Proc. Indian Acad. Sci., Vol. 87 B (Animal Sciences), No. 3, March 1978, pp. 45-50,


# Seedling blight of sugarcane — A new disease caused by *Drechslera* state of *Cochliobolus spicifer*

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MS received 23 August 1977; revised 11 January 1978

**Abstract.** Sugarcane nurseries raised from fluff were found to be infected with a deuteromycetous fungus namely *Drechslera* resulting in seedling blight. The causal organism was later identified as *Drechslera* state of *Cochliobolus spicifer*. The disease incidence varied from 10–30% and the seedling mortality ranged from 50–95%. Studies were conducted on isolation, symptomatology, etiology, varietal reaction, morphology and identification of the pathogen including some control aspects under laboratory conditions. Etiological studies revealed that there was 8–16% infection of the fluff obtained from different crosses and open pollination. Artificially infected seedlings exhibited the same symptoms that were observed on diseased seedlings under natural conditions. The seedling mortality under artificial inoculation varied from 85–100%. All the four sugarcane varieties tested for their reaction to artificial inoculation were observed to be susceptible but the degree of susceptibility varied. Among 10 chemicals tried for control dithane-M 45, thiride, brassicol, zineb and ziram proved the best in inhibiting more than 50% of the conidial germination and also the growth of the mycelium. Kasumin proved very poor in its fungitoxic property.

**Keywords.** Seedling blight; sugarcane; symptomatology; etiology; varietal reaction; morphology.

## 1. Introduction

During February and March 1976, a severe outbreak of seedling blight was observed in sugarcane nurseries raised under sugarcane breeding programme in Karnataka, at this Regional Research Station. The disease was observed to occur in different crosses (total number of crosses=30) with varying degrees of intensity. The disease incidence varied from 10–30% and the seedling mortality in the infected plots ranged between 50–95%. The disease was more prevalent in thickly sown seed beds or plots. The first indication of the disease was the death of few seedlings in patches due to wilting and drying. The infected seedlings showing blight symptoms also revealed the occurrence of certain reddish brown spots with straw coloured centre. Such seedlings showed very poor root development. Repeated isolations from such blighted seedlings yielded a species of *Drechslera*.

A perusal of literature revealed that the earliest known record of such seedling diseases in sugarcane caused by fungi was made by Subramaniam (1936) from Coimbatore. He recorded among others two seedling diseases of sugarcane caused by two different species of *Helminthosporium* viz. *H. halodes* and *H. tetramera* of which the latter was proved to be a weak parasite.

The fungus *H. sacchari* Butler, known to be the cause of eye spot disease was shown to be the cause of an undescribed seed borne disease of sugarcane seedlings by Loveless and Smith (1956). A severe blight of sugarcane seedlings was observed by Singh and Singh (1968) in Uttar Pradesh, the causal organisms of which were identified as *H. halodes* and *A. tenuis.*

Parris (1950) has reported on the Helminthosporia that attack sugarcane.

The present paper deals with the symptomatology, etiology, varietal reaction, morphology and identification of the pathogen including some control aspects. This constitutes the first report of such a seedling disease of sugarcane.

## 2. Symptomatology

The infected seedlings at two leaf stage revealed the appearance of small reddish specks at the collar region followed by the drying of leaf tips. This constituted the first symptom of the disease.

The lesions formed on the leaves at collar regions and also on leaf sheaths were elongated to elliptical with dark reddish brown to brick red margin. Under favourable conditions such lesions enlarge, coalesce and finally cover the entire leaf area. This apparently resulted in blighting of seedlings followed by wilting.

Infected seedlings showed stunted growth and very poor root development. Such seedlings die after infection. If the seedlings escaped mortality at this stage, damage was not caused to the nursery.

## 3. Etiology

### 3.1. *Seed infection*

Infection of fluff with the present pathogen is strongly suggested by the occurrence of blight in seedlings grown in seed bed nurseries. This was confirmed by a pathological study made on sugarcane true seeds (fluff or fuzz* obtained from different crosses and open pollination).

For this study five seed samples of sugarcane representing three different crosses

**Table 1.** Per centage incidence of *Drechslera* state of *C. spicifer* recorded in the seed samples of sugarcane by the blotter method. 100 seeds tested per sample.

| Crosses/OP | Samples tested | Germination percentage | % occurrence of the pathogen |
|---|---|---|---|
| Co. 419 × Co. 62175 | 2 | 28·6 | 16·0 |
| Co. 62175 × Co. 419 | 2 | 14·3 | 8·0 |
| Co. 419 × Co. 6806 | 1 | 57·1 | 8·0 |
| Co. 419 OP | 1 | 20·0 | 16·0 |
| Co. 62175 OP | 1 | 65·7 | 12·0 |

OP = Open pollinated.

