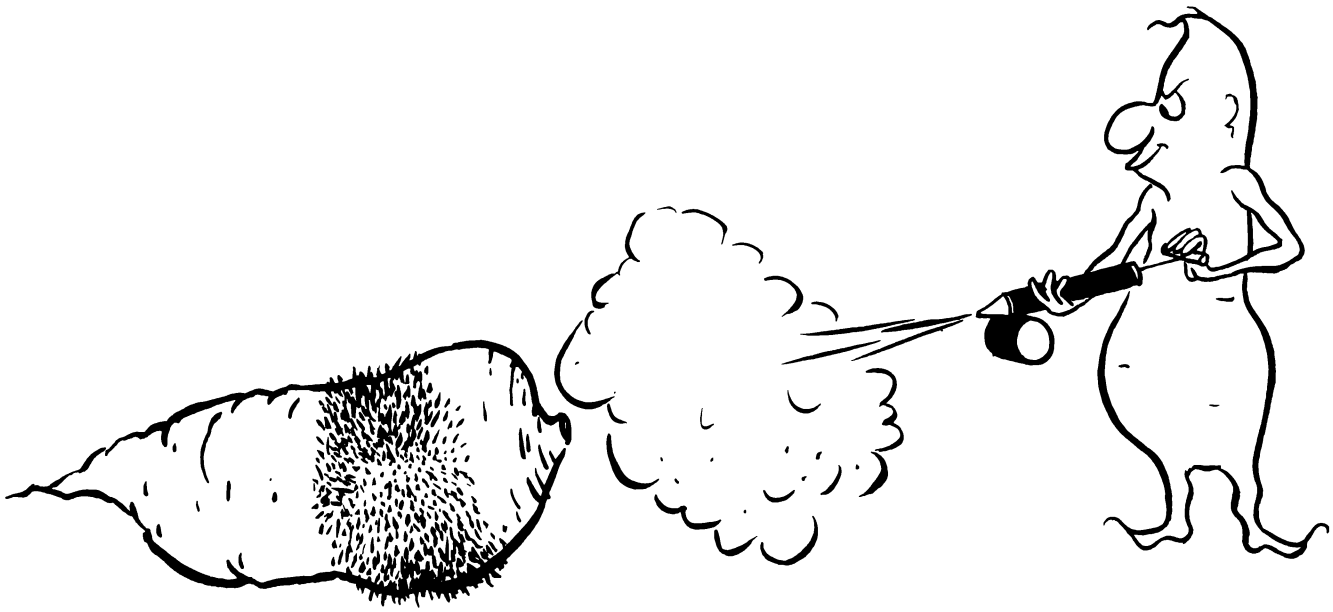
FUNGICIDE RESEARCH FOR PREVENTING DECAY OF NEMAGOLD SWEET POTATOES



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FUNGICIDE RESEARCH FOR PREVENTING DECAY OF NEMAGOLD SWEET POTATOES

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INTRODUCTION

Sweet potatoes are susceptible to various diseases in storage and also in the marketing process after leaving the packing shed. Losses from these diseases represent a significant physical loss in our volume of food products to be consumed. Substantial economic losses also are incurred at various stages in the marketing process. For example, the grower receives a smaller dollar return for his crop and possibly loss of repeat sales. The consumer pays a higher price per unit of sweet potatoes purchased and often buys a product of reduced quality.

Researchers from various manufacturing organizations and other agencies, including USDA and state experiment stations, have worked on the control or elimination of these diseases. On the production side, new strains or varieties have been developed that are resistant to nematodes and various other organisms attacking the root. Also, research has been done on reducing

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the loss caused by disease organisms during the marketing process. A selected list of publications reporting some of these research results appears in the bibliography.

Damage is also caused by factors not directly associated with disease organisms. These factors or sources of loss are bruising, chilling, and freezing injury, growth cracks, and internal breakdown. Proper precautions during production and in handling the sweet potato after it is ready for harvest would eliminate much of this damage.

Virginia sweet potato growers and packers have expressed their concern over the losses they have incurred, either physically in storage, or economically because they received a lower price for their sweet potatoes shipped to market. Some buyers have refused to accept lots of sweet potatoes which show substantial decay. Others have purchased the sweet potatoes from the packer-shipper only at a price less than the originally contracted price.

