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Diseases of Fruits and Vegetables Observed on the
Chicago and New York Markets in 1937

July 15, 1938.

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF FRUITS AND VEGETABLES OBSERVED ON THE
CHICAGO AND NEW YORK MARKETS IN 1937

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FRUIT AND VEGETABLE DISEASES ON THE CHICAGO MARKET IN 1937

By G. B. Ramsey, Senior Pathologist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Chicago, Illinois.

A total of 70,614 carlots of fruit and vegetables were unloaded on the Chicago market in 1937¹. In addition to these freight and express shipments, it was estimated that an equivalent of 11,272 carlots were received by truck. Most of these truck lots came from nearby States and the produce was so widely distributed throughout the Chicago district that it is impossible to get accurate information regarding the diseases shown. Consequently, in this report there is little information on the diseases of fruits and vegetables from Ohio, Michigan, Indiana, Illinois, Iowa, and Wisconsin. If it appears that most of the decaying fruits and vegetables come from California, Washington, Oregon, Florida, and Texas, it is because the produce from the distant States comes in carlot shipments to regular terminals and to South Water Market where regular inspection service is maintained. As a matter of fact, the fruits and vegetables shipped from distant well-organized producing centers are generally better graded and more free from blemishes and decay than local products.

APPLES:

The majority of the apples inspected showed some blue mold rot (Penicillium expansum). While many lots showed less than 5 percent, in a few cases there was as much as 20 percent loss on account of this decay.

Since the development and use of oiled wraps and shredded oiled paper, scald usually has been of little economic importance. However, occasional lots sometimes show small percentages of this trouble. This year about the only appreciable scald (4 to 6 percent) was found in some New York Greenings and McIntosh apples.

One lot of Washington Winesap apples showed 10 percent of soft scald.

A lot of Yellow Newtown apples from Washington received here in April showed 25 to 50 percent of internal browning.

The most severe bitter pit observed during the year occurred in California Gravensteins received in July. The variation in amount of bitter pit according to size of fruit was well demonstrated in one lot in which the 125's size and smaller had only 1 percent, while the 113's and larger sometimes had as high as 30 percent of this blemish. The average for the larger sizes was about 16 percent.

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¹/Arrivals and Unloads of Fresh Fruits and Vegetables at Chicago. Annual Report Calendar year 1937. A. B. Farlinger, Bureau of Agricultural Economics, Chicago, Illinois.

Arsenical injury occurred to a slight extent in several lots of Idaho and Washington apples and in a few this injury damaged 40 percent of the stock. Some lots in storage showed shriveling and blue mold following this type of injury.

ASPARAGUS:

California asparagus on this market showed relatively little decay. The development of precooling methods in which either cold air or cold water is used reduces the temperature of this product quickly so that good refrigeration is maintained throughout the transit period. Consequently, bacterial decays and fungous rots (mostly fusaria) are generally well controlled.

During April several cars of California asparagus showed freezing injury of the tips of the spears, apparently due to precooling with air that was below the freezing point for asparagus (29.8° F).

Gray mold rot (Botrytis spp.) was found affecting about 10 percent of the stock in one lot received from California.

A car of South Carolina asparagus was received in May showing 20 to 40 percent of the spears badly wilted and shriveled.

AVOCADO:

No decay was observed in appreciable amounts in either the California or Florida stock received this year. However, a lot of 140 boxes of California avocados hauled by truck to Denver in January showed severe freezing injury, characterized by dark brown spots and slit-like openings throughout the flesh.

BANANAS:

Anthracnose (Colletotrichum musarum) caused slight discoloration and spotting of most lots of bananas inspected, and in a few instances an objectionable decay of the peel was noted.

Bruising of the bananas on the retail market was particularly damaging this year. In many bruised fruits anthracnose and rhizopus rot caused much loss.

The most serious loss observed in any one lot of bananas occurred in 300 bunches that showed brown discoloration of the flesh and peel due to chilling.

BEANS:

The greatest loss of green beans occurred in a car from South Carolina which arrived the last of May. On inspection it was found that there was no ice in the bunkers of the car and the temperature at the bottom of the doorway was 83°-86° F., and the beans at the top of the load showed a temperature of 112° to 115°. The beans in the bottom and the second layer hampers were fairly fresh and green and showed about 1 percent decay. Those in the third layer hampers had 50 to 75 percent decay, and the three top layer hampers showed 90 to 100 percent of the beans severely affected with bacterial soft rot (Bacterium spp.) and some watery soft rot (Sclerotinia sclerotiorum).

Watery soft rot was found in small amounts in stock from Florida, Louisiana, and Arkansas.

During February some lots of Florida beans showed soil rot (Rhizoctonia solani) affecting 5 to 10 percent of the stock.

Bacterial blight (Bacterium phaseoli) was observed only in small amounts in beans from Florida and Colorado.

