

SOME OBSERVATIONS ON SCLEROTIAL BEHAVIOUR OF *CORTICIUM SASAKII* CAUSING SHEATH BLIGHT OF RICE

BY

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Environmental, nutritional, and pesticidal effects on the production of sclerotia of *Corticium sasakii* (Shirai) Matsumoto, a rice pathogen were studied *in vitro*. Results revealed that temperature of 30°C, pH 5.0 and light significantly stimulated sclerotia production. Potato-dextrose-agar, 3% sucrose in Richard's medium and a ratio of 3 : 1 carbon and nitrogen in the medium supported maximum production of sclerotia. Among the four pesticides (viz., Carbofuran, dimethoate endosulfan and Phosphamidon) tested, all excepting carbofuran completely inhibited sclerotia production at 0.1% level. Endosulfan was the most effective. Effect of burial on the viability of sclerotia was also recorded. Sclerotia (in unsealed cellophane packet) buried in rhizosphere of rice at a depth of 15 cm for 45 days lost their viability up to 50%. The percentage survival was only 10% when retrieved from burial after 60 days.

INTRODUCTION

Sclerotia are perennating structures and are considered as one of the potential sources of fungal inocula causing diseases of various crop plants. Severity of infection and dissemination are sometimes related to the rate of production and germination of disease. *Corticium sasakii* causes sheath blight disease of rice. Attempts have been made to study effect of some environmental, and nutritional factors and pesticides on production of sclerotia. Besides, effect of burial on the viability of sclerotia has also been studied. Although considerable amount of work has been done on the sclerotia of other fungi (Adams, 1975; Rodriguez-Kabana *et al.*, 1980) relatively little is known about the sclerotia of *C. sasakii* (Inoue and Uchino, 1963; Roy, 1976; Dath, 1982). This communication reports some observations on the sclerotial behaviour of the rice sheath blight pathogen.

MATERIALS AND METHODS

Corticium sasakii (Shirai) Matsumoto was grown on desired media, incubated for 4-6 days at 30°C and then sclerotia were counted. Only the number of brown coloured sclerotia were noted. In some cases, however, fresh and dry weights recorded after 72 hours drying at 60°C were also recorded.

To study the viability of sclerotia, they were collected from 6-day-old culture, taken in unsealed colophase packets (30 sclerotia/packet - 10 cm x 5 cm) and buried in the rhizosphere of rice at a depth of 15 cm. The packets were collected after a desired period of incubation. Each sclerotium was placed in a drop (0.02 ml) of sterile distilled water on a glass slide (4 sclerotia/slide) and incubated in a moist chamber at $30 \pm 1^\circ\text{C}$. To avoid contaminants nutrient medium was not used. Since 0.1% HgCl_2 was also found to be slightly inhibitory to the germination of sclerotia, this chemical was also avoided. Percentage survival of sclerotia was calculated after microscopic observations.

RESULTS

Effect of environmental factors on production of sclerotia : *C. sasakii* was grown on PDA medium in petriplates and incubated at 20, 25, 30 and 35°C . No sclerotia were formed at 20 and 35°C after 4 days of incubation while maximum sclerotia (50 sclerotia/Petri plate) were produced at 30°C . Sclerotia (20 sclerotia/Petri plate) were also formed at 20 C only after 10 days of incubation.

To study the effect of pH, PDA medium adjusted to different pH levels (5.0, 5.5, 6.0, 6.5, 7.0, 7.5 and 8.0) were prepared using phosphate buffer, inoculated and incubated for 7 days at 30 C. Sclerotia were produced in a wide range of pH. Highest number of sclerotia were noted at pH 5.0 (106 Petri plate) followed by pH 5.5 (95/Pstri plate) and pH 6.0 (65 Petri plate). No sclerotia were observed at a pH range of 6.5-8.0 up to 4 days. A few were produced at a pH range of 6.5-7.5 after 5 days and also at pH 8.0 after 7 days of incubation.

Five sets of culture of *C. sasakii* in Petri plates were exposed separately to continuous light (400 lux), continuous darkness, alternate light and darkness (every 24 h), first 4 days in light and last 3 days in complete darkness and vice versa. In all cases incubation period was 7 days. Results revealed that continuous light supported maximum production of sclerotia while continuous darkness inhibited it.

Effect of substrate nutrients : A number of media (Potato-dextrose agar (PDA), 2% Malt extract agar, 2% Rice leaf extract agar, 2% Rice sheath extract agar and 2% water agar) were testen of which PDA appeared to be the best (90/Petri plate). When Richard's medium was supplemented separately with different concentrations (1, 2, 3, 4 and 5%) of sucrose favoured maximum production of sclerotia (44/Petri plate).

