Mycobiology 28(4): 177-179, (2000)

Occurrence of Rhizopus Soft Rot on Peach (*Prunus persica* var. *vulgaris*) Caused by *Rhizopus nigricans* in Korea

Jin-Hyeuk Kwon*, Soo-Woong Kang[1] and Chang-Seuk Park[2]

Kyongsangnam-do Agricultural Research and Extension Servies, Chinju 660-360, Korea
[1]Chinju National University, Department of Agricultural science, Chinju 660-758, Korea
[2]Gyeongsang National University, College of Agriculture, Chinju 660-701, Korea

A soft rot of fruits caused by *Rhizopus nigricans* occurred on peach (*Prunus persica* var. *vulgaris*) in The Chinju City Agricultural Products Wholesale Marke during in summer season of 2000. The disease infection usually started from wounding after harvest fruits, and then moved to outside. At first, the lesions started with water soaked and rapidly softened and diseased area gradually expanded. In severely infected film house, the rate of infected fruits reached 65.2%. Numerous sporangiospores were produced on the diseased fruits. Most of the sporangiospores were appeared to be readily dispersed in the air. The mycelia grew surface of fruits and produced stolons. Colonies on potato dextrose agar at 25~30°C white cottony at first becoming heavily speckled by the presence of sporangia and the browinish black at maturity, spreading rapidly by means of stolons fired at various points to the substrate by rhizoids. Sporangia were 85.3~243.5 × 53.4~219.2 μm in size and were globose or sub-globose with somewhat flattened base. The color of sporangia was white at first and then turned black with many spores, and never overhanging. Sporangiophores were 8.9~36.6 μm in width, smooth-walled, non-septate, light brown, simple, long, arising in groups of 3~5 from stolons opposite rhizoids. Sporangiospores was 9.7~24.8 × 5.9~15.8 μm, irregular, round, oval, elongate, angular, and browinish-black streaked. Columella was 70.2 × 149.7 μm. brownish gray, and umberella-shaped when dehisced. The causal organism was identified as *Rhizopus nigricans* Lind on the basis of the morphlogical characteristics of the fungus. Rhizopus soft rot on peach (*Prunus persica*) caused by the fungi has not been reported in Korea. This is the first report of rhizopus soft rot on peach caused by *Rhizopus nigricans* in Korea.

KEYWORDS: Peach, *Prunus persica* var. *vulgaris*, *Rhizopus nigricans*, Rhizopus soft rot

The soft rot on the succulent tissues of vegetable, fruits and ornamentals caused by *Rhizopus* occurs throughout the world after harvestings, transports, marketing and during storage. *Rhizopus* is omnipresent as a saprophyte and sometimes as a weak parasite on storaged organs of plants. The fungus usually to grows inside the tissues. When the epidermal cells are collapsed, the fungus emerges through the wounds and produces aerial sporangiophores, sporangia, stolons, and rhizoids, the latter capable of piercing the softened epidermis (Agrios, 1997).

In the summer of 2000, a disease presumed as Rhizopus soft rot occurred on peaches (*Prunus persica*) in The Chinju City Agricultural Products Wholesale Market. The infection rate of the disease in some containers reached to 65.2% and the damage was very severe. *Rhizopus* attacks only matured fruits, not young and immatured fruits.

The infected parts of fleshy organs appeared water soaked at first, then became soften. Gray hyphae grew from the site where the fungus invaded primarily and covered the affected portions by producing tuft whiskerlike gray sporangiophores and sporangia. The infected tisses finally broke down and disintegrated in watery rot (Fig. 1A, B, C).

Diseased fruits were collected from peaches (cv. Yumyongbaegdo) in the containers. The causal organism was isolated from mycelial tip of the disease fruits. Brownish black fungal colonies were formed on potato dextrose agar in the dark at 20°C. Sporangia, sporangiospores and sporangiophores were intensively observed under the light microscope (Nikon fluophot, Japan).

The fungal colonies grown on potato dextrose agar at 30°C were white cottony at first, and became heavily speckled with the appearance of sporangia and the browinish black, spreading rapidly by means of stolons fired at various points to the substrate by rhizoids (Fig. 2D).

Sporangia were 85.3~243.5 × 53.4~219.2 μm (av. 159.8~150.3 μm) long and were. globose or sub-globose with somewhat flattened base. The color was white at first and then turned black with many spores, but never overhanging. The sporangia contained thousands of spherical sporangiospores (Fig. 2A).

Sporangiophores were 8.9~36.6 μm wide, smooth-walled, non-septate, light brown, simple, long, and arising in groups of 3~5 from stolons opposite rhizoids. Sporangiospores were 9.7~24.8 × 5.9~15.8 μm in size, irregular, round, oval, elongate, angular, and browinish-black streaked (Fig. 2B).

Columella was 70.2 × 149.7 μm in size. light brownish gray, hemispheric, and umberella-shaped when dehisced (Fig. 2C).

Rhizoids and stolons hyaline to dark brown (Fig. 2D, Table 2).

