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# STUDIES ON *FUSARIUM OXYSPORUM* SCHLECT INFECTING RICE BROWN PLANT HOPPER *NILAPARVATA LUGENS* STAL

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Kuruvilla and Jacob (1978) reported the occurrence of *Fusarium oxysporum* Schlect as a pathogen of the rice plant hopper in Vellayani, Kerala. Results of studies made on the effect of different compositions of media on growth and sporulation of the fungus and on the influence of age of the culture on its sporulation and virulence are presented in this paper.

## Materials and Methods

Laboratory culture of the fungus was established from field collected diseased specimens of the plant hopper and the culture was maintained on oat meal agar medium. Growth characteristics and sporuiation were studied on the different media given in Table 1. Plates were prepared with the media and one loopful of the spore suspension was placed at the centre of the plate and incubated at room temperature and humidity.

Four replicates were maintained for each medium. Radial growth of the fungus was recorded when mycelial growth in any one of the media completely covered the petri dish. On the same day sporuiation counts were made in all the media. For this, six 5 mm diameter discs were cut out from differnt areas of the fungal growth and put into a 250 ml conical flask containing 100 ml sterile water The flask was agitated thoroughly and spore concentration in each flask estimated with the aid of a haemocytometer and expressed as number of spores per ml.

To study the effect of age of culture on sporulation, plate cultures of the fungus on oat meal agar medium were observed daily from the second day onwards upto the nineth day as described earlier. Virulence of the spores collected on each day from the third day onwards was assayed against third instar nymphs of the brown plant hopper liberated on small clumps of rice (variety, *Jaya)* enclosed in glass hurricane lamp chimneys. The suspension used for these assays contained 3.1 x $10^6$ conidia/ml and this was sprayed on the plant hoppers.

## Results and Discussion

The colony characters of the fungus grown on different media are summarised in Table 1.

Tabte 1

Colony characters of *F. oxysporum* on different culture media

| Media | Colony characters |
|---|---|
| Oat meal agar | Mycelium white, aerial, cushiony, having entire margin-Colour of medium turns light chocolate brown, — only microconidia produced. |
| Potato dextrose agar | Mycelium white, woolly, aerial, having entire margin, only microconidia produced. |
| Richards' agar | Mycelium white, more or less cushiony, aerial, having entire margin—few concentric rings seen from reverse side of petridishes—only microconidia produced. |
| Czapek's agar | Mycelium white, cottony, aerial having entire margin,—only microconidia produced. |

Macroconidia are not produced in any of the artificial media tested. Kuruvilla and Jacob (1978) have observed that the pathogen produces both micro and macroconidia on the insect host. According to Kiraly (1974), colonies of *Fusarium* on artificial media and in natural hosts do not develop in a like manner.

The rate of growth and sporulation of the fungus were maximum in oat mea agar medium followed by potato dextrose agar, Richards agar and Czapeck's agarl. Though there was considerable growth of the fungus in Richard's and Czapeck's agar, sporulation was comparatively poor in them. *F. oxysporum* is a soil saprophyte which can growwel! on organic materials in soil for a long time (Kiraly, 1974).

Table 2

Growth and sporulation of *F. oxysporum* on different media on nineth day

| Media | Mean diameter of colony (in mm) | Mean number of spores/ml |
|---|---|---|
| Oat meal *agar* | 90.00 | $3.612 \times 10^6$ |
| Potato dexrose agar | 85.23 | $2.235 \times 10^6$ |
| Richards' agar | 80.73 | $1.590 \times 10^6$ |
| Czapeck's agar | 75.25 | $1.277 \times 10^6$ |

The present finding indicates that under artificial conditions, the fungus g rows better on media with an organic source of nutrients such as cat meal agar o potato dextrose agar than in media containing inorganic source of nutrients like Czepeck's or Richards' agar and This may be due to its preference for organic subst-r rates.

Sporulation increased gradually from second day onwards reaching the maximum on the fifth day and decreased thereafter (Table 3).

Table 3

Average number of spores of *F. oxysporum* in culture of different ages

| Age of culture (in days) | Average number of spores/ml |
|---|---|
| 2 | $2.400 \times 10^6$ |
| 3 | $3.862 \times 10^6$ |
| 4 | $4.765 \times 10^6$ |
| 5 | $5.608 \times 10^6$ |
| 6 | $4.062 \times 10^6$ |
| 7 | $3.759 \times 10^6$ |
| 8 | $3.274 \times 10^6$ |
| 9 | $2.599 \times 10^6$ |

Spores from four and five day old cultures were more virulent causing complete mortality in the plant hopper within three days of application and between these the four–day–old culture was more virulent causing significantly higher mortality on first and second days after inoculation (Table 4).

