

Cause and Extent of Cullage of Florida Bell Peppers in the Rotterdam Terminal Market

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ABSTRACT

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An average 8.8% of Florida bell peppers were spoiled on arrival at the Rotterdam terminal market between January and April 1979. Bacterial soft rot was responsible for 86.3% of this decay; the remainder was caused by seven different fungi. A further 4.6% and 28.8% spoiled during simulated wholesale and retail periods, respectively. Bacterial soft rot and alternaria rot accounted for most of the increase in decay during these two periods.

Florida is a major supplier of bell peppers (*Capsicum annuum* cv. *grossum*) to markets in Western Europe from January through March. Receivers frequently complain about the poor condition of the peppers on arrival and their subsequent deterioration in the marketing channels. Knowledge of the causes and extent of losses incurred during marketing would help shippers, carriers, and research workers to control disease and maintain quality. We report the incidence and severity of pepper cullage in the Rotterdam terminal market.

MATERIALS AND METHODS

Sample boxes of peppers were collected from 36 van containers during unloading at receiving facilities near Rotterdam between January and April 1979. Transit time from Florida until unloading was about 14 days. Bills of lading stated that transit temperature should be set at about 5.5 C. Two shipping units (0.5-, 1.0-, or 1.11- bu fiberboard boxes) were withdrawn at random from each van container for examination in the laboratory.

Peppers were inspected on arrival, after storage for 7 days at 7.5 C to

simulate a wholesale period, and after storage for an additional 3 days at 21 C to simulate a retail period at a European greengrocer. Peppers were examined carefully to avoid wounding and invasion by disease-causing organisms. Fruits judged commercially unacceptable were removed. Peppers were considered a commercial loss if decayed areas were larger than 0.5 cm², cuts and bruises were longer than 2 cm, or nonparasitic disorders affected more than 3 cm² of the surface. Organisms were identified by disease symptoms produced and by microscopic verification of isolations (1,3).

Table 1. Losses attributed to diseases of Florida bell peppers occurring during transit from Florida to Rotterdam (January–April 1979) and during simulated wholesale and retail periods in the laboratory^a

Disease	At arrival (%)	Simulated wholesale ^b (%)	Simulated retail ^c (%)	Total (%)
Bacterial soft rot	7.55	1.87	9.48	18.90
Alternaria rot	0.35	1.94	16.21	18.50
Geotrichum rot	0.64	0.17	0.84	1.65
Rhizopus rot	0.03	0.03	1.08	1.14
Gray mold rot	0.08	0.35	0.42	0.85
Blue mold rot	0.02	0.22	0.46	0.70
Cladosporium rot	0.03	0.03	0.22	0.28
Yeast rot	0.05	0.03	0.08	0.16
Total	8.75	4.64	28.79	42.18

^aSummation of 36 shipments.

^bHeld 7 days at 7.5 C.

^cHeld 3 days at 21 C.

RESULTS AND DISCUSSION

We found 8.75% of Florida bell peppers arriving on the Rotterdam terminal market commercially unacceptable (Table 1). Bacterial soft rot (*Erwinia carotovora* (L. R. Jones) Holland), was by far the most serious of the eight diseases identified, accounting for 86.3% of the culls. The other seven diseases identified accounted for the remaining losses on arrival. Mechanically damaged culls totaled 0.44% on arrival. Loss from nonparasitic disorders on arrival was only 0.02%, much less than found by Ceponis and Butterfield (2) in a similar study in the New York terminal market. Total loss at arrival amounted to 9.2% and was approximately the same in all 36 shipments.

Following the simulated wholesale period, alternaria rot (*Alternaria alternata* (Fr.) Keissler) and bacterial soft rot each were responsible for an additional 1.9% loss. In simulated retail samples, total decay (28.8%) included 16.2% alternaria rot and 9.5% bacterial soft rot. The higher temperature during

this simulated retail period probably stimulated the development of decay, especially alternaria rot. The remaining six identified diseases were likewise stimulated by the higher temperature and were responsible for 3.1% spoilage.

By the time the peppers had gone through transit and simulated marketing conditions, 42.2% were culled because of

disease. Fruit may have become infected before harvest, after harvest during packing, or in transit. Because most losses were due to *E. carotovora* and *A. alternata*, we suggest that commonly used disease control measures be reexamined and that research be directed toward reducing the occurrence of these pathogens in Florida bell peppers.

LITERATURE CITED

1. BREED, R. S., E. G. D. MURRAY, and N. R. SMITH, eds. 1957. *Bergey's Manual of Determinative Bacteriology*. Williams & Wilkins Co., Baltimore.
2. CEPONIS, M. J., and J. E. BUTTERFIELD. 1974. Causes of cullage of Florida bell peppers in New York wholesale and retail markets. *Plant Dis. Rep.* 58:367-369.
3. ELLIS, M. B. 1971. *Dematiaceous hyphomycetes*. Commonw. Mycol. Inst., Kew, Surrey, England.