Above characteristics were almost identical to *Rhizopus*

*Corresponding author <E-mail: Kwon825@mail.knrda.go.kr>

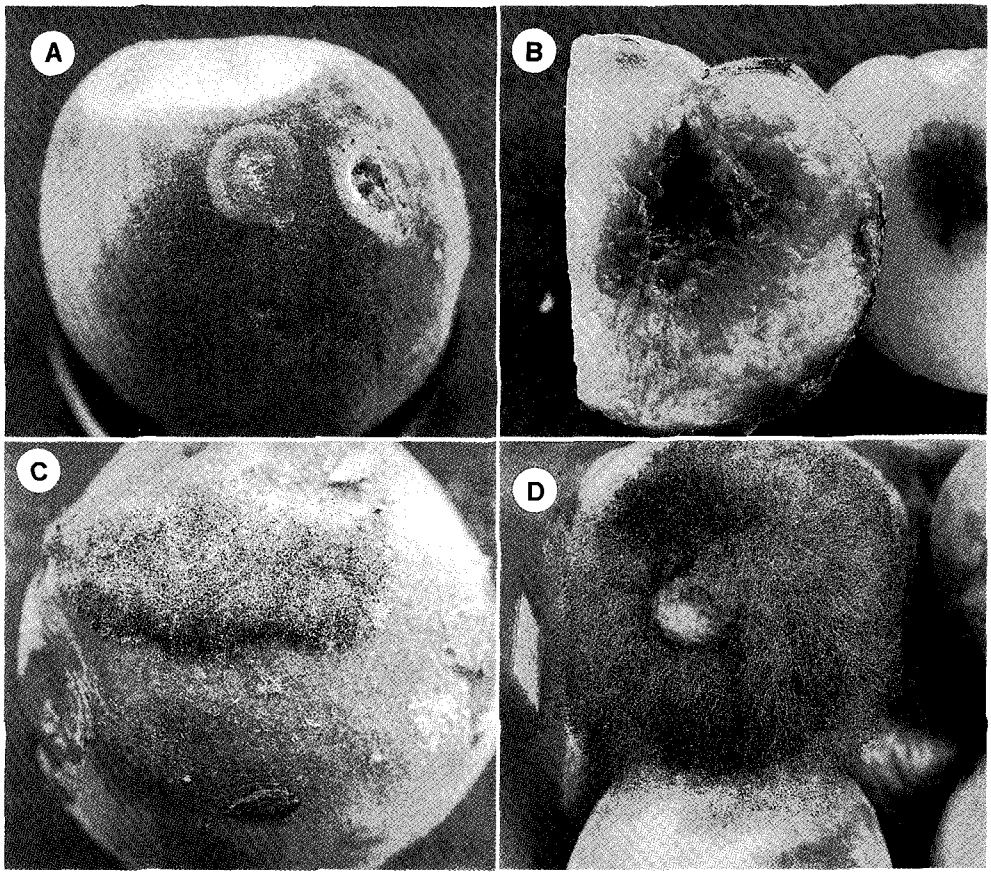

Fig. 1. Symptoms of Rhizopus soft rot occurred on peach fruits. A : Early symptom showing water soaked lesion which usually started from the wounds. B : Longitudinal section of infected fruits. C : Typical symptom with mycelia, sporangia and sporangiospores. D : Artificially inoculated fruits.

