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During the years of the journal's publication, the Butler University Botany Department had an active program of research and student training. 201 bachelor's degrees and 75 master's degrees in Botany were conferred during this period. Thirty-five of these graduates went on to earn doctorates at other institutions.

The Botany Department attracted many notable faculty members and students. Distinguished faculty, in addition to Cain and Friesner , included John E. Potzger, a forest ecologist and palynologist, Willard Nelson Clute, co-founder of the American Fern Society, Marion T. Hall, former director of the Morton Arboretum, C. Mervin Palmer, Rex Webster, and John Pelton. Some of the former undergraduate and master's students who made active contributions to the fields of botany and ecology include Dwight. W. Billings, Fay Kenoyer Daily, William A. Daily, Rexford Daudenmire, Francis Hueber, Frank McCormick, Scott McCoy, Robert Petty, Potzger, Helene Starcs, and Theodore Sperry. Cain, Daubenmire, Potzger, and Billings served as Presidents of the Ecological Society of America.

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MOLDS ON VEGETABLES IN INDIANAPOLIS RETAIL MARKETS

By WALTER A. MILLER

Mold growth on market vegetables presents a problem to the storekeeper. Fungi detract from a display of produce and in turn reduce the sale of such produce; and reduction in sales results in loss of the produce. All produce is susceptible to mold growth, some more than others. Studies of molds in local markets have been made by Fisher (1) and Lentz (2). Fisher confined his work to the disease of fruits found in the markets at Evanston, Illinois; and Lentz studied molds on both fruits and vegetables in the Indianapolis markets. Lentz's studies included molds found on produce from the Indianapolis Producers Market and other markets, or wholesale outlets where the produce was offered for sale only to retail markets. Final grading by the commission houses assures the retailer better produce and may also eliminate some of the molds. The molds developing after delivery to the retailer should be fewer. Other factors which may effect the growth of molds are locality of production, weather, temperature, and the difference of seasons and marketing. Lentz (2) studied mold growth on fruits and vegetables during the three month period from September 15, to December 5, 1938. The present study was made from March 1, to May 15, 1948.

METHOD

Inspection of vegetable displays in several retail markets in North Indianapolis were made on Mondays, Wednesdays, and Fridays. Only those vegetables showing evidence of mold growth were collected. The specimens were placed in separate, sterile, deep petri dishes. After the fungus growth had developed fruiting bodies, microscopic examination was made. Identification was made to genus only.

OBSERVATIONS

During the period of March 1 to May 15, seventeen genera of molds were identified from fifty-seven specimens collected (table I). Macrosporium was observed 14 times on 7 different kinds of vegetables: green bean, green pepper, onion, tomato, green pea, egg

plant, and beet. Rhizopus occurred 11 times on 5 different kinds of vegetables: cauliflower, turnip, onion, sweet potato, and tomato. Aspergillus was found 4 times on tomato and onion. Periconia was found 3 times on green beans and beets. Monilia, Oospora, Sporodinia, and Fusarium were encountered but twice; and other genera listed in table I were found but once.

Of the vegetables studied, the onion and tomato were hosts to the most kinds of fungi: 7 being identified from onion and 6 from tomato. Turnip and green bean were next with 4 fungi identified from each. The rest of the vegetables listed were hosts to only one or two fungi (table II). Several specimens of lettuce, endive and spinach were collected. These vegetables exhibited disease symptoms; but, in each instance, the disease appeared to be bacterial rot.

DISCUSSION

A comparison between the findings of soil vegetable molds studied by Lentz, and the findings of the present study (table III), shows a difference in genera of fungi encountered. Factors involved in this difference may be due, in part, to the different seasons at which the study was carried on. Lentz's work was done in the fall and early winter. Much of the produce was probably grown locally during the regular growing season. The produce of the present study included hot-house grown vegetables, and vegetables shipped in from other localities. Source of the specimens accounts, to some extent, for the absence of some genera and the presence of others. The molds most prevalent were Macrosporium which occurred in 24.5% of the specimens examined, Rhizopus in 19% and Asperigillus in 7%. Penicillium was found on only 1.7%. Lentz found Rhizopus and Penicillium as chief sources of contamination. This would indicate that the vegetables reaching the retailer are in much better condition because of the weeding-out of contaminated material. Other genera, not found in retail markets but which were found from other sources, include Alternaria, Botrytis, Verticillium, and Isaria. The incidence of Oospora and Fusarium was found to be lower on retail market vegetables.

SUMMARY

1. Seventeen genera of fungi were identified from 57 specimens of vegetables collected in retail markets in North Indianapolis during

the period from March 1, to May 15, 1948.