A car of Colorado beans received in August showed a range of 3 to 25 percent with an average of 18 percent rhizopus rot, much of it nested.

A severe russetting developed in two cars of Florida wax beans that were delayed in transit on account of flood waters in February. The beans had a dirty greyish-brown appearance on arrival and after a few days on the market, they were so badly discolored that 211 hampers out of one car and 75 hampers out of another car had to be dumped.

Lima beans from Florida showed soil rot (Rhizoctonia solani) in some lots received in January and February. In advanced cases the fungus penetrated the pods and caused decay of the seeds.

California lima beans received in December showed discoloration and decay of pods due to Cladosporium, Alternaria, and Botrytis. Many pods also showed numerous small reddish-brown spots, the cause of which was not determined.

CABBAGE:

Most cars of cabbage inspected showed some bacterial soft rot (Bacterium spp.). The Florida, Alabama, and South Carolina stock received in April frequently had 3 to 15 percent of this type of decay in the wrapper leaves. The cabbage from Louisiana, Mississippi, and Tennessee received during May showed most serious bacterial soft rot affecting the stem. This decay is also common in cabbage that has been injured by freezing. One lot of New York cabbage had 60 percent of bacterial soft rot following freezing injury.

A small amount of black rot (Bacterium campestre) was noted in cabbage from South Carolina and Texas.

CANTALOUPE:

Most California and Arizona melons arrived on this market without showing much decay of consequence. However, a lot of soft melons received from Mexico in April showed green mold rot (Cladosporium spp.) and fusarium (Fusarium spp.) affecting 8 to 80 percent with an average of 65 percent.

CARROTS:

About 90 percent of the carrots shipped to the Chicago market come from California. Most of this stock arrives in exceptionally good condition, but occasionally a slight amount of watery soft rot (Sclerotinia sclerotiorum) occurred in a few lots. Macrosporium blight (M. carotae) discolored about 30 percent of the tops in some lots.

Gray mold rot (Botrytis spp.) occurred in 2 percent of a lot of carrots from Colorado received in September.

CAULIFLOWER:

Bacterial soft rot (Bacterium spp.) caused the most damage to the curd and jackets of cauliflower during the year. One lot received from California in February showed 50 percent so affected. Colorado stock showed some yellowing of the jacket leaves and a spreading and ricey condition of the curd.

A storage lot of New York cauliflower showed 2 percent gray mold rot (Botrytis spp.).

CELERY:

Bacterial soft rot (Bacterium spp.) following freezing injury affected several lots of Florida and California celery during January. This decay was also very serious in stock received in May. A car of celery from Florida arrived showing a temperature of 68° F. at the top of the load and 55° at the bottom, with 90 percent of the bunches affected. A lot of California celery showed a temperature of 45° at the bottom and 68° at the top of the load. The celery in the bottom layer crates showed 1 to 5 percent decay, the middle layers 10 to 75 percent, and the top layer 75 to 100 percent of bacterial soft rot. The hatch covers were down, the plugs in, and the bunkers half full of ice in this car at time of inspection.

Watery soft rot (Sclerotinia sclerotiorum) was serious in California celery in May. This decay ranged from 5 percent in some cars to 65 percent

in others. It also occurred in Florida celery from February to June. One of the last loads inspected showed a range of 10 to 50 percent with an average of 25 percent watery soft rot and also about 15 percent black heart.

Late blight (Septoria spp.) was found affecting from 10 to 30 percent of the leaves and stalks in several California shipments during March and April.

ENDIVE:

During November several shipments of California endive showed reddish-brown discoloration of the blanched heart leaves. The cause of this trouble is not known. Some gray mold rot (Botrytis spp.) and bacterial soft rot was present in the outer green leaves of the bunches, but these diseases were not prominent in the heart leaves.

CUCUMBER:

Bacterial spot (Bacterium lachrymans) was observed in cucumbers from Cuba, Florida, New York, and Maryland. The most severe anthracnose (Colletotrichum lagenarium) noted was in a lot of cucumbers from Maryland which showed a range of from 4 to 45 percent with an average of 30 percent.

DANDELION GREENS:

Bacterial soft rot mostly in the early stages of development was found affecting 65 percent of the plants in one lot received from Texas. No other decays were observed.

EGGPLANT:

Many lots of Florida eggplant showed some phomopsis fruit rot (Phomopsis vexans). In the cars inspected the decay often ranged between 1 and 10 percent, the average being near 5 percent.

GRAPES:

The table grapes received from California generally showed small to moderate amounts of decay. Two or 3 percent of blue mold (Penicillium spp.) and rhizopus rot was noted in several lots. The juice grapes, however, often showed a much higher percentage of decay, for example, a car of black juice grapes showed a range of from 15 to 85 percent and an average of 40 percent gray mold rot (Botrytis spp.) and rhizopus rot.

