A Transitory Cottony Variant of *Rhizoctonia solani* from Rice

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Wu-hsiung Tsai* · Wen-hsiung Ko** : イネから分離した *Rhizoctonia solani* 菌の綿毛状変異株

Abstract

Cultures of single mycelial fragments from the cottony mycelial mass of *Rhizoctonia solani* occurring on rice plants with sheath blight consisted of a new cottony type and the ordinary type. The new variant reverted to the ordinary type in every case before it covered the petri plate. It was pathogenic to rice plants and the transitory nature of the organism also occurred in the parasitic phase of the life cycle.

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Key Words : *Rhizoctonia solani*, sheath blight, variant.

Introduction

Sheath blight of rice caused by *Rhizoctonia solani* Kühn is a serious disease in Taiwan. Recently an unusual variant of *R. solani* was noticed on the blighted plants of the cultivars Tainan 5 and Chi-nung-shen 8 at the booting stage in the experimental farm in Chia-yi. The fungus formed cottony mycelial masses over disease lesions on leaf blades and sheaths (Fig. 1). Sometimes mycelial masses occurred on healthy leaf blades or sheaths several centimeters away from the sheath blight lesions. In the later growth stage mycelial masses became yellowish brown and were easily deformed by wind and rain. It represents a variant of *R. solani* different from those reported previously^{1,3,4,8)}. The unique characters of this new variant of *R. solani* were examined in this study.

Materials and Methods

Isolation of mycelial fragments. A small amount of mycelia (ca. 1 mm diam) was removed with a pair of sterile dissecting forceps with extra fine points from the center of a cottony mycelial mass produced on an infected rice plant. The mycelia were transferred to 10 ml of sterile distilled water in a test tube and stirred with a needle for 4-5 min. The test tube was placed on a whirlimixer for 2-3 min to break the mycelia into small fragments, and the mycelial fragments were plated on potato dextrose agar (PDA). After over night incubation at 28 C, plates were observed with

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Fig. 1 Cottony mycelial masses on rice seedlings infected with sheath blight disease.

Fig. 2 A germinating mycelial fragment.

a microscope and those germinating mycelial fragments with one or two cells (Fig. 2) were each transferred to the center of PDA plate and further incubated for 10 days.

Pathogenicity test. Rice seedlings of the cultivar Tainan 5 grown in 12-cm pots for 50 days were inoculated with the cottony type of *R. solani* by inserting a sclerotium in between the second leaf sheath and the stem. Inoculated plants were covered with plastic cages (55×55×45 cm) and watered twice a day. Data were recorded after 10-day incubation. Control seedlings were treated similarly.

Results and Discussion

Of the 35 cultures of single mycelial fragments obtained from cottony mycelial masses on rice plants, 2 were the ordinary and 33 were the new cottony type forming loose

Fig. 3 Colony appearance of the cottony type (left) and the ordinary type of *Rhizoctonia solani* on potato dextrose agar.

whitish mycelial mass at the center of the colony (Fig. 3). The mycelial mass became yellowish brown and flattened when the culture grew old. Mycelia of both cottony and ordinary types have the characteristics of *R. solani* such as constriction at the base of the branch and formation of a septum in the branch near the point of origin⁹⁾. Moreover, cells of 10-day-old mycelia of both types were multinucleate ranging from 3–21 nuclei/cell, when the staining method of Tu and Kimbrough¹⁰⁾ was used.

The new variant of *R. solani* is unstable. Before it had covered a 9 cm petri plate, the fungus had reverted to the ordinary type in every case. Pieces of agar culture (5 mm diam) obtained from the colony margin of a cottony type were placed on water agar plates. After 48 hr, 100 hyphal tips were transferred to PDA plates. All the single hyphal tip cultures were the ordinary type. The experiment was repeated three times with the same results. Moreover, some mycelia in the whitish mycelial mass at the colony center of a cottony type also reverted to the ordinary type. Of 46 cultures of single mycelial fragments obtained, 32 were the cottony type and 14 were the ordinary type. The experiment was repeated 8 times with similar results.

When rice seedlings of Tainan 5 cultivar were inoculated with sclerotia of the new variant produced on mycelial mass in the colony center, 9 of 10 inoculated tillers formed lesions on leaf sheaths and 3 of the diseased tillers were with cottony mycelial masses on the lesions. No such mycelial masses were found on the other 6 diseased tillers. Control seedlings remained healthy. When sclerotia on the colony margin were used as inocula, again 9 of 10 inoculated tillers formed lesions on leaf sheath, but cottony mycelial masses were not found on any of the diseased tillers. Cultures of single mycelial fragments were derived from the mycelial mass of an inoculated plant. Of the 68 cultures obtained 62 were the cottony type and 6 were the ordinary type. Similar results were obtained when seedlings of cultivar Taichung-shen 3 were inoculated. These results show that the new variant of *R. solani* is pathogenic to rice and that the transitory nature of the organism also occurs in the parasitic phase of the life cycle.

The origin of the new variant of *R. solani* is still unknown. Spontaneous mutation in *R. solani* has been observed in culture, but not in nature^{5,6)}. The new variant described

in this report could have originated from a heterokaryon resulting from anastomosis between two homokaryons^{2,6,7,11}). Although most heterokaryons are stable, reversion of heterokaryon formed from two morphological mutants to cultural morphology of an original mutant has been observed in culture⁶).

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和文摘要

イネから分離した *Rhizoctonia solani* 菌の綿毛状変異株

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イネ体上の紋枯病病斑あるいはその周辺に生じた *Rhizoctonia solani* 菌の綿毛状菌糸塊から単菌糸片を分離培養したところ、培地上に綿毛状菌叢を形成するものと通常型の菌叢を形成するものがあった。綿毛状変異株はいずれの場合でも菌叢の先端がシャーレ側壁に達するまでに通常型に戻った。本菌株はイネ体に対して病原性を示し、また本菌の綿毛状菌糸の一過性はイネ体上でも発現した。