Consequently, substantial interest has been expressed by these grower-packers in research efforts to find a fungicide treatment which will reduce the losses caused by storage and marketing diseases. Any fungicide treatment which might eliminate some of this decay is of particular interest to the senior author since he currently has underway research on prepackaging sweet potatoes into consumer packs, as well as a cost analysis study on packing and shipping sweet potatoes in various containers. A considerable delay sometimes occurs from the time the sweet potatoes are packed at the local packing shed until they are used in the home. Therefore, before a significant volume of sweet potato prepackaging is done at packing sheds, some fungicide treatments to reduce decay loss need to be recommended. It would be useless to do this prepackaging at the packing shed level if the package had to be broken down to remove and replace a rotten sweet potato in the retail store before the package could be displayed.

As indicated in a recent USDA publication1/, "Rhizopus soft rot is the most important storage, transit, and market disease of sweet potatoes. It occurs in stock from all sweet potato regions and is the principal cause of loss of sweet potatoes during marketing and while they are in the hands of the consumer. Ordinarily, this disease causes more loss on the market than all of the other sweet potato diseases combined." Infections by Rhizopus spores are dependent upon wounds (cuts, deep skinning) or upon injuries produced by other diseases.

Black rot is the second most important storage and marketing disease of sweet potatoes, in terms of the amount of damage done. "Sweet potatoes may become infected through wounds, dead rootlets, or apparently uninjured tissues . . . . Especially severe infection occurs when healthy sweet potatoes are washed in the same water with those affected with black rot."2/

1/ Glen B. Ramsey, B. A. Friedman, and M. A. Smith, Market Disease of Beets . . . and Sweet Potatoes, Agricultural Handbook No. 155, AMS, USDA, Washington 25, D. C., April, 1959, pages 30-31.

2/ Ibid., pages 22-23.

It is very important to do a more careful job of handling, washing, and packing sweet potatoes to reduce the optimum conditions for the spread of these two diseases. Also, it appears vitally significant to experiment with various fungicide treatments in hopes of developing one or more which might reduce or partially control the losses occurring from these decay organisms.

With this background in mind, the results of three lots of fungicide treatments on sweet potatoes are presented in this publication. Perhaps other researchers will profit by the results of this study and will point their efforts in the direction of the more promising treatments. It should be mentioned that one of the fungicides not showing up well in our work has proved effective in controlling sweet potato decay in experiments done by another researcher.

Comments and suggestions are invited as to the contents of this report as well as any recommendations for possible further research on various fungicides which might reduce some of the decay occurring in sweet potatoes during the storage and marketing process.

FIRST LOT

December 20, 1960, 12 bushels of Nemagold sweet potatoes were taken out of storage at a packing house on the Eastern Shore of Virginia and placed in full telescope fiberboard bushel boxes. The boxes were transported to Blacksburg in a station wagon. Temperature remained between 55 and 70°F. during transit, including an overnight layover in a heated garage. These sweet potatoes were field-run No. 1's, unwashed and ungraded except for picking out a few rotten roots as they were being dumped into the fiber-board boxes.

The next day the sweet potatoes were placed in a 70°F. room at the Horticulture Laboratory and washed in 75°F. water. They were then laid on a table to dry and sorted to get all whole (no breaks or scratches) and non-decayed sweet potatoes in one lot, and seconds (decayed and breaks) in another. After drying, the sweet potatoes were placed in perforated polyethylene bags[3/]. Six potatoes (approximately 3 pounds per bag) were selected and placed in each bag. There were 8 bags in each box and 2 boxes for each treatment -- 96 potatoes in all.

On the same day, the sweet potatoes were treated as follows: The poly bags containing the roots were dipped in solutions for 5 seconds, then turned upside down and drained, and placed back in the box. The treatments were:

1. Dry check
2. Water check
3. 2% Mycoban
4. 3 1/2% Mycoban
5. 5% Mycoban
6. 10% Mycoban
7. 3% Captan

3/ These polyethylene bags had forty 1/4 inch in diameter holes. The size of these bags was 3 1/2 inches X 6 1/2 inches X 17 inches.

After completing the treatments, all boxes were held at 70°F. overnight. The top of each bag was folded over but not tied. The next day the tops of all the bags were fastened with wire ties. Water globules clung to the inside of the polyethylene bags containing the Mycoban treatment. No globules appeared in bags with Captan treatment or in those containing water check. All 16 fiberboard boxes were left uncovered and placed in a temperature-controlled room at 68°F. and 55% relative humidity.

Three days after treating, the sweet potatoes were spot checked. There was no rot, decay, or Rhizopus growth of any consequence. Five days after treating, all sweet potatoes were checked. The Captan, water-check, and dry-check lots had no moisture accumulation. Mycoban treatments had moisture accumulation with the 10% Mycoban treatment showing more moisture than the others.