The response of *C. sasakii* to different ratios of carbon and nitrogen (C : N) in the medium was also tested. Equal amounts of carbon and nitrogen (0.14g litre each) in the form of sucrose and potassium nitrate were supplemented with the basal medium (KH_2PO_4 - 5g; $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ - 2.5g; FeCl_3 - 0.2g; distilled water - 1 litre). Similarly, other grades were also prepared by mixing appropriate quantity of carbon

and nitrogen. The production of sclerotia was counted after 5 days of incubation and the result are given in Table 1. The ratio 3 : 1 (C : N) was most suitable for the production of sclerotia. It is significant to note that no sclerotium was observed in a medium with 1 : 3 ratio of carbon and nitrogen or medium without either carbon or nitrogen.

Table 1: *Effect of C : N ratio on the production of sclerotia of C. sasakii*

C : N ratio	Incubation period (5 days)		
	Av. No. of sclerotia/ Petri plate (100 mm)	Fresh weight (mg)	Dry weight (mg)*
1 : 1	20.00	53.00	13.66±0.44
2 : 1	45.33	176.50	47.26±1.89
3 : 1	4.00	291.66	69.80±4.71
5 : 1	18.33	125.33	37.00±4.04
1 : 2	8.66	12.83	2.66±1.66
1 : 3	0	0	0
Basal medium+carbon	0	0	0
Basal medium+nitrogen	0	0	0

*C.D. (5%)=7.12 3 replicate Petri dishes/treatment

*C.D. (1%)=9.81 Temperature 30±1°C

Table 2: *Effect of pesticides on the production of sclerotia of C. sasakii*

Pesticides %, (a.i)	Incubation period (4 days)		
	Av. no. of sclerotia/ Petri plate (100 mm)	Fresh weight (mg)	Dry weight* (mg)
Furadon 3G**			
0.01	23.00	70.33	25.33±1.45
0.1	6.66	0.33	7.33±1.20
Control	50.33	220.66	76.33±1.45
Rogor 50 EC			
0.01	29.00	115.66	38.66±1.76
0.1	0	0	0
Control	54.66	218.00	73.33±3.17
Endosulfan 35 EC			
0.01	5.66	14.00	4.66±0.33
0.1	0	0	0
Control	37.00	218.00	72.66±0.67
Dimecron 85 SL			
0.01	27.33	92.66	38.66±1.76
0.1	0	0	0
Control	52.00	204.00	72.00±2.88

*C.D. (5%)=3.05 3 replicate Petri dishes/treatment.

*C.D. (1%)=4.13 Temperature 30±1°C

**No production of sclerotia at 0.25%

Effect of pesticides : Since pesticides are frequently used on rice plants to control various pests, effectiveness of four pesticides viz., Furadon 3G (Carbofuran), Roger 50 EC (dimethoate), Endosulfan 35EC and Dimecron 85SL (Phosphamidon), were also tested *in vitro*. PDA medium was separately supplemented with different concentrations (0.01, 0.1%) of pesticides. The sclerotia were counted 4 days after inoculation and the results are presented in Table 2. All the four pesticides excepting Furadon inhibited sclerotia production at 0.1% level. In case of Furadon total inhibition occurred at 0.25% level. Endosulfan was most effective in inhibiting the production of sclerotia.

Effect of burial on germination : Thirty sclerotia were taken in each cellophane packet and placed in the rhizosphere at a depth of 15 cm for a period of 60 days. About 50% sclerotia lost their viability when they were buried at a depth of 15 cm for 45 days. Only 10% sclerotia germinated when retrieved from depth of 15 cm after 60 days.

DISCUSSION

Optimum environmental conditions required for the production of sclerotia of *C. sasakii* in culture have been evaluated. The stimulatory effect of light on sclerotia production has been noted which confirms the findings of Hemi and Endo (1931). This fungus was unable to produce any sclerotia when the medium was devoid of either carbon (C) or nitrogen (N). However, a ratio of 3 : 1 carbon and nitrogen in the medium markedly stimulated sclerotia production. It suggests that both C and N are essential for the formation of sclerotia of *C. sasakii*.

Some pesticides significantly inhibited the production of sclerotia although their efficacy was not same. Results of present study suggest that both infectivity and viability of sclerotia of *C. sasakii* could be considerably reduced by application of selective pesticides.

It is noteworthy that 90% of sclerotia lost their viability when buried at a depth of 15 cm for 60 days. The loss of viability due to burial is not uncommon in other sclerotia producing fungi (Bretag and Merriman, 1981). Chowdhuri (1946) reported that only 60% sclerotia of *Sclerotium rolfsii* were viable when buried in the field at a depth of 10.1 cm for 60 days. The loss of viability may be caused by any volatile substances (Javed and Coley-Smith, 1973) or toxic microbial metabolites present in the soil.

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