2. Contaminants most common to all specimens in order found were: Macrosporium, Rhizopus, Aspergillus, and Periconia.

3. Incidence of Penicillium and Rhizopus was much lower in retail markets than in other sources listed by Lentz in a similar study.

4. Vegetables upon which more than two genera were found were tomato, onion, green bean, and turnip.

LITERATURE CITED

1. Fisher, George W. A study of the fruit diseases occurring in a midwestern market. Butler Univ. Bot. Stud. 1:105-127. 1930.
2. Lentz, Paul. Molds found in Indianapolis markets. Butler Univ. Bot. Stud. 5:59-67. 1940.
3. Ramsey, Glen B., and James S. West. Market disease of fruits and vegetables. U. S. Dept. Agr. Misc. Pub. 440. 1941.
4. Market disease of fruits and vegetables. U. S. Dept. Agr. Mise. Pub. 541. 1944.

TABLE I

Hosts serving a substrates for pathogens.

	Pathogen	Host
1.	Rhizopus	Cauliflower, Turnip, Onion, Sweet Potato, Tomato
2.	Macrosporium	Green Bean, Green Pepper, Onion, Tomato Green Pea, Egg Plant, Beet
3.	Monilia	Turnip, Celery
4.	Penicillium	Onion
5.	Aspergillus	Onion, Tomato
6.	Oospora	Turnip, Tomato
7.	Phycomyces	Green Bean
8.	Sporodinia	Green Bean, Tomato, Onion
9.	Periconia	Green Bean, Beet
10.	Circinella	Green Pepper
11.	Spinellus	Onion
12.	Fusarium	Onion, Squash
13.	Trichosporium	Green Pea
14.	Monosporium	Parsnip
15.	Hyalopus	Rhubarb
16.	Botryosporium	Turnip
17.	Trichothecium	Tomato

TABLE II

Pathogens occurring on each host.

Host	Pathogens
1. Cauliflower	Rhizopus
2. Turnip	Monilia, Oospora, Rhizopus, Botryosporium
3. Celery	Monilia
4. Green Bean	Phycomyces, Macrosporium, Sporodinia, Periconia
5. Green Pepper	Macrosporium, Circinella
6. Onion	Aspergillus, Macrosporium, Spinellus, Rhizopus, Penicillium, Fusarium, Sporodinia
7. Sweet Potato	Rhizopus
8. Tomato	Macrosporium, Trichothecium, Oospora, Rhizopus, Aspergillus, Sporodinia
9. Squash	Fusarium
10. Green Pea	Macrosporium, Trichosporium
11. Parsnip	Monosporium
12. Egg Plant	Macrosporium
13. Beet	Macrosporinm, Periconia
14. Rhubarb	Hyalopus

TABLE III

Comparison of Genera of Molds found on Vegetables in the Present Study (March 1-May 15) with those found by Lentz (September 15-December 5).

	Kinds of vegetable on which each genus of mold was found		Percentage of kinds of vegetables on which each genus of mold was found	
Pathogen	Present paper	Lentz	Present paper	Lentz
Macrosporium	7	1	42%	9%
Rhizopus	5	10	30	91
Monilia	2	2	12	18
Penicillium	1	9	6	82
Aspergillus	2	5	12	46
Oospora	2	4	12	36
Phycomyces	1	0	6	0
Sporodinia	2	0	12	0
Periconia	2	0	12	0
Circinella	1	0	6	0
Spinellus	1	0	6	0
Fusarium	2	5	12	46
Trichosporium	1	0	6	0
Monosporium	1	1	6	9
Hyalopus	1	0	6	0
Alternaria		6		55

TABLE III—(Continued)

Comparison of Genera of Molds found on Vegetables in the Present Study (March 1-May 15) with those found by Lentz (September 15-December 5).

	Kinds of vegetable on which each genus of mold was found		Percentage of kinds of vegetables on which each genus of mold was found	
Pathogen	Present paper	Lentz	Present paper	Lentz
Isaria		2		18
Mucor		1		9
Haplaria		1		9
Synsporium		1		9
Monacrosporium		1		9
Sporotrichum		1		9
Acremoniella		1		9
Graphium		1		9
Stemphyllium		1		9
Rhizoctonia		1		9
Trichothecium	1	1	6	9
Verticillium		2		18
Cladosporium		2		18
Botryosporium	1	1	6	9
Stysanus		1		9
Mycogone		1		9
Diplosporium		1		9
Mortierella		1		9
Dendrostibella		1		9
Acrostalagmus		1		9
Colletotrichum		1		9
Total Vegetables	14	11		
Total Mold Genera	17	37		