Seven days after treating, the sweet potatoes were checked for decay. Some moisture was still evident in the bags with Mycoban treatment. The 10% Mycoban treatment had the most decay and showed evidence of being burned. Three percent Captan-treated potatoes had no decay one week after treatment.

Checks were made periodically (see Table 1) for a period of 21 days, at which time all treatments were discarded. The higher level Mycoban treatments (3 1/2, 5, and 10%) appeared to burn the skin or outer tissues of the sweet potato causing more rapid break-down. The 3% Captan treated roots had the least decay of any treatment or check in the first lot. The low density of Rhizopus spores in the laboratory room and a good job of washing

Table 1. First Lot of Nemagold Sweet Potato Treatments for Decay Prevention[a/]

Treatment	Number of decayed roots							
	Date checked and time elapsed since treatment							
	1960			1961				
	12/26	12/28	12/30	1/2	1/4	1/6	1/9	1/11
	5 days	7 days	9 days	12 days	14 days	16 days	19 days	21 days
Check								
Dry	1	2	2	4	4	5	8	9
Water	1	3	3	4	4	7	10	10
Mycoban								
2%	2	5	10	16	17[c/]	14[e/]	17[f/]	16[g/]
3 1/2%	4	12	22	33	38[d/]	Discarded -----------		
5%	5	11	18	35	51[d/]	Discarded -----------		
10%	3	21	42[b/]	Discarded ----------------------------				
Captan								
3%	0	0	0	0	0	1	1	1

a/ This first lot was treated December 21, 1960. The sweet potatoes were U.S. #1 in good condition and contained 2 boxes of 8 polyethylene bags each. There were 6 roots in each bag or a total of 96 sweet potatoes per treatment.

b/ Discarded 16 bags (96 potatoes) on December 30, 1960, because rotten and leaking.

c/ Discarded 1 bag of 2% treatment since it had 3 rotten, leaking potatoes in it.

d/ Discarded all (96 potatoes) January 4, 1961.

e/ Only 90 roots left in this treatment for checking on January 6, 1961, and January 9, 1961.

f/ Discarded 1 bag -- had 5 rotten potatoes in it.

g/ Only 84 roots left in this treatment for checking on January 11, 1961.

the roots before drying probably accounted for the small amount of decay in the dry and wet checks.

SECOND LOT

Based on the results of the first lot of fungicide treatments, it was decided to try several more Mycoban treatments using lower treatment levels. Some lower-level Captan treatments and a stop-mold fungicide were also included on the second lot to determine their effectiveness in controlling decay of sweet potatoes. The lower-level Captan treatment was agreed upon partly because the 3% level used in the first lot left a residue of powdery flakes on the root which detracts from the appearance of the market sweet potato. However, the powdery residue would not be a problem if the fungicide was used before storing and the roots were washed before shipping.

A second lot of sweet potatoes was obtained from an Eastern Shore packer. These were Nemagold sweet potatoes which had been cured (kiln-dried) and held in storage for approximately 2 1/2 months. On Wednesday afternoon, December 28, 1960, these sweet potatoes were taken out of storage, washed, clear waxed, packed in bushel baskets, and loaded in a closed van-type truck. This truck delivered small orders of sweet potatoes in North Carolina, eastern Tennessee, and Princeton, West Virginia, before bringing the last 12 bushels to Blacksburg Thursday night, December 29.

These sweet potatoes were held overnight in the Horticulture Laboratory at a temperature of approximately 70°F. The next day the sweet potatoes were removed from the bushel baskets. Only sweet potatoes with no new injuries were treated. The treatment procedure was as follows: The sweet potatoes were placed in a burlap bag and dipped in each treatment solution and held there for 5 seconds. The same procedure was followed for the water check. Immediately after the treatment, the sweet potatoes were removed from the burlap bag and 6 roots were placed in each polyethylene bag.[4] The tops of the bags were fastened and 8 bags were placed in each fiberboard box. A tray divider was placed over the tops of the bags to further retard evaporation from the bags.