Table 4

Cumulative per cent mortality of third instar nymphs of *N. lugens* inoculated with F. *oxysporum* cultures of different ages.

| Age of Culture | Cumulative per cent mortality at intervals (in days) (Mean of four replications of 15 insects each) | | | | | | |
|---|---|---|---|---|---|---|---|
| (days) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3 | 50.02 | 76.80 | 93.40 | 100.00 | 100,00 | 100.00 | 100.00 |
| | [45.03] | [61.20] | [75.11] | [90.00] | [90.00] | [90.09] | [90.00] |
| 4 | 64.90 | 99.58 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| | [53.66] | [86.28] | [90.00] | [90,00] | [90.00] | [90.00] | [90.00] |
| 5 | 58.00 | 83.50 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| | [49.52] | [66.03] | [90.00] | [90.00] | [90.00] | [90.00] | [90.00] |
| 6 | 53.50 | 72.00 | 83.80 | 99.58 | 100.00 | 100.00 | 100.00 |
| | [45,99] | [58.03] | [70.57] | [86.28] | [90.00] | [90.00] | [90.00] |
| 7 | 51.00 | 71.90 | 88.90 | 99.58 | 100.00 | 100 00 | 100.00 |
| | [45.58] | [57.98] | [70,57] | [86.28] | [90.00] | [90,00] | [90.00] |
| 8 | 40.00 | 61.70 | 78.40 | 90.30 | 81.90 | 96.30 | 93.30 |
| | [39.23] | [51.77] | [62.32] | [71.86] | [73.45] | [78,83] | [78.83] |
| 9 | 28.40 | 45.00 | 60.10 | 73.50 | 7710 | 80.60 | 83.50 |
| | [32.18] | [42.14] | [50.85] | [59.03] | [61.44] | [63.86] | [66.00] |
| CD [0,05] | 3.575 | 6.18 | 4.95 | 6 51 | 3.12 | 2.09 | 4.45 |

(Figures in Parenthesis are values after angular transformation)

The virulence of the different cultures varies significantly with age. It is thus indicated that the optimum age of the culture of *F. oxysporum* on oat meal agar for good sporulation and high virulence is five days. The virulence shows a decrease corresponding with the increase in the age of the culture beyond five days. Thus spores from six and seven day old cultures take five days to cause complete mortaiity of the hoppers while those from seven and nine days old cultures fail to produce such an effect even after seven days,

## Summary

Growth and sporulation of *Fusarium oxysporum* Schlect, an entomogenous fungus of the rice plant hopper *Nilaparvata lugens* Stal were superior in oat meal agar closeiy followed by potato dextrose agar. Czapeck's and Richards' agar media were less suitable. In all these media, only microconidia were produced. Maximum number of spores were produced on the fifth day, after which the spore production decreased. Virulence was highest in spores of four and five–day–old cultures and spores of cultures more than five day old showed decreasing virulence.

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## സംഗ്രഹം

നെല്ലിന്റെ ബ്രൗൺഹോപ്പർ കീടത്തെ ബാധിക്കുന്ന ഫ്യൂസേറിയം ഓക്സിസ്പോറം എന്ന കുമിളും, ഓട്സ് പൊടി ചേർന്ന അഗാർ, ഉരുളക്കിഴങ്ങും ഡെക്സ്ട്രോസും ചേർന്ന അഗാർ എന്നീ മാധ്യമങ്ങളിൽ at നന്നായി വളരുന്നതായി കണ്ടു. സെപ്പക്സ്, റിർച്ചാർഡ്സ് എന്നീ മാധ്യമങ്ങളും ഇവയുടെ വളർച്ചക്ക് യോജിച്ചവയല്ല. ransiauoimfflroi ദിവസമായ ഏറെ വും കൂടുതൽ സ്പോറുകളും ഉണ്ടാകുന്നത്. കൂടുതൽ ശക്തിയുള്ള സ്പോറുകളും, നാലും അഞ്ചും ദിവസങ്ങളിൽ ഉണ്ടാകുന്നവയാണ്.

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