GRAPEFRUIT:

Numerous cars of Florida and Texas grapefruit inspected showed blue mold rot (Penicillium italicum) ranging from 1 to 20 percent; the average in most lots was usually near 5 percent.

Stem end rot (Phomopsis and Diplodia) was observed in Florida grapefruit, occasionally affecting as much as 5 percent.

LEMONS:

Most lots of lemons inspected showed a little green mold (Penicillium digitatum). One lot showed 40 percent infected, but the history of this lot was unknown.

LETTUCE:

As in previous years, bacterial soft rot caused most serious damage to lettuce received on the market. California stock received during April, May, and June often showed 15 to 60 percent of this decay, the higher percentages in most instances being associated with tipburn. One car that stood on track over two weeks on account of poor market conditions had 80 to 100 percent of the heads affected with bacterial soft rot.

Tipburn continues to be one of the most serious troubles affecting head lettuce. In some cars inspected, from 45 to 90 percent of the heads were affected with tipburn.

MUSTARD GREENS:

One lot of mustard received from Texas in February was badly blemished with white rust (Albugo candida).

NECTARINES:

In September a lot of California nectarines that had been in storage for six weeks showed severe internal breakdown and a small amount of brown rot (Sclerotinia fructicola) and blue mold (Penicillium spp.).

ONIONS:

Most onions showing serious decay were affected either with gray mold rot (Botrytis spp.) or bacterial soft rot. The greatest loss noted occurred in a lot of Colorado onions inspected in a store. These onions showed 80 percent of gray mold rot and 65 percent had developed sprouts.

A lot of Texas onions had an average of 50 percent gray mold rot. Stock from Washington, Utah, and Iowa often showed from 1 to 16 percent with an average of about 8 percent of this decay.

Bacterial soft rot occurred in Texas onions during April and May to the extent of 3 to 15 percent. Some black mold rot (Aspergillus niger) was also observed in Texas stock at this time.

Practically all onions in a storage lot from Utah showed discolorations due to ammonia fumes.

Smudge (Colletotrichum circinans) was found causing some serious blemishes in Illinois white onions.

Rhizopus soft rot often occurs in small amounts, but serious loss is seldom caused by this rot. A few cars of California onions received in July showed this decay ranging from 2 to 50 percent. There was no ice in the bunkers in these cars at the time of the inspection.

ORANGES:

Florida oranges received from January to April frequently showed blue mold rot (Penicillium italicum) ranging from 2 percent in some boxes to as high as 30 percent in others, the average usually being near 10 to 12 percent. The stock received in November and December sometimes had serious skin breakdown occurring as sunken brown pits and areas, 1/8 to 1/2 inches in diameter about the stem end of oranges that had "color added". Other car lots showed this processing injury affecting from 10 to as high as 50 percent of the fruit. Stem end rot (Phomopsis sp.) and blue mold rot (Penicillium spp.) sometimes was associated with this injury.

California oranges marketed in February showed some brown rot (Phytophthora citrophthora). A few inspections at that time revealed about 2 percent of this decay.

PEACHES:

The peaches from Georgia, Arkansas, Tennessee, Illinois, and Michigan all showed more or less brown rot (Sclerotinia fructicola). In a few cars this decay ranged as high as 50 percent in some baskets, and an average of 20 percent was not unusual.

Rhizopus rot occurred in the top layer baskets in many cars, especially in the ripe lots that showed excessive bruising.

Some shipments of peaches that arrived in otherwise good condition showed skin discolorations and streaking apparently due to mechanical injury during the defuzzing process.

PEARS:

Gray mold rot (Botrytis sp.) caused some damage to pears on this market. California and Oregon stock sometimes had 2 or 3 percent of this decay. Several lots of Oregon Bosc pears received in November showed some gray mold, and 15 to 25 percent were noticeably shriveled about the stem end.

PEAS:

A large number of carlots of California peas received in April showed little or no decay, but much of this stock showed 20 to 30 percent of defects consisting of poorly filled pods and blemishes due to pod spot (Ascochyta pisi) and scab (Cladosporium pisicola).

Gray mold rot (Botrytis spp.) occurred in one lot of Idaho peas to the extent of 5 percent. A few lots of California peas also showed from 1 to 3 percent of this decay.

A physiological spotting of the seed coat was found in a few peas from Mississippi in May.

Cladosporium scab and mosaic were the cause of the most important marketing defects noted in California peas.

PECANS:

On inspection of a lot of pecans that had been in cold storage for a year, it was found that the shells were dull and somewhat darker than normal in color and 45 percent of the meats within were discolored greyish-brown to black. This injury was caused by ammonia fumes escaping from the refrigerating system.

PEPPERS:

Green peppers from Florida received in April frequently showed a high percentage of decay caused by a species of Phytophthora. In one car inspected this decay ranged from 30 to 90 percent in various hampers, the average for the lot being 70 percent. Serious decay was also caused by bacterial soft rot and Rhizopus. One lot examined in June showed a range of from 20 to 70 percent of these rots, the average being 38 percent.

