

Disorders in Fresh Pepper Shipments to the New York Market, 1972-1984

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During 1972-1984, USDA personnel inspected nearly 6,000 rail and truck shipments of fresh peppers (*Capsicum annuum* L.) on the New York market, usually at the request of receivers questioning the product's arrival quality. These shipments comprised almost 3.2 million packs of 11.35 kg (25 lb) each, or about 9% of all fresh peppers delivered to the New York market during that period (11,12). Peppers from 18 states, six foreign countries, and Puerto Rico were inspected, but most originated from Florida (42.1%), California (23.4%), Texas (16.8%), and Mexico (10.1%). The principal types were green bell, red bell, and cubanelle.

This report deals only with the three main fresh pepper types and is another in a series on the arrival condition of fresh produce on the New York market (1,2,5-9). The data were abstracted from USDA inspection certificates, which usually reported the condition of the peppers within 24 hours of arrival.

USDA inspectors, trained to diagnose disorders by symptomatology, named or described 21 disorders of 5,055 green bell pepper, 379 red bell pepper, and 471 cubanelle pepper shipments from 1972 to 1984 (Tables 1-3). Nine parasitic diseases, four physiological disorders, six kinds of injury, and two disorders described as external discoloration and sunken discolored areas were noted.

Bacterial soft rot (*Erwinia* and *Pseudomonas* spp.) was noted in 70% of all inspected fresh pepper shipments and was

distributed throughout all incidence classes; 1% to more than 50% of the pods in a shipment were affected. The seriousness of bacterial soft rot is evidenced by the rotting of more than 10% of the pods in over one-half of the pepper shipments in which the disease was reported (Tables 1-3). Bacterial soft rot was also the most damaging disease in a number of bell pepper export shipments, accounting for more than 80% of the spoilage found on arrival at European markets (10).

Gray mold rot (*Botrytis cinerea*) was the most damaging of the other parasitic diseases and was reported in 23% of all pepper shipments. The disease was distributed throughout all incidence classes, rotting more than 10% of the pods in 676 (11%) of all shipments. Unidentified decays were reported in 11% of the shipments but mostly in the lowest incidence class. Inspectors often do not identify a decay when grade tolerance (usually 2%) is met or when characteristic symptoms are lacking or unrecognized. Watery soft rot (*Sclerotinia sclerotiorum*) and Alternaria rot (*Alternaria* spp.) were the only other diseases of importance, reported in 1.0 and 0.5% of the shipments, respectively. Only a few occurrences were noted of Cladosporium rot (*Cladosporium herbarum*), anthracnose (*Colletotrichum gloeosporioides*), Rhizopus rot (*Rhizopus stolonifer*), and blue mold rot (*Penicillium* spp.) (Tables 1-3).

Soft or misshapen pods, chilling injury, and two isolated instances of blossom-end rot were the physiological disorders noted (Tables 1-3). Soft pods, reported in 14% of all pepper shipments, possibly resulted from high temperatures, bruising, or overpacking. Misshapen pods were reported in less than 3% of the green and red bell pepper shipments and in only a few of the cubanelle pepper shipments. Chilling injury, manifested principally by pitting of the pods, was reported in 1.3% of the shipments and affected each pepper type.

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Table 1. Frequency of disorders reported in USDA inspections of 5,055 green bell pepper shipments on the New York market, 1972-1984

Disorder	Shipments affected (%)	Number of shipments affected according to incidence class (% pods)					
		0	1-5	6-10	11-20	21-50	> 50
Bacterial soft rot	69.1	1,564	653	927	1,060	719	132
Gray mold rot	23.0	3,894	240	343	353	205	20
Soft pods	14.0	4,345	380	185	120	25	0
Bruise damage	11.5	4,476	450	97	29	2	1
Unidentified decays	11.1	4,493	420	49	54	30	9
Crushed/broken pods	11.1	4,496	510	44	4	1	0
Misshapen pods	2.9	4,910	119	23	3	0	0
Scarring	2.7	4,919	119	11	5	1	0
Sunken discoloration	2.6	4,925	58	43	25	3	1
Freeze damage	1.5	4,977	4	8	28	24	14
Chilling injury	1.3	4,988	32	18	13	3	1
Insect injury	0.7	5,022	31	1	0	0	1
Alternaria rot	0.6	5,024	12	9	9	1	0
Watery soft rot	0.6	5,025	13	8	7	2	0
Sunscald	0.3	5,040	15	0	0	0	0
Miscellaneous ^a	0.7	5,018	11	17	4	2	3

^a Anthracnose, Rhizopus rot, Cladosporium rot, blossom-end rot, blue mold rot, and external discoloration.