*Fluff or Fuzz is the name commonly applied to the sugarcane true seeds on account of the whorl of long hairs surrounding the base of each spikelet (Loveless and Smith 1956).

and two open pollinated ones were examined visually as well as by blotter method for detecting various fungi associated with them (Chidambaram *et al* 1973). The results showed that all the samples were infected by *Drechslera* state of *C. spicifer*, the infection ranging from 8–16% (table 1). Such infected seeds when germinated on blotters were transferred to sterilized soil taken in pots. These exhibited the blight symptoms at two leaf stage, revealing a clear seed borne nature of the pathogen.

### 3.2. *Pathogenicity of Drechslera state of C. spicifer to sugarcane seedlings*

Pathogenicity tests were conducted under field conditions by raising seedlings in raised seed beds, using all the above mentioned crosses and OP fluff material. 20-day old seedlings were sprayed with the inoculum (spore suspension) prepared using monosporic cultures of the pathogen and sterilized distilled water with the help of an automizer. A separate control was set apart where only sterilized distilled water was sprayed. The inoculated beds were covered with alkathene tents to maintain high humidity. Irrigation was stopped for seven days. Observations were made after every 48 hr. After 72 hr the seedlings showed blight symptoms along with the appearance of small reddish specks at the collar regions of leaves and leaf sheaths. Six days after inoculation the disease symptoms were very clearly observed in the inoculated plots. Eight days after inoculation most of the seedlings died and the pathogen sporulated heavily on such seedlings. The mortality of seedling varied from 85–100%. The pathogen was reisolated in pure culture from these infected as well as dead seedlings, thus proving Koch's postulates. Root infection was also observed. The seedlings under control plots remained green and healthy without any infection.

### 3.3. *Varietal reaction*

It was also decided to study the reaction of promising sugarcane varieties against this pathogen. For this purpose single budded setts of four promising varieties were planted in big cement pots and provided with normal agricultural practices under field conditions. The varieties employed for this study were Co. 419, Co. 62175, B. 37172 and KHS. 2045. 3–4 month-old seedlings were sprayed with the inoculum prepared as mentioned above. The pots along with the seedlings were covered with alkathene tents. Observations recorded after 10 days showed that all these varieties were susceptible to this pathogen but the degree of susceptibility varied. Two replications

**Table 2.** Varietal reaction of sugarcane varieties against *Drechslera* state of *C. spicifer*.

| Varieties | % germination at 3 months | | per cent incidence* | Degree of susceptibility |
|---|---|---|---|---|
| | M | ST | | |
| Co. 419 | 100·0 | 75·0 | 7 | HS |
| Co. 62175 | 66·7 | 43·0 | 1 | S |
| B. 37172 | 88·9 | 69·0 | 7 | HS |
| KHS. 2045 | 66·7 | 30·0 | 3 | MS |

*Scale=(% leaf area affected).
1=Less than 1% 5=5-25% 9=More than 50% 3=1-5% 7=25-50%
M=Mother ST=side tillers HS=Highly susceptible MS=moderately susceptible
S=Susceptible.

were used along with one control for each variety. The varieties Co. 419 and B. 37172 were highly susceptible when compared to Co. 62175 and KHS. 2045. The per cent incidence and degree of susceptibility are given in table 2.

## 4. Morphology and identification

Colonies on potato dextrose agar greyish black to black, circular, subaerial, measuring 50 mm in six days with abundant production of conidia on conidiophores.

Conidiophores arising in groups, flexuous, geniculate with well developed conidial scars, dark brown to black, measuring 250–280 $\mu$ long and 3·5–9 $\mu$ thick. Conidia oblong to cylindrical, rounded at both the ends, brown in colour, smooth, three septate, measuring 28–36 $\times$ 8–13 $\mu$.

Habit: Isolated from blighted seedlings of sugarcane.

Remarks: Basing on gross morphology and dimensions of conidia and conidiophores, this isolate of *Drechslera* was identified as *Drechslera* state of *C. spicifer* Nelson.

This species which was previously known as *H. spiciferum* (Bainier) Nicot was first grouped under the genus *Brachycladium* by Bainier in 1908, as *B. spiciferum* Bainier. Later Boedijn in 1933 transferred it into the genus *Curvularia* as *C. spicifera* (Bainier) Boedijn. It was in 1953 this isolate was included under the genus *Helminthosporium*. Nelson (1964) placed it under the genus *Drechslera* with the perfect state *C. spicifer* which is an ascomycete, after the revision of graminicolous helminthosporia. No specific state has been given to this isolate of *Drechslera* and the disease reported here is caused by the imperfect state only and at no stage of the present study the perfect state was observed.