A lot of California peppers in storage showed 45 percent of gray mold rot (Botrytis spp.).

PINEAPPLES:

The pineapples received from Cuba from April until June often showed a very high percentage of black rot (Thielaviopsis paradoxa). In some instances noted, decay ranged as high as 70 percent, and the average in many cars was near 40 to 50 percent. Much of this decay was in advanced stages so the affected fruits were a total loss. Some Cuban stock also showed a brown rot in which a Fusarium was constantly associated.

Several lots of Mexican pineapples received on this market during June had a very high percentage of the fruits showing a brown watery internal breakdown of the heart region of the fruit. In some lots 90 to 100 percent of the stock was affected, but none of this trouble showed externally. No organisms of any kind were found associated with this trouble.

PRUNES:

The Washington, Oregon, and Idaho Italian prunes received during September sometimes showed a small percentage of blue mold (Penicillium spp.), but most serious decay was caused by Rhizopus, especially in the stock that was generally ripe and becoming soft. Sometimes rhizopus rot affected more than half of the prunes in some boxes. The average in the worst lots was about 20 percent.

POTATOES:

Bacterial soft rot occurred in many cars of Florida potatoes shipped during January to April. Sometimes this decay affected 50 percent of the tubers in certain crates. The average for most lots usually was not more than 10 to 15 percent. The general appearance of the stock indicated better harvesting, washing, and drying conditions than prevailed last year.

Idaho potatoes sometimes had 12 to 16 percent fusarium tuber rot (Fusarium spp.), mostly of the dry type, but in general this storage decay affected little more than 1 or 2 percent in most of the lots inspected.

A few lots of Idaho potatoes inspected in August and September showed from 3 to 5 percent leak (Pythium spp.). A lot of Washington potatoes inspected at this time also showed approximately 8 percent leak.

Alabama and Louisiana potatoes received during May and June frequently showed small amounts of sclerotium rot (Sclerotium rolfsii) and in a crate or two this decay ranged as high as 20 percent.

California, Oklahoma, and North Carolina potatoes marketed during June and July showed bacterial soft rot in many lots. Some of this decay

followed mechanical injuries and some followed scald. A car of North Carolina potatoes arrived under ventilation during the hot weather in July, showing 15 to 80 percent, with an average of 45 percent bacterial soft rot.

White Rose potatoes from the Shafter district in California marketed during July, showed considerable brown discoloration affecting 1/4 to 1/2 of the tuber, usually at the bud end. This stock is very susceptible to bruising and peeling and must be picked up immediately after digging in order to avoid scald during hot weather. In scalded tubers the brown discolored areas at the bud end were slightly sunken and sticky owing to invasion by bacteria.

The most serious scab (Actinomyces scabies) noted was in a car of Minnesota potatoes inspected in September, which showed a range from 20 to 65 percent with an average of 35 percent of the tuber appreciably blemished.

A small amount of nematode injury was found in Florida potatoes during January.

A watery breakdown and black heart condition was found in some potatoes from Florida and Hawaii that had been fumigated with methyl bromide for control of tuber moth.

RADISHES:

Generally speaking, overmaturity and pithiness of radishes reduces the marketability of this stock more than decay. Bacterial soft rot in the tops was noted in several lots, but not in high percentages.

RHUBARB:

A lot of Washington rhubarb consisting of 125 boxes inspected in a store showed from 20 to 90 percent with an average of 65 percent gray mold rot (Botrytis spp.) at the ends of the stalks. The rhubarb in 21 boxes was completely decayed. A few lots of California rhubarb also showed some of this decay ranging from 2 to 15 percent.

RUTABAGAS:

The only decay of any consequence noted in rutabagas was in some Canadian stock received in March, which showed an average of 7 percent gray mold rot (Botrytis spp.).

One lot of Canadian rutabagas also showed 2 percent of slight brown-heart.

SHALLOTS:

Louisiana shallots received during February and March often showed 1 or 2 percent of bacterial soft rot. In bruised and crushed lots the decay sometimes ranged to as high as 30 percent. Generally this stock is so well refrigerated with layers of crushed ice in the barrels that decay does not develop. Temperatures of 33 and 34° F. were noted in some lots.

SPINACH:

Bacterial soft rot (Bacterium spp.) caused some loss in most lots of spinach but generally this decay did not affect more than 5 percent of the stock. In the instances of excessive loss, such as in a car of Texas spinach received in January, which showed a range of 8 to 65 percent with an average of 40 percent bacterial soft rot, some very unfavorable loading or transit conditions are indicated. The spinach in the top two layers of baskets was badly wilted and about two-thirds decayed, while the stock in the bottom four layers of baskets showed very little wilting and about 40 percent bacterial soft rot. Although there was crushed ice over the top of the load at the time of inspection on this market and temperatures of 36° F. at the top and 39° at the bottom were noted, certainly sometime previously this stock had been much warmer.