Table 2. Frequency of disorders reported in USDA inspections of 379 red bell pepper shipments on the New York market, 1972–1984

Disorder	Shipments affected (%)	Number of shipments affected according to incidence class (% pods)					
		0	1–5	6–10	11–20	21–50	>50
Bacterial soft rot	77.8	84	55	74	74	73	19
Gray mold rot	28.5	271	25	33	27	21	2
Soft pods	17.7	312	41	17	9	0	0
Bruise damage	12.4	332	35	9	3	0	0
Unidentified decays	9.2	344	24	0	4	6	1
Crushed/broken pods	6.9	353	25	1	0	0	0
Sunken discoloration	5.8	357	11	10	0	1	0
Scarring	3.2	367	10	0	1	1	0
Misshapen pods	2.1	371	8	0	0	0	0
Chilling injury	1.8	372	3	2	2	0	0
Watery soft rot	1.1	375	1	2	0	1	0
Freeze damage	1.1	375	0	0	1	3	0
Miscellaneous ^a	2.1	371	1	2	4	0	1

^a Alternaria rot, Cladosporium rot, Rhizopus rot, anthracnose, external discoloration, and insect injury.

Table 3. Frequency of disorders reported in USDA inspections of 471 cubanelle pepper shipments on the New York market, 1972–1984

Disorder	Shipments affected (%)	Number of shipments affected according to incidence class (% pods)					
		0	1–5	6–10	11–20	21–50	>50
Bacterial soft rot	74.9	118	66	88	112	72	15
Gray mold rot	16.6	393	13	17	24	22	2
Unidentified decays	10.2	423	31	6	7	4	0
Soft pods	8.9	429	19	13	6	4	0
Crushed/broken pods	3.6	454	15	2	0	0	0
Bruise damage	3.0	457	12	2	0	0	0
Sunken discoloration	1.9	462	3	3	1	2	0
Freeze damage	1.7	463	0	1	2	2	3
Scarring	1.1	466	4	1	0	0	0
Watery soft rot	0.8	467	1	1	1	1	0
Chilling injury	0.6	468	1	2	0	0	0
Miscellaneous ^a	1.9	462	5	4	0	0	0

^a Rhizopus rot, misshapen pods, insect injury, and yellowing.

Table 4. Frequency of parasitic diseases reported in USDA inspections of 2,154 Florida and 1,006 California green bell pepper shipments on the New York market, 1972–1984

Source and disease	Shipments affected (%)	Number of shipments affected according to incidence class (% pods)					
		0	1–5	6–10	11–20	21–50	>50
Florida							
Bacterial soft rot	67.6	698	275	394	453	274	60
Gray mold rot	23.2	1,655	82	159	160	92	6
Unidentified decays	10.4	1,930	161	21	22	18	2
Watery soft rot	0.4	2,145	5	4	0	0	0
Alternaria rot	0.3	2,147	3	3	1	0	0
Others ^a	0.1	2,152	1	1	0	0	0
California							
Bacterial soft rot	62.4	378	160	176	172	115	5
Gray mold rot	26.4	740	63	89	71	39	4
Unidentified decays	14.9	856	121	12	13	2	2
Watery soft rot	1.3	993	7	1	5	0	0
Alternaria rot	0.6	1,000	2	1	2	1	0
Cladosporium rot	0.3	1,003	1	0	0	1	1

^a Anthracnose and blue mold rot.

Mechanical injury, expressed as bruise damage and crushed/broken pods, was the most serious nonphysiological disorder. Bruise damage and crushed/broken pods were each reported in about 11% of all shipments, with bell peppers more adversely affected than cubanelle peppers. Scarring was reported in about 3% and insect injury in less than 1% of the inspections (Tables 1-3).

The parasitic diseases noted on green bell peppers from Florida and California, the main sources of supply, are listed in Table 4. Aside from the proportionately greater occurrence of bacterial soft rot in Florida peppers in the two highest incidence classes, the disease patterns were similar.

This information on fresh peppers is not representative of the arrival condition of all fresh peppers delivered to the New York market. Although inspections were routinely performed in many cases, most were conducted on shipments whose arrival quality was suspect. We present this information to illustrate the nature of the problems that plague fresh produce arrivals at terminal markets. Data derived from the inspection of all pods in 30,000 or more packs of peppers (minimum of six packs per shipment) during a 13-year period should provide information of value to researchers concerned with the economically feasible control of diseases and other disorders that cause substantial losses in the marketing of this major vegetable commodity (3,4).

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