Table 2  Chemical analysis of leaves of some cotton germplasm

<table>
<thead>
<tr>
<th>Germplasm</th>
<th>Total sugars (%)</th>
<th>Reducing sugars as glucose (%)</th>
<th>Non-reducing sugars as sucrose (%)</th>
<th>Sucrose as percentage of total sugars</th>
<th>Moisture (%)</th>
<th>Cell-sap (concentration) mhos/cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamecot SP23</td>
<td>3.1</td>
<td>2.5</td>
<td>0.5</td>
<td>17.6</td>
<td>74.0</td>
<td>5.5</td>
</tr>
<tr>
<td>TX ORSC-78</td>
<td>2.8</td>
<td>2.4</td>
<td>0.5</td>
<td>17.0</td>
<td>69.5</td>
<td>5.5</td>
</tr>
<tr>
<td>TX ORHU 1-78</td>
<td>2.9</td>
<td>2.3</td>
<td>0.6</td>
<td>19.7</td>
<td>70.5</td>
<td>5.4</td>
</tr>
<tr>
<td>Tamecot SP-215</td>
<td>2.9</td>
<td>2.5</td>
<td>0.4</td>
<td>13.7</td>
<td>71.0</td>
<td>5.5</td>
</tr>
<tr>
<td>Reba B-50</td>
<td>3.3</td>
<td>2.7</td>
<td>1.0</td>
<td>30.0</td>
<td>71.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Laxmi</td>
<td>3.4</td>
<td>2.6</td>
<td>0.8</td>
<td>24.0</td>
<td>75.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Smooth leaf types, like Deltapine 61, Deltapine 62 and AET 5 have been reported resistant to whitefly as compared to pubescent cotton varieties. Hairy varieties of cotton have been observed susceptible to thrips and whiteflies.

Chemical analysis of leaves of some germplasm lines (where population of whitefly was very low and high) was carried out. Preliminary studies indicated positive relationship between susceptibility to whitefly and sugar content particularly of non-reducing sugars as sucrose. Susceptible lines contained more of non-reducing sugars as sucrose compared to other fairly resistant lines. Sucrose constituted about 24 and 30% of the total sugars in whitefly susceptible lines, (viz. Laxmi and Reba B 50 respectively) while in other fairly resistant lines, it varied from 14 to 20% of the total sugars (table 2). Preference of whitefly for higher sucrose concentration has been reported. No definite trends were observed in leaf N, P and K contents and cell sap pH between susceptible and fairly resistant lines.

Studies indicate that moderately hairy cotton germplasm lines with higher level of non-reducing sugars (as sucrose) are susceptible, while lines having less hairs coupled with relatively low sucrose content appear to be fairly resistant to whitefly.

Thanks are due to Dr Sheo Raj and Dr N. D. Mannikar for assistance and to the Division of Crop Improvement for supplying seeds of germplasm materials.


GROWTH AND SPORULATION OF MILLET LEAF BLAST FUNGUS PYRICULARIA PENNISETI: ROLE OF POLYAMINES

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Leaf blast of millet (Pennisetum americanum) caused by Pyricularia pensetii Prasad and Goyal adversely affects the yield of the crop as it attacks green leaves and damages photosynthetic tissues. We are working on the biology of the fungus and the factors which influence its growth and sporulation. Polyamines are essential for the growth of the plant as well as for the fungal cells. The physiology and biochemistry of polyamines and their metabolism in normal plants and plants under stress have been reviewed. Rajam and Galston have studied the effect of inhibitors of polyamine biosynthesis on the growth and morphology of various phytopathogenic fungi and have observed that polyamines are essential for fungal growth and development. They reported on the fungicidal and plant protective efficacy of DL-difluoromethylornithine (DFMO), a specific inhibitor of ornithine decarboxylase, the enzyme that provides fungi with the necessary polyamines. Birecka et al., reported that DFMO inhibited mycelial growth and sporulation of Helminthosporium maydis and the inhibition could be reversed with putrescine. We report here on the

11 November 1987

role of spermidine, a polyamine required for the
growth and sporulation of the fungus *P. pennisetii*.

The pure culture of the fungus *P. pennisetii* was
maintained on Czapek's liquid medium. The medium
was supplemented with thiamine and biotin. Biotin
was found to be an essential component of the
medium for sporulation of the fungus. The inhibitor
D-arginine was added to sterile culture medium to
get final concentrations of 0.1, 0.5 and 1 mM.
Inhibitor-amended culture media were dispensed
aseptically into 125 ml Ehrenmeyer flasks (35 ml per
flask). For experiments involving reversal of inhibition,
we used 1 mM D-arginine (which yielded about 50%
inhibition of mycelial growth and allowed no
sporulation) with two concentrations (0.1 and 1 mM)
of polyamines (PAS). The control flasks contained
only the culture medium with no inhibitor.

Six replicate flasks were used for each treatment
and were incubated at 28±2°C with a 12 h dark/
12 h light cycle. Fungal growth and sporulation were
recorded on the 5th, 10th and 15th days of culture.
Dry weight of the fungus was determined at the end
of the experiment. The experiments were repeated
three times and were highly reproducible. The results
given are averages of 18 replicates.

Table 1 shows the effect of D-arginine on mycelial
growth and sporulation of *P. pennisetii*. The inhibitor
at 0.1, 0.5 and 1 mM produced successively greater
inhibition of mycelial growth and allowed no
sporulation. It is clear that the effect of inhibitor on
vegetative growth was reversible with L-arginine,
putrescine, spermidine and spermine. The dry weight
of the fungus was greater than that of the control
when L-arginine and spermidine (1 mM) were added
along with D-arginine. L-Arginine was the most
effective in the reversal of inhibition. However,
sporulation could be recovered only with spermidine
(1 mM).

The results clearly indicate that D-arginine, an
antagonist of L-arginine, induced inhibition of fungal
growth and sporulation. L-Arginine is a basic
precursor of polyamines. Probably D-arginine is
incorporated into proteins in place of L-arginine and
inhibits polyamine biosynthesis. The hypothesis is
further supported by the addition of L-arginine and
polyamines (putrescine, spermidine and spermine)
along with D-arginine. The reversibility of the D-
arginine effect was most significantly marked with
spermidine followed by L-arginine. The reversal of
inhibition of sporulation was obtained only with
1 mM spermidine and not with other polyamines.
These findings are unique because the D-arginine
effect on sporulation could not be reversed with L-
arginine and putrescine from which spermidine is
derived in the biosynthetic pathway. Probably, D-
arginine forms some linkage with another substance
which is not easily displaced when L-arginine or
putrescine is added (Galston, personal communica-
tion).

The results of the present investigation might be
of practical importance, particularly for control of
millet leaf blast. Prevention of a plant disease by
specific inhibition of fungal polyamine biosynthesis
was reported by Rajam *et al.* and Walters.

The authors thank Prof. A. W. Galston, Department
of Biology, Yale University, USA, for help.

6 December 1988


FOLIAR NECTARIES IN ERYTHRINA STRICTA L.

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EXTRAFLORAL nectaries in the genus Erythrina have been studied by several workers1-4. Reports on extrafloral nectaries5-7 show that they are helpful in reducing herbivore activity. The present study describes the structure, secretion and function of stipellar nectaries in Erythrina stricta.

FAA fixed materials were used for paraffin embedding and sectioning. For scanning electron microscopic (SEM) studies, materials were dehy-