One lot of Texas spinach had about 1 percent of Heterosporium leaf spot.

STRAWBERRIES:

Rhizopus rot (Rhizopus spp.) was the most common and destructive decay encountered in strawberries from all regions. Many lots from Louisiana, Arkansas, and Tennessee averaged about 10 percent of this decay.

One car of Arkansas berries received in May had an average of 6 percent gray mold rot (Botrytis spp.) and some leather rot (Phytophthora spp.).

SQUASH:

The only decay of serious consequence in squash was observed in a lot from Minnesota in December with 20 percent gray mold rot (Botrytis spp.).

SWEETPOTATOES:

Sweetpotatoes were received from Delaware, New Jersey, Virginia, Tennessee, Louisiana, and Texas, which often showed a range of from 2 to 28 percent of rhizopus rot (Rhizopus spp.) with an average for most lots near 10 percent.

TOMATOES:

Throughout the months of January to April this market receives a large number of cars of tomatoes from Mexico. Considering the long trip made by this perishable product, the stock arrives in a very satisfactory condition. However, carlots that arrive showing most of the fruit ripe frequently show from 10 to 30 percent of rhizopus rot and bacterial soft rot. The stock that arrives mostly green and is held on track or in ripening rooms for coloring, often develops alternaria rot (Alternaria spp.) and green mold rot (Cladosporium spp.). These two decays frequently damage from 10 to 20 percent.

Tomatoes from Cuba are received in January and February. This stock also shows most damage from rhizopus and bacterial soft rot because the fruits are frequently ripe and soft.

Most Florida tomatoes arrive from January to June. Phoma rot (Phoma destructiva) caused serious loss in this stock from February to March. Many lots showed a range of from 5 to 35 percent with an average of 15 percent of this decay. One car lot that was held on track for ripening showed 12 to 50 percent with an average of 30 percent of phoma rot in growth cracks about the stem scar and in shoulder bruises.

During June and July most shipments of tomatoes originate in Texas and Mississippi. Many lots of Texas tomatoes had buckeye rot (Phytophthora terrestris) [P. parasitica] and soil rot (Rhizoctonia) averaging about 10 percent. Some lots also showed about 15 percent blossom end rot (physiological) which was often followed by bacterial soft rot.

Bacterial soft rot and Rhizopus caused greatest damage to the tomatoes received from Mississippi. Blossom end rot was also noted affecting 4 or 5 percent of the tomatoes in a few lots.

One lot of Mississippi tomatoes showed small amounts of bacterial speck, (Bacterium punctulans), ghost spot, and cloudy spot. These last two blemishes are probably due to insect punctures.

California tomatoes arrive in greatest quantities during October and November. Alternaria rot and green mold rot (Cladosporium spp.) were most common and caused most serious damage this season. Tomatoes shipped in November following wet or foggy weather sometimes had from 15 to 25 percent decay at the stem end by the time that they arrived here. Green tomatoes held on track or in the ripening rooms sometimes showed as much as 65 percent of these decays by the time they were ripe.

Pleospora rot (Pleospora lycopersici) caused decay in several lots of California tomatoes during November and December. However, unless perithecia have begun to form in the larger lesions, it is very difficult

to distinguish the Macrosporium stage of this fungus from other Alternaria and Macrosporium species without microscopic examination. Consequently, it is probable that many reports of alternaria rot in California tomatoes at this time of the year are in reality pleospora rot. Furthermore, when lesions about the stem scar begin to show the development of perithecia, they look very much like phoma (Phoma destructiva), and it is not uncommon to find some reports of phoma rot in this stock, but in the writer's experience, no true phoma rot has been observed in these November and December shipments.

Virus mottling of the tomatoes from California was not extremely serious on this market. However, many lots showed uneven ripening and some mottling of the fruit. Apparently, most of the blemishes were due to the spotted wilt and mosaic viruses.

WATERMELON:

Anthracnose (Colletotrichum lagenarium) seemed to cause an unusual amount of spotting of watermelons from Florida and Georgia. A lot of Florida melons received in May showed an average of 30 percent of the fruits covered with small anthracnose spots. A car of Georgia melons received in July showed 20 percent with small spots and 10 percent deeply pitted anthracnose spots. A small amount of stem end rot (Diplodia tubericola) was noted in some lots from Texas and Georgia.

The bruising and cracking of melons during transit is still one of the most important transit problems in marketing watermelons. For example, a carload of Cuban Queen melons from Georgia which showed some shifting of the load on arrival at this market had 144 melons cracked and broken, 23 badly bruised, and 56 scarred.

DISEASES OF FRUITS AND VEGETABLES ON THE NEW YORK MARKET DURING 1937

By C. O. Bratley and James S. Wiant, Associate Pathologists, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, New York City, New York.

