	2·0	—	—	—	—	2	—

0 Nil sporulation; * Sparse sporulation; — Nil growth. + (included for comparison).

TABLE II

Visual growth response of Pyricularia *spp. to phenolic compounds at* 0·5 *and* 2·0 *mM concentrations*

Isolates from	Phenolic compounds																							
	Salicylic acid		*p*-Hydroxy benzoic acid		Guaiacol		Catechol		Resorcinol		Hydro-quinone		Proto-catechuic acid		Caffeic acid		Pyrogallol		Phloro-glucinol		Coumarin		†Cinnamic acid		Basal medium
	0·5	2·0	0·5	2·0	0·5	2·0	0·5	2·0	0·5	2·0	0·5	2·0	0·5	2·0	0·5	2·0	0·5	2·0	0·5	2·0	0·5	2·0	0·5	2·0	
O. sativa	+ 0	+ 0	+ 0	− 0	+ 4	− 4	− 4	* 4	+ 0	− 0	− 1	− 3	+ 2	− 4	+ 3	+ 4	− 0	* 0	+ 0	− 0	− 0	* 0	− 0	* 0	+ 0
E. coracana	− 0	− 0	− 0	− 0	+ 2	− 4	− 2	* 3	+ 1	− 2	− 1	− 2	− 3	− 4	+ 3	+ 4	− 1	* 1	− 1	− 2	− 0	* 0	− 0	* 0	+ 0
S. italica	+ 0	+ 0	− 0	− 0	+ 4	+ 4	− 2	* 2	+ 0	− 0	− 0	* 0	− 3	− 4	+ 4	+ 4	− 2	− 3	− 0	− 0	− 0	* 0	− 0	* 0	+ 0
P. repens	− 0	− 0	− 0	− 0	− 4	− 4	* 4	* 4	+ 0	− 0	− 1	* 2	− 1	− 2	+ 4	+ 4	− 0	− 2	− 0	− 0	− 0	* 0	− 0	* 0	+ 0
B. mutica	+ 0	+ 0	+ 0	+ 0	+ 4	+ 4	− 2	− 4	+ 2	− 3	− 2	− 4	− 3	− 4	+ 4	+ 4	− 2	* 0	+ 0	− 0	− 0	− 0	− 0	− 0	+ 0
L. hexandra	− 0	− 0	− 0	− 0	− 2	− 4	* 1	* 2	+ 0	− 0	− 1	− 1	− 0	− 0	− 1	− 2	* 0	* 0	− 0	− 0	− 0	− 0	− 0	* 0	+ 0

Growth ratings:

+ same or slight stimulation over control.
− Inhibition over control.
* Nil growth.
† (included for comparison).

Browning response:
0: No browning.
1: Light browning.
2: Moderate browning.
3: Intense browning.
4: Very intense browning.

It is evident from the results presented in Table I that the isolates of *Pyricularia* from the three cultivated cereals generally sporulated better than the isolates from the grasses. With few exceptions, most of the phenolic compounds inhibited sporulation of the isolates under the experimental conditions of the investigation. The extent of this inhibition varied with the compound and the concentration as well as with the isolate.

None of the compounds stimulated sporulation of the isolates from *S. italica* and *L. hexandra*. However, caffeic acid and guaiacol stimulated sporulation of *P. oryzae* at 0·5 mM concentration. Coumarin for the isolate from *E. coracana* and cinnamic acid for the isolate from *P. repens* were stimulatory at 0·5 mM level. In contrast to the other isolates, that from *B. mutica* failed to sporulate in the basal medium. It is interesting to note that many phenolic compounds which inhibited sporulation of other isolates tended to induce the isolate from *B. mutica* to sporulate, though sparsely. This effect is particularly noticeable with cinnamic acid at both concentrations.

Hydroxylation of aromatic compounds is believed to be associated with sporulation and pigment formation in *Aspergillus niger* (Woodcock, 1960). Because of the general inhibition of sporulation by most of the phenolic compounds in the present study it has not been possible to attempt any such correlation. However, it may be noted from Table II that catechol, hydroquinone, pyrogallol, coumarin and cinnamic acid inhibited growth of all the isolates, and growth response to the rest of the compounds varied with the isolate. Except for resorcinol, all other phenolic compounds inhibited growth of the isolate from *L. hexandra* even at the lower concentration. Similarly all compounds except resorcinol and caffeic acid inhibited growth of the isolate from *P. repens*. In contrast to this, the isolates from *O. sativa* and *B. mutica* tolerated a wider variety of phenols. Growth of the isolate from *E. coracana* and *S. italica* was not affected by resorcinol, caffeic acid and guaiacol and growth of the latter isolate was not inhibited by salicylic acid also. The other compounds were inhibitory for both isolates. These differences in growth response among the *Pyricularia* isolates to various phenolic compounds would seem to be of interest in further studies on the taxonomy and host range of the genus.

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