

## Rhizopus Stem Rot of *Nicotiana glauca*

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### ABSTRACT

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*Rhizopus arrhizus* incited stem rot of *Nicotiana glauca* plants in the field, resulting in a slimy wet rot of the cortical tissues that became pale to yellowish brown when dry. The disease often caused the flower heads to bend downward. The fungus also infected several detached fruits and vegetables including cotton (*Gossypium hirsutum*) bolls and sunflower (*Helianthus annuus*) heads when artificially inoculated. Maximum radial growth of the fungus on potato-dextrose agar and maximum decay in cucumber (*Cucumis sativus*) fruits occurred at 35 C.

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*Nicotiana glauca* Graham is mostly cultivated in the Hilla and Kerbala regions of central Iraq (1). In June 1980, a stem rot disease of *N. glauca* was noticed

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in the Tobacco Research Station at Hindiya about 100 km from Baghdad. The local cultivar Asos was severely affected by the disease, with more than 30% of the plants infected in the field.

Symptoms of the disease initially appear as pale green water-soaked lesions on the stem, mostly below the inflorescence. Infection extends both upward and downward, resulting in a slimy wet

rot of the cortical tissues of the stem. The lesion may either be confined to only one side or may completely encompass and girdle the stem, eventually killing the top of the plant. The leaf petioles attached to the diseased portions of the stem become infected and the leaves become flaccid and die. The infected stem tissues appear pale to yellowish brown when dry. In many cases, the flower head topples downward, bending at the infected region but remaining attached to the plant (Fig. 1), or the inflorescence may be broken off by strong winds. Severe disease results in death of the plant. Fluffy mycelial growth of the pathogen is visible in the pith of infected stems.

Diseased tissues placed on potato-dextrose agar medium after surface-sterilization yielded a *Rhizopus* sp. subsequently identified as *Rhizopus arrhizus* Fischer. Pathogenicity of the

**Table 1.** Growth on potato-dextrose agar medium and decay in inoculated cucumber fruits produced by *Rhizopus arrhizus* at different temperatures<sup>2</sup>

Temperature (C)	Colony diameter on PDA after 24-hr incubation (cm)	Extent of decay in cucumber fruits (fresh weight basis) after 24-hr incubation (%)
20	4.8 a	7.1 a
25	6.0 b	12.5 a
30	7.1 b	27.4 b
35	8.8 b	57.8 c
40	4.5 a	23.9 b

<sup>2</sup> Means followed by the same letter within a column do not differ ( $P=0.05$ ) according to Duncan's multiple range test.



**Fig. 1.** *Rhizopus arrhizus* field-infected *Nicotiana glauca* plant with inflorescence bent downward just above infected stem region.

fungus was proven by artificial inoculations on the stems of *N. glauca*. The plants were kept in a greenhouse during June and July, when the night/day temperatures ranged between 30 and 42 C, respectively. Wounding of the tissues by artificial inoculation was a prerequisite for infection by the fungus. Injury caused by removal of plant suckers from tobacco plants in the field favored the stem rot disease.

*R. arrhizus* is known to cause "pole rot" or "barn rot" of tobacco leaves during the process of curing in the barns (2,8) and is a serious problem in areas where the leaves are air-cured (6). There is no record in the literature of this fungus causing stem rot of tobacco plants in the field.

*R. arrhizus* is reported to incite decay of various fruits and vegetables (3,4) and also to cause root rot of sugar beet (*Beta vulgaris* L.), boll rot of cotton (*Gossypium hirsutum* L.), and head rot of sunflower (*Helianthus annuus* L.) (5,7,9). The isolate from *N. glauca* infected and caused decay in detached fruits of cucumber (*Cucumis sativus* L.), watermelon (*Citrullus vulgaris* Schrad.), bottlegourd (*Lagenaria siceraria* (Mol.) Standl.), pumpkin (*Cucurbita maxima* Dcne.), summer squash (*C. pepo* L.), pepper (*Capsicum frutescens* L. var.

*grossum*), date palm (*Phoenix dactylifera* L.), egg plant (*Solanum melongena* L.), apple (*Malus sylvestris* Mill.) peach (*Prunus persica* (L.) Batsch.), tomato (*Lycopersicon esculentum* Mill.), potato (*Solanum tuberosum* L.), onion (*Allium cepa* L.), cotton (*G. hirsutum*) boll, and sunflower (*H. annuus*) that were artificially inoculated after wounding.

*R. arrhizus* is heat-tolerant and has been recovered from diseased cured tobacco leaves after shed drying at 74 C for 24–32 hr (2). The optimum temperature for lateral spread of the fungus has been reported to be around 35 C (2,5,7). Maximum linear growth of the isolate under study was also recorded at 35 C. At 35 C, the isolate caused maximum decay in artificially inoculated cucumber fruits (Table 1). Based on our observations, high temperature tolerance of *R. arrhizus* may contribute to the prevalence of stem rot disease in Iraq during the hot summer months.

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