The Market Pathology Laboratory in New York City was established for purposes of research on the diseases of fruits and vegetables in transit, in storage, and on the market. During the course of such investigations contact is continually had with members of the produce trade, representatives of rail and water transportation companies, private produce inspection agencies, and more particularly with the inspectors of the Bureau of Entomology and Plant Quarantine and those of the Fruit and Vegetable Division of the Bureau of Agricultural Economics. Through

such contacts attention is frequently called to the occurrence of new or uncommon troubles, or to the unusual absence or abundance of the more common diseases, and in many cases these are followed up with personal observations on commercial shipments. Likewise when a research problem centers on a given commodity observations are regularly made on representative commercial lots. No attempt is made to follow the arrival condition of representative lots of all fresh produce coming into the market. Observations are, however, recorded of the more interesting or unusual conditions met with in the manner described above. The results of such observations during the calendar year 1937 are summarized below.

APPLES:

Relatively few cases were found of injury to apples from improper washing for spray removal. Three severe cases were, however, observed in the early fall. Twenty-eight percent of the fruit in a carlot of Washington Delicious had from traces to entire surface showing a dark brown discoloration as though the skin had been cooked. A few days earlier a car of Jonathans from the same packing house showed 6 percent injury. Inquiry at shipping point brought out the fact that the thermometer in the washing tank was incorrect and the fruit had been subjected to temperatures above 130° F. A truck lot of Lady apples from Virginia had about 25 percent of the fruit showing from 5 to 100 very small spots around lenticels. Upon tracing to point of origin it was learned that rinse water was carried some distance by hand, thus explaining why acid was not thoroughly removed.

California Gravenstein apples were more generally affected with bitter pit (physiological) than noted in previous years. In eight cars examined an average of 12 percent of the fruit was affected. One car showed 22 percent and the least affected lot showed 3 percent. Shippers reported that this fruit was not visibly affected when packed.

Gray mold rot (Botrytis cinerea) affected 2, 7, 3, and 10 percent respectively in four of the above cars. This decay had not spread by contact, being found scattered through the box.

CHERRIES:

Except for 2 and 5 percent respectively of brown rot (Sclerotinia fructicola) in two early shipments, cherries from California were unusually free from decay and cracking.

Again a mild form of pitting similar to that seen very commonly on California fruit the past three years, was observed in a few early shipments from that State. The pits were about 1/8 inch in diameter, but slightly sunken, and contained a slightly raised ring in the center

around what seemed to be an insect puncture. The pit was rarely discolored, and isolations either remained sterile or gave a variety of organisms.

An unusual pitting taking the form of barely visible to pin-head size, bleached or tan slightly depressed spots, was found in 4 cars of mixed varieties of cherries from Stockton, California. In one car almost 100 percent of the fruit was affected while pitting occurred on from 10 to 50 percent of the others. Affected fruits were scattered throughout the packs but were more prevalent along the edges of the lugs. Pitting was more pronounced on poorly colored fruit than on those fully mature. From the shippers it was learned that the cars had been treated with sulfur dioxide as used for fumigating cars of grapes for control of gray mold rot. Since no decay occurred in any of the California cars on days the treated cars were observed, no indication of the effectiveness of the treatment for decay control could be obtained.

Barely had cherry shipments started from the Pacific Northwest before heavy rains caused almost all of the riper fruit to crack. At first the few shipments received in New York City contained fruit almost 100 percent cracked. Two weeks later receipts showed about 30 percent cracking. A few of the final shipments for the season showed none of the cracking but an occasional fruit was malformed, bearing scars or irregular sunken areas on its surface. Shipments made during this season showed more cracking than had been seen on the market previously.

In only a few cases was green mold rot (Cladosporium spp. and Alternaria spp.) common on the cracked cherries. This is surprising since in previous years cracks of this nature were frequently lined with these decay fungi. Freedom from decay probably resulted in part at least from expeditious handling and thorough refrigeration given the fruit. Cooling was carried to extremes in three of the cars that had been refrigerated with salt-ice mixtures, for several lugs next to the bunkers were frozen.

GRAPEFRUIT:

During the summer several carlots of California grapefruit were found to contain as high as 10 percent blue mold rot (Penicillium spp.). These lots were said to have been held in cold storage at shipping point.

GRAPES:

Certain lots of California Emperor grapes of the 1936 growing season packed in sawdust-filled lugs and kegs and held in cold storage until January and February of 1937 showed a rather high percentage of berries affected with a jet-black decay. Specimens were examined from 5 different carlots in which about 40 percent of the bunches contained from 1 to 5

affected berries. The decayed areas were firm and flattened or slightly sunken. Many affected areas were black and shiny; a few bore dark green to black sparse mycelium to which grains of sawdust clung. Decayed tissue was shallow, firm, black in the center to milky gelatinous on the edges. By peeling the skin from the grape the decayed tissue was removed with it, being readily separated from the healthy tissue.

