Research Note

BACTERIAL BASAL ROT OF STRAW MUSHROOMS[1]

Over the last 3 years in Puerto Rico, some field- and laboratory-grown straw mushrooms (*Volvariella volvacea*) have shown arrested development and a failure to reach normal maturity. The pin to egg stages show mycelium softening, discoloration, shrinkage and watersoaking (fig. 1A and 1C). Basidiocarps in button and egg stages become distinctly beaked. When dissected, these show basal soft rot, internal watersoaking, and discoloration (fig. 1B and 1D).

Healthy and diseased mushrooms were tested for internal bacterial ooze. Profuse bacterial ooze was found in diseased but not healthy basidiocarps. Gram staining revealed a mixture of bacteria with a predominance of gram negative rods. Small surface sterilized fragments of diseased mushrooms were submerged in sterile fluid thioglycolate. After 24 hours at 35° C, a surface film with little or no submerged growth suggested aerobic bacterial growth. Pure culture of gram negative bacilli were isolated on McKonkey agar.

Growing on McKonkey agar, the bacteria produced a green water insoluble pigment. Colonies were lustrous with a fruity aroma. Using the Oxi-Ferm Tube of Roche Diagnostics, biochemical tests were conducted. Cultures were cytochrome oxidase positive. This and the other tests suggested *Pseudomonas aeruginosa* according to the Roche Diagnostic Key. In Bergey's Manual (1) the green pigment denoted *P. chlororaphis*, a species closely related to *P. aeruginosa*, not found in the Roche key.

With antibiotic impregnated paper discs on agar diffusion plates, the sensitivity of the bacteria to antibiotics was tested. The bacteria was sensitive to Polymyxin B (300 units): slightly sensitive to Carbenicillin (100 mcg); Gentamycin (10 mg) and Amikacin (30 mcg); and insensitive to Kanamycin (30 mcg) and Neomycin (30 mcg). Polymyxin B is often recommended for *P. aeruginosa* control in humans.

Young (24 hours old) pure cultures of the test bacteria on tryptic soy agar were used for inoculating 1-cm diameter straw mushroom buttons. Mushrooms were grown on sterilized coffee pulp:newspaper: montmorillonite clay (2:1:2) amended with 5% agricultural limestone ($CaCO_3$) at 33° C and 95% RH. Nontreated and wounded but not inoculated buttons served as controls in the pathogenicity tests. A flame sterilized needle was cooled and then passed through *P. chlororaphis* colonies. The coated needle was either rubbed on the side of the basal

[1] Manuscript submitted to Editorial Board August 15, 1985.

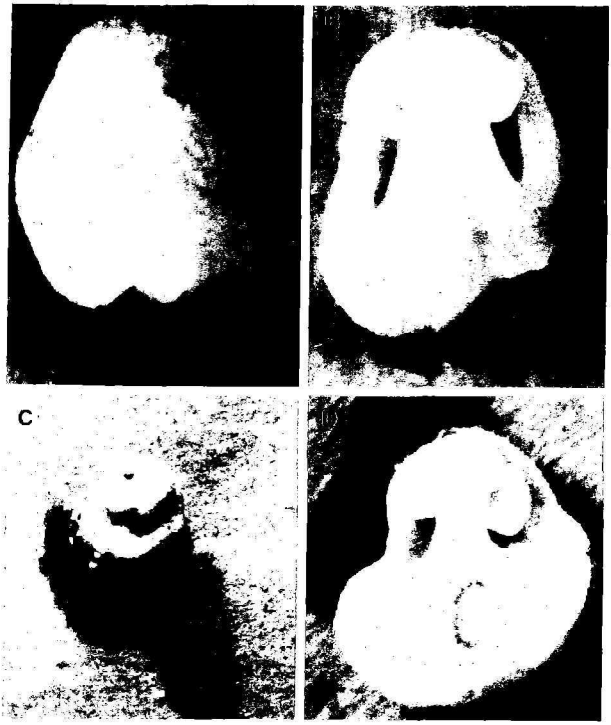

FIG. 1.—A) Whole large button of the Chinese Straw Mushroom without evidence of bacterial decay. B) Longitudinal section of the healthy developing basidiocarp as seen in A. C) Top view of a bacterial diseased Chinese Straw button showing beaked appearance. D) Longitudinal section of a bacterial diseased basidiocarp as in C.

area of the buttons or a superficial puncture was made at the same area. Wounded controls followed the same procedure, but a clean noninoculated needle was used.

One day after inoculation slight discoloration and water soaking was noted in the inoculated treatments. Marked shrivelling and basal rot were found 2 days later and thereafter. No symptoms were noted in wounded controls or in nontreated buttons. Rubbing and puncture inoculations appeared to produce like symptoms.

This is the first demonstration of a bacterial disease in straw mush-

rooms. Although bacterial and fungal pathogens are of known importance in common mushrooms (2), little information is available on tropical diseases of tropical mushrooms (3). In common mushrooms, bacterial diseases can cause economic losses and often require special control measures (4, 5). Considering the lack of in-depth information on diseases of tropical mushrooms, additional study is warranted. Besides etiology, future studies should seek effective and economic control methods.

Paul R. Hepperly
E. Ramos-Dávila
Department of Crop Protection

LITERATURE CITED

1. Buchanan, R. E. and N. E. Gibbons (Ed), 1974. *Bergey's Manual of Determinative Bacteriology* 8th ed. The Williams and Wilkins Co, Baltimore.
2. Sinden, J. W., 1971. Ecological control of pathogens and weed molds in mushroom culture. Annu. Rev. Phytopathol. 9: 411–32.
3. Chang, S. T. and T. H. Quimio (Ed), 1982. *Tropical Mushrooms Biological Nature and Culti Methods*, The Chinese University Press, Hong.
4. Royse, D. J. and P. J. Wuest, 1980. Identification and thermal sensitivity of two bacterial pathogens of *Agaricus bisporus*, Plant Dis. 64: 455–57.
5. Royse, D. J. and P. J. Wuest, 1980. Control of brown blotch of the cultivated mushroom, 1979. Fung. Nematol. Tests 35: 175.