ROLE OF NITROGEN IN HOST SUSCEPTIBILITY TO *PIRICULARIA ORYZAE* CAV.

THAT heavy nitrogenous manuring augments the disease-proneness of susceptible rice to *Piricularia oryzæ* but not the resistant ones is well recognized.[1-3] Further, it is known that not infrequently normal suscepts behave like resistant ones either in the field or in laboratory inoculation trials. In an attempt to explain this phenomenon on the basis of the environment altering the host metabolism, it has been repeatedly found in this laboratory that the prevailing nyctotemperatures largely determine the susceptibility of rice to the blast disease.[4] Experiments conducted in this regard have shown that a nyctotemperature of 20° C. alternating with day temperatures of 30-35° C. under a fixed illumination for 14 hr. and darkness for 10 hr. render the susceptible types to take infection. Whereas, in plants grown with higher nyctotemperatures (above 26° C.), infection seldom occurs even on the susceptible types.

The effect of low nyctotemperatures on the nitrogen metabolism of the host was investigated, and, indeed, it was found that low nyctotemperatures favoured amide synthesis, especially glutamine which was identified chromatographically in the guttates. The concentration of this amide in the guttate characteristically increased when the plants were also heavily dressed with ammonium sulphate. The guttation fluid when dried on the leaf surface left easily identifiable macroscopic crystals, mainly of glutamine. When pure glutamine as well as that from the guttate was studied for their effect on germination of *P. oryzæ* spores, marked stimulation of germination was observed over a wide range of concentrations. But this stimulation was obvious only at a temperature of 24-26° C., a range established by many workers to be the optimum for infection of rice plants by *P. oryzæ*. At temperatures below or above this optimum, glutamine had no stimulating effect, possibly, due to the disfunction of the glutamic decarboxylase system of the pathogen. Recently, Weintraub *et al.*,[5] reported the stimulating effect of guttates from rice on *Piricularia* spores but failed to identify the substance concerned with any of the number of sterols, steroidal sapogenins, steroidal amines and α-tocopherol which also stimulated germination. But from the foregoing, it is evident that glutamine crystals on the leaf surface provide a readily assimilable substrate for the germinating *Piricularia* spores under the right conditions.

To sum up, it is clear that two factors are concerned in determining the host susceptibility to this disease in so far as the nitrogen metabolism of the plant is concerned. The foremost is the low nyctotemperature which facilitates nitrate reduction and favours glutamine synthesis. Secondly, the prevalence of the optimum temperature (24-26° C.) aids the utilisation of this glutamine by the pathogen at the infection court. It is conceivable that at high nyctotemperatures, amide synthesis is impaired as a result of low nitrate reduction as reported by Went[6] in the case of tomato leaves. Possibly, in this case, the products of photosynthesis are largely diverted to the formation of complex cell-wall materials like lignin and cutin which make the leaf-blade resistant to mechanical puncture by the germ tubes. It is not clear in what way the resistant types differ in glutamine synthesis from the suscepts. It is however known that environmental conditions like long-day stimulus and night temperatures as well as genetical factors are involved in the biogenesis of glutamic and related compounds in plants.[7] Further work on the interrelationships of these factors in relation to glutamine synthesis by rice, resistant and susceptible to *P. oryzæ*, is in progress and would be reported in detail elsewhere.

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