The present communication on this isolate of *Drechslera* infecting sugarcane ssedlings constitutes the first known report. The culture of the pathogen has been deposited at the Commonwealth Mycological Institute, Kew, Surrey, England under Herb. IMI No. 211583.

## 5. Control

To test the efficacy of some fungitoxicants in controlling this disease, *in vitro* studies were made with nine fungicides and one antifungal antibiotic on germination and mycelial growth of the present *Drechslera* isolate. This was studied in two separate experiments as detailed below.

### *Experiment I*

### *Conidial germination studies*

Monosporic cultures of the above pathogen was used for germination studies by ' slide germination method ' as suggested by the Committee on Standardization of Fungicide tests of the American Phytopathological Society (Nene 1971). The

concentrations of the fungicides were taken in parts per million (ppm) in weight by volume. The method suggested by Kothari and Bhatnagar (1966) was also followed for this purpose. The results are given in table 3.

*Experiment II*

*Mycelial growth studies*

For this study the ' poisoned food technique ' was adopted as suggested by Sharvelle (1961) and Nene (1971). The technique involves poisoning the basal medium with a fungitoxicant and then allowing the test fungus to grow on a such medium. Potato dextrose agar was used as the basal medium and the fungicides in different concent-

**Table 3.** Percentage inhibition in the conidial germination of *Drechslera* state of *C. spicifer* at various concentrations.

| Fungicides | PPM of fungicides and percentage inhibition in conidial germination | | |
|---|---|---|---|
| | 250 | 500 | 1000 |
| Dithane-M 45 | 100·0 | 100·0 | — |
| Thiride | 91·4 | 100·0 | — |
| Brassicol | 88·6 | 88·6 | 100·0 |
| Zineb | 82·8 | 91·4 | 100·0 |
| Ziram | 88·6 | 94·3 | 100·0 |
| Fytolon | 57·0 | 71·4 | 77·0 |
| Blitox-50 | 48·6 | 65·7 | 71·4 |
| Benlate | 14·3 | 28·6 | 42·9 |
| Bavistine | 14·3 | 25·7 | 42·9 |
| Kasumin | 0·0 | 0·0 | 2·8 |
| Control* | | | |

*100% germination in tap water and 85% germination in distilled water.

**Table 4.** Percentage inhibition of mycelial growth of *Drechslera* state of *C. spicifer* in different concentrations.

| Fungicides | PPM of fungicides and percentage inhibition of growth | | |
|---|---|---|---|
| | 250 | 500 | 1000 |
| Dithane-M 45 | — | — | — |
| Thiride | 78·6 | 100·0 | 100·0 |
| Brassicol | 71·4 | 78·6 | 100·0 |
| Zineb | 71·4 | 74·3 | 85·7 |
| Ziram | 67·1 | 74·3 | 78·6 |
| Fytolon | 65·7 | 65·7 | 71·4 |
| Blitox-50 | 57·1 | 65·7 | 74·3 |
| Benlate | 21·4 | 28·5 | 35·6 |
| Bavistine | 14·3 | 14·3 | 21·4 |
| Kasumin | 2·9 | 7·1 | 7·1 |
| Control* | | | |

*50 mm colony diameter on pure basal medium only.

rations were added before inoculating the test pathogen. The results obtained at the end of seven days at room temperature are presented in table 4. Inhibition percentage of mycelial growth was determined by comparing it with that of control.

## 6. Observations

The observations revealed that in both the experiments dithane-M 45, thiride, brassicol, zineb, ziram and fytolon proved the most highly toxic fungicides by almost inhibiting 50% or even more of the conidial germination and mycelial growth. Blitox-50 followed next. The only one antifungal antibiotic tried viz. kasumin did not give any control by not inhibiting the conidial germination or the mycelial growth (Thirumalachar 1968; Patil and Rao 1972).

## Acknowledgements

The authors are grateful to the Director of Research, University of Agricultural Sciences, GKVK, Bangalore and to the Chief Scientific Officer, Regional Research Station, VC Farm, Mandya for their encouragement and providing laboratory facilities. Thanks are also due to Dr A Johnston, Director and Dr J L Mulder, Mycologist, Commonwealth Mycological Institute, Kew, Surrey, England for their kind help in confirming the identification of the casual organism.

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