Species of Alternaria, Cladosporium, and Hormodendrum, in that order of abundance, were repeatedly isolated from the lesions. Undoubtedly these entered injured areas on the fruit. Gray mold rot and penicillium rots that are usually found, did not occur in these shipments. This black decay has been of no importance in previous years. Probably some unusual condition during growth or packing of the grapes predisposed them to the decay, since there was nothing unusual about the method of storing or the storage conditions used. In some cases at least the affected grapes had been treated with sulfur dioxide by application of sodium bisulfite in the sawdust.

During June similar lesions were observed on a few grapes of the Almeria variety from Argentina. Fungi of the genera enumerated above were again found in the lesions.

Almeria spot (physiological) on this variety of grape from California was common in the fall. Most shipments contained about 2 percent and a few had as much as 10 percent of the berries affected. The spots were usually deep in the berry at the stem end and caused a flattening but no surface discoloration of the fruit.

Many shipments of the colored varieties of table grapes showed injury from the sulfur dioxide used as a fumigant for decay control. In most cases the injury consisted of small, bleached, slightly shriveled areas centering at the cap-stem attachments. Despite the fact that the affected fruits were astringent and lacking in flavor, the buyers seemed to overlook most of the injury.

During May two 5,000 box shipments of grapes mostly of the Barlinka variety arrived in New York City after 24 days refrigerated transit from South Africa. Each bunch was wrapped individually and packed in excelsior. Although no sulfur dioxide or other antiseptic treatment had been given them, most arrived in good condition. A few boxes showed from 1 to 2 percent gray mold rot.

HONEY DEW MELONS:

Charcoal rot (Rhizoctonia bataticola) was found on two occasions in carlots of California melons and in one carlot of Arizona melons. Although commonly observed on South American Honey Dews the decay has seldom been reported from the market on domestic melons.

Anthrachnose (Colletotrichum lagenarium) was noted on South Carolina Honey Dews. The disease is not found on this market on melons from the Western States.

Several late-season carlots of California Honey Dews that had been held in transit or on track for a total of 17 days between time of shipping and that of unloading showed symptoms indistinguishable from those of low-temperature (cold storage) breakdown. Decays caused by Cladosporium cucumerinum, Fusarium spp., and Alternaria spp. were abundant in the broken down areas of the rind. Two melons were found affected with watery soft rot (Sclerotinia sclerotiorum). This is the first time that we have noted this decay on Honey Dews. Gray mold rot (Botrytis cinerea) was likewise found in several melons in one of the carlots. Only twice previously have we found this decay on Honey Dew melons on the New York market, both times on melons that had been held for some weeks at cold storage temperatures.

LEMONS:

In May, sweet-orange scab (Elsinoë australis) was found affecting most of the fruit in two small shipments from San Lorenzo, Paraguay. The scabbed spots were only slightly raised and were covered with reddish-brown corky tissue. The disease was identified by Dr. Anna E. Jenkins.

Common citrus scab (Sphaceloma fawcetti) was found affecting almost every fruit in a 125-box shipment of lemons from Florida. In this case the fruits bore disfiguring protuberances with but small corky areas on the tops.

LIMES:

Stylar end rot (physiological) of Persian limes from Florida was more prevalent this summer than in any recent season. Twenty-five percent of the fruit was affected in some lots and in 25 or so shipments seen during the summer, an average of 5 percent was found, with greater amounts on riper fruits. Oospora rot (Oöspora citri-aurantii) occasionally followed this trouble as did aspergillus rot (Aspergillus niger) in fruits held at a high temperature.

Seen for the first time in West Indian limes was a trouble having the same appearance and involving the same tissues as stylar end rot in Persian limes. It affected an occasional fruit in a large lot from the Dominican Republic that had been held in a New York storage house.

Oleocellosis (rupturing of oil cells of rind at picking time) was very common on shipments of green fruits both of Persian and West Indian varieties, and was the most important blemish found on these fruits.

Stem end rot (Diplodia natalensis and Phomopsis citri) was found occasionally but was not as prevalent as usual.

OLIVES:

Two lots of large size fresh olives from California in the turning stage of maturity showed about 80 percent decay starting at the blossom end. The decayed tissues were black, firm, and wrinkled. Isolations yielded species of Alternaria and Fusarium, chiefly the latter.

About half of the fruit in a large lot of green olives from California were dark brown around the pit although no external evidence of the trouble was visible. A similar internal breakdown has been seen on olives stored at low temperatures.

ORANGES:

Oranges were generally free from decay but pitting and skin breakdown around the stem end of the fruit were common and were the most important factors of condition in fruit from Florida. Collapsed areas in the skin involving from a few oil vesicles to areas covering most of the surface of the fruit were observed in a few shipments of natural color fruits and in many shipments of dyed fruit. The worst cases of these occurred early in the season when fruits at packing were subjected not only to dye solutions but also to the ethylene de-greening treatment. The following percentages of badly injured fruits were noted in various lots of Hamlin and Parson Brown oranges during the month of October: 30, 55, 80, 65, 72, 70, and 15. Lesser amounts occurred in many other lots of oranges of all early varieties.