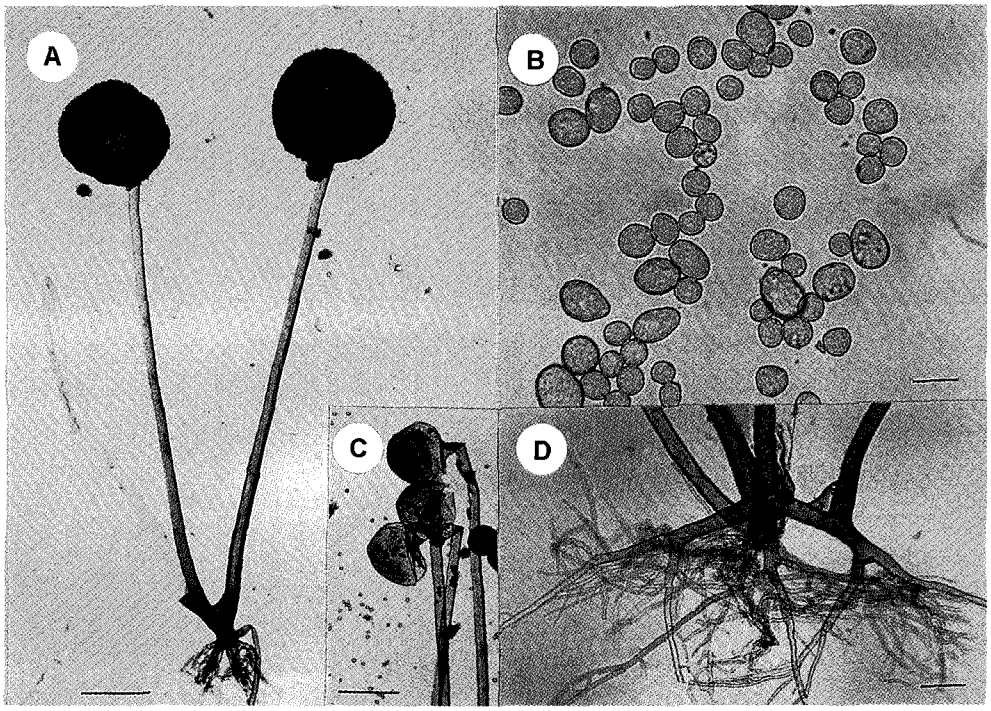

Fig. 2. Morphology of the causal organism, *Rhizopus nigricans*. A : Sporangia bearing sporangiophores, B : Sporangiospores, C : Typical columella, D : Rhizoid and stolon, Scale bar : 10 μm.

Table 1. Effect of temperature on mycelial growth of *Rhizopus nigricans* isolated from rotten peach (*Prunus persica*)

	Temperature (°C)								
	0	5	10	15	20	25	30	35	40
Colony diameter (mm)[a)]	0.0	18.2	25.0	44.6	55.6	90.0	90.0	11.0	0.0

[a]Diameter of mycelial growth were measured after 28 hours of incubation on PDA.
The data are means of three replications.

Table 2. Comparison of mycelial characteristics of the pathogenic fungus isolated from Rhizopus soft rot of peach (*Prunus persica*) with previous descriptions of *Rhizopus nigricans*

Characteristics		Present isolate	*R. nigricans*[a)]	*R. nigricans*[b)]
Colony	color	white → brownish	white → brownish	white → brownish
Sporangiospores	size	9.7~24.8 × 5.9~15.8 μm	10~20 μm	10~30 μm
Sporangiophores	wide	8.9~36.6 μm	3~5 × 13~25.3 μm	7~20 × 5~12 μm
Sporangia	shape	globose, sub-globose	globose, sub-globose	globose, sub-globose
	size	85.3~243.5 × 53.4~219.2 μm	85~200 μm	100~350 μm
Columella	size	70.2 × 149.7 μm	70~90 μm	50~160 μm

[a]CMI described by Sarbhoy (1966) and [b]Udagawa, S. *et al.* (1980).

nigricans (Ehrenberg ex. Fr.) Lind.

The maximum and minimum temperature for mycelial growth were 35°C, and 5°C, respectively and the optimum growth temperature was 25~30°C for most isolates (Table 1).

All of the isolates on fruits successfully induced the typical rhizopus soft rot symptoms on peach. The typical symptoms were appeared 2 days after inoculation in fruit container (Fig. 1D).

The symptoms were identical to those on naturally infected peach. Morphological characteristics of the conidia and mycelia of the fungi that were reisolated from inoculated plants were same as those of naturally infected fruits.

Favorable temperature and humidity or sufficient maturity of the fruit enhanced the growth and activity of the fungus. The rhizopus soft rot disease in sweet potato (*Ipomoea batatas* Lam), strawberries (*Fragaria ananssa* Duch), and persimmon (*Diospyros kaki* var. *domestica* Makino) has been reported in Korea (The Korea society of plant pathology, 1998), but no record on peach (*Prunus persica*) in Korea (Ryu *et al.*, 1993. The Korea Society of Plant Pathology, 1998). The rhizopus soft rot disease in peach *Prunus* L. have been reported in Japan (Kitagima, 1989; Ogata, 2000).

We assume that *Rhizopus nigricans* is the main fungus that will cause epidemic of the rhizopus soft rot on peach in Korea. This is the first report of rhizopus soft rot on peach in Korea.

References

Agrios. G. N. 1997. Plant pathology. Fourth edition. Academic press. Pp. 283-286.

C.M.I. Descriptions of pathogenic fungi and bacteria. 1966. 1977. No. 110. 524.

Gobayashi, T., Katumoto, K., Abiko, K., Abe, Y. and Kakishima, M. 1992. Illustrated Genera of Plant Pathogenic Fungi in Japan. *The Whole Farming Educational Association.* 534 pp.

Kitagima, H. 1989. Particulars of fruits tree diseases. Yokendo, Tokyo, Japan. Pp. 285-346 (in Japanese).

Ogata, T. 2000. Present status and control of fruit decays of peach. *Plant Protection* **54**: 12-15.

Ryu, H. Y., Lee, Y. H., Cho, W. D., Kim, W. G., Myung, I. S. and Jin, K. S. 1993. Compendium of fruit tree diseases with color plates. Department of Plant Pathology, Agricultural Science and Technology. Pp. 77-92 (in Korea).

The Korean Society of Plant Pathology. 1998. List of Plant Diseases in Korea, 3rd ed. Pp. 149151 (in Korean).

Udagawa, S., Tubaki, K., Horie, Y., Miura, K., Minoura, K., YamazaKi, M., Yokoyama, T. and Watanbe, S. 1980. Illustrated Genera of Fungi. Pp. 300-301. (in Japanese).