COMMUNICATION TO THE EDITOR

A Cause of Damaged and Pecky Rice

DEAR SIR:

Rice kernels that have been discolored by fungi are classified as damaged kernels (1). Such kernels cause a considerable loss to the rice industry because, when milled, they break more easily than do sound kernels, thus lowering the percentage of head rice and increasing the percentage of broken kernels. Their presence in milled rice can also lower the grade and value of the product because the U.S. Standards for Milled Rice (1) set maximum limits of 0.5% damaged kernels (singly or combined with red rice) for U.S. No. 1 to 6.0% damaged kernels (singly or 15.0% combined with red rice) in U.S. No. 6. Additional loss is incurred when rice is parboiled. The parboiling process strengthens the damaged kernels and increases the intensity of the discolorations. Such kernels are referred to as peck or pecky kernels by the trade. They are removed from the final product, usually with electronic sorters which also remove nonpecky rice in reducing the amount of peck to an acceptable level.

Several workers (2,3) have associated peck with stinkbug damage and infestation by fungi. However, the relation between fungus infestations and discoloration has only been inferred by the frequency of isolations of fungi from discolored kernels. Although the ability of individual fungus species to cause discoloration in rice has not been thoroughly investigated (4), such studies are a necessary prerequisite to an elucidation of the mechanisms by which discoloration occurs and to the development of preventive measures.

Fusarium chlamydosporium Wollenweber and Reinking has been repeatedly isolated at this laboratory from samples of southern-grown rough rice. The incidence of kernel infection ranged from 0 to 5% and there appeared to be an association between the incidence of damaged kernels and the percentage infection by *F. chlamydosporium*.

To test this apparent relationship, sterile samples of Bluebonnet 50 and Belle Patna rough rice were inoculated with comminuted mycelium of pure cultures of the fungus; brought to 23% moisture content by the addition of sterile water; and incubated for 10 days at 30°C. At the end of the incubation period, one-half of the samples were parboiled and then all were dried to approximately 12% moisture. After shelling, the discolored kernels were easily identified in the brown rice and were found to have increased from less than 1% to 35–54% in individual samples. In the nonparboiled rice the discolorations were light to dark red. Parboiling changed the color to dark brown or black (Fig. 1).

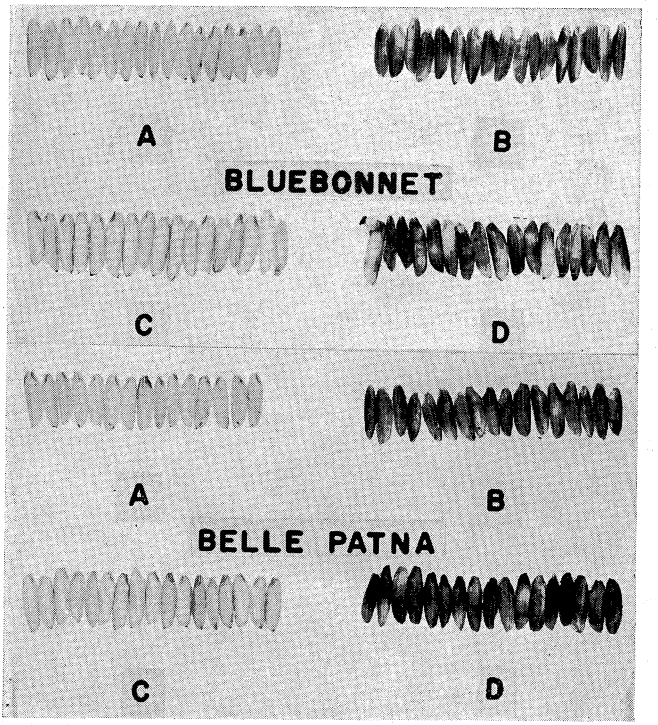

Fig. 1. Discoloration of Bluebonnet (top) and Belle Patna (bottom) brown rice by *Fusarium chlamydosporium*: (A) nonparboiled noninoculated; (B) nonparboiled inoculated; (C) parboiled noninoculated; and (D) parboiled inoculated.

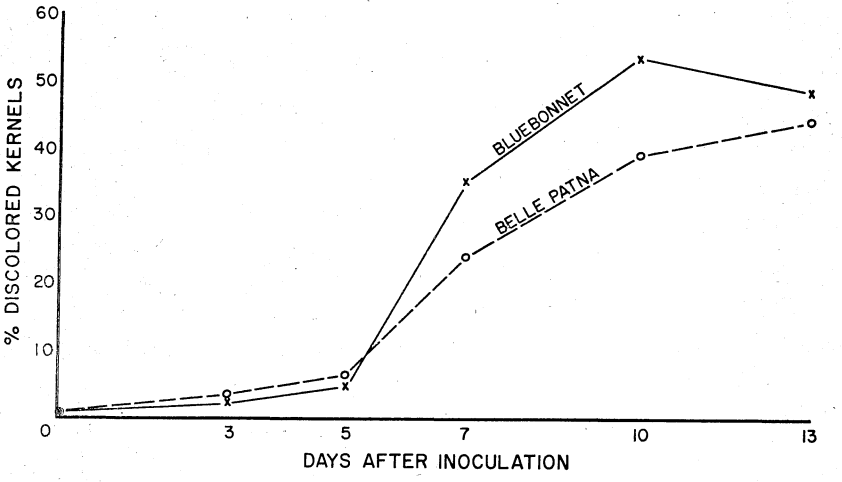

Fig. 2. Development of kernel discoloration in Bluebonnet and Belle Patna rough rice after inoculation with *Fusarium chlamydosporium*.

The ability of *F. chlamydosporium* to discolor rice kernels was also tested in relation to incubation time. A series of sterile rough rice samples were inoculated with the fungus and incubated as previously described. At intervals of 2 or 3 days after inoculation, replicate samples were removed from the incubator, dried and shelled, and the percentage of discolored kernels was determined. The most rapid rate of kernel discoloration occurred during the period of 5 to 10 days after inoculation (Fig. 2).

These data indicate that *F. chlamydosporium* is one cause of discoloration of rice kernels. Although kernels with red discolorations are not uncommon in nonparboiled rice, they usually constitute a small percentage of the total discolored kernels. After parboiling, kernels discolored by *F. chlamydosporium* cannot be differentiated from pecky kernels resulting from other causes. In view of the frequency of isolation of this fungus from southern-grown rice and of the results of these tests, *F. chlamydosporium* is believed to contribute to the incidence of damage or peck in rice.

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