Stem end rot (Diplodia natalensis or Phomopsis citri) was found in quantity in only two or three shipments early in the season. One car of Pineapple oranges arriving in late September contained 32 percent of this decay. An additional 32 percent of the fruit bore reddish-brown collapsed areas in the skin characteristic of "gas-burn" due to long continued de-greening treatment.

Brown stain (physiological) was found affecting 30 percent of the fruit in a boat shipment under refrigeration from California in August.

Small, definitely limited glassy areas overlying mushy, off-flavored juice vesicles were found in several lots of oranges shipped from northern Florida immediately after a freeze which occurred during the second week of December. No other recognized effect of the freeze on the fruit was noted on the market until the last of December when an occasional fruit was found showing buckling of the segment walls and drying of the segments at the stem end.

Blue mold rot (Penicillium spp.) was of no importance in Florida oranges but occurred regularly in those from California. In only a few lots of the latter fruit did this decay affect more than 5 percent of the fruit. An estimated average of the decay in this fruit for the year is about 1 percent.

PEACHES:

Seventy boxes of peaches shipped in a car of California grapes were badly pitted and bleached by sulfur dioxide which had been blown into the car, after loading, for the control of gray mold (Botrytis cinerea) on the grapes.

In another car of mixed California fruits containing nectarines, plums, and peaches, 25 percent of the latter were decayed with rhizopus rot (Rhizopus nigricans), while the other fruits were sound.

PEAS:

Cladosporium scab [C. pisicola] and thrips injury constituted two serious blemishes of California peas.

PINEAPPLES:

A cracking and gumming occurred commonly on the Red Spanish variety pineapples from Puerto Rico early in the season. The cracks were located between the fruitlets, usually near the base of the fruit. Sometimes rather large cavities were formed and in all cases these were lined with a thin layer of decayed tissue. The border of the decayed tissue was brown and watersoaked but the inner portion was tan in color and fairly dry. In most cases a Fusarium was found covering the decayed tissue with fine white to pink mycelium. A species of Penicillium producing abundant sporulation was found in a few of the cavities.

During April and May many shipments of this variety contained as high as 15 percent of the fruit affected with from 1 to 4 lesions per fruit. Shipments received in late June and July were not affected. The trouble was not observed on fruits of the Cabezonas and Smoothe Cayenne varieties.

Black rot (Thielaviopsis paradoxa) in various amounts was found in practically all shipments of pineapples from Puerto Rico and Cuba. Certain shipments said to have been made during or immediately following protracted rainy periods contained as much as 25 percent decay. The average rot in Puerto Rican fruit during the season was estimated to have been between 3 and 4 percent. Well over half of the shipments were repacked in part at New York before they were sold. Even so, the receivers considered the season to be better than usual in regard to

prevalence of this decay. About $\frac{3}{4}$ of the decay was found to have started at the base of the fruit, with most of the remainder starting on the side of the fruit.

POMEGRANATES:

In most lots of California pomegranates received during late summer, from few to many of the larger size fruits were cracked open owing to the internal pressure. The cracked surfaces were surprisingly free from decay although in a few cases dark mycelium similar to that of Alternaria was found.

PRICKLY PEARS:

During the fall months many carlots of prickly pears from California were found free from decay. In a few cars 2 or 3 percent of the fruits were affected with rhizopus rot (Rhizopus spp.) which caused the fruit to collapse but held it together in the wrap by the luxuriant growth of mycelium. Blue mold rot (Penicillium spp.) in the form of slowly developing, circular, dark-brown watersoaked spots with tufts of blue fungus in the centers, was found on an occasional fruit in a few cars.

SPINACH:

A white rust of spinach (caused by what appears to be Albugo occidentalis) was found as a serious blomish of the leaves of Texas spinach (P.D.R. 21: 114-115). In one carlot three-fourths of the plants examined were affected.

Bacterial soft rot and downy mildew (Peronospora effusa) continued to remain the most important market disease of this commodity.

TOMATOES:

A decay caused by a species of Diplodia was noted on a Cuban tomato.

Phoma rot (Phoma destructiva) continued to be one of the most important decays of Cuban tomatoes.

Pleospora rot (Pleospora lycopersici) was responsible for heavy losses in late-season California stock. Spotted wilt caused serious blemishing of tomatoes in many lots.

WINTER QUEEN WATERMELONS:

Only three carlots of Winter Queen watermelons were unloaded on the New York market during 1937. The receipts thus fell to the lowest point since records of carlot unloads were first recorded in 1928. The melons were free of decay, in contrast with those received during the past several years during which time phytophthora rot was of considerable importance.