The boxes were placed in a temperature and humidity-controlled room at 68°F. and 55% relative humidity, and held there continuously, except for brief periods of checking. Treatments A through G had 2 boxes of 8 bags each, or 96 potatoes per treatment (since both A and A_2 were the same treatment, B and B_2 were the same treatment, etc.). Treatments H, J, L, and M had 8 bags, or 48 potatoes per treatment. In treatment K, 96 potatoes were placed loose in a fiberboard box. This was a full telescope box designed for 50 pounds of sweet potatoes. Treatment X was a dry check in a bushel basket. After one week, this bushel was taken to the Kroger Store in Blacksburg for prepackaging into polyethylene bags by the produce personnel in that store. The objective of having the produce personnel pack

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[4] These polyethylene bags used in the second and third lots had twenty-four 1/4" in diameter holes. However, at least 4 of these holes were too near the top of the bag to be useful for ventilation after the top was fastened. The size of the bags was 5" X 3 1/2" X 16".

this bushel was to see how the sweet potatoes would keep after being pre-packaged at the retail store level by the usual handling methods. The code treatments were as follows:

A Dry check	F_2 2% Mycoban
A_2 Dry check	G 4% Mycoban
B Water check	G_2 4% Mycoban
B_2 Water check	H .5(1/2)% Captan
C 1/4% Mycoban	J 1% Captan
C_2 1/4% Mycoban	K 1% Mycoban in corrugated box
D 1/2% Mycoban	L 1:80 Stop Mold (1 part Stop Mold to 80 parts water by weight) and no rinse
D_2 1/2% Mycoban	
E 1% Mycoban	M 1:80 Stop Mold (1 part Stop Mold to 80 parts water by weight) and water rinse for 15 seconds
E_2 1% Mycoban	
F 2% Mycoban	X Dry check-bushel tub for 1 week until repacked into poly bags.

In the second lot of treatments, there appeared to be no difference between most of the fungicides at the end of the 12 day period except that the Stop Mold with rinse had the least decay. However, in reviewing the results for the 24-day check, which would represent a long store and consumer holding period after packaging into polyethylene, the 1/2% Mycoban and the Stop Mold with rinse treatments did have fewer rotten potatoes than the other fungicides.

THIRD LOT

A third lot of sweet potatoes was treated using some fungicide treatment levels from the first two lots plus an additional fungicide.

Table 2. Second Lot of Nemagold Sweet Potato Treatments for Decay Prevention[a]

Code	Treatment	Number of decayed roots					
		Date checked and time elapsed since treatment					
		1/2/61 3 days	1/4/61 5 days	1/6/61 7 days	1/11/61 12 days	1/16/61 17 days	1/23/61 24 days
A	Dry Check	0	0	0	4	6	14
A_2	Dry Check	0	0	1	3	10	11
B	Water Check	0	0	0	2	2	7
B_2	Water Check	0	0	1	2	6	13
C	¼% Mycoban	0	-	1	9	11	13
C_2	¼% Mycoban	0	-	0	2	6	12
D	½% Mycoban	0	-	0	4	6	7
D_2	½% Mycoban	0	-	0	2	8	8
E	1% Mycoban	0	-	0	4	8	13
E_2	1% Mycoban	0	-	0	2	6	8
F	2% Mycoban	0	0	2	7	16	17
F_2	2% Mycoban	0	0	1	5	10	14
G	4% Mycoban	0	1[b]	0	1	6	11
G_2	4% Mycoban	0	2[b]	2	4	6	11
H	½% Captan	0	0	0	3	9	12
J	1% Captan	0	0	1	5	13	15
K	1% Mycoban	0	1	1	4	10	16
L	Stop Mold 1:80 no rinse	0	0	0	2	12	12
M	Stop Mold 1:80 rinse	0	-	1	1	4	8
X	Bushel tub (check)	0	0	5[c]	6	9	16

[a] The second lot was treated December 30, 1960. Each code letter represents 48 potatoes except K and X which had 96 roots.

[b] Bags had moisture condensed on inside.

[c] Taken to Kroger Store in Blacksburg and repacked into polyethylene bags by store produce personnel. These 5 rotten roots were discarded and are not included in the number of rotten roots in subsequent checks.

Thirteen bushels of Nemagold variety sweet potatoes were taken out of storage February 6, 1961. These sweet potatoes were treated with the following fungicides: Dowicide A (sodium O-phenylphenate), Chloro-IPC (CIPC), Mycoban, and Captan.

One-half of the sweet potatoes for each treatment were bruised by hitting one end of the sweet potatoes on the concrete floor before treating. Two types of consumer packages were used -- 1/2 of the bruised sweet potatoes in each treatment were placed in the polyethylene bags and 1/2 in the open-mesh polyethylene netting (Vexar) bags. The non-bruised roots were also placed in both types of bags. This was an attempt to determine if the higher temperature and humidity conditions in the polyethylene bags caused more decay than occurred in the fully-ventilated bags. In treatment C (1/2% Dowicide A) for example, a total of 96 sweet potatoes were treated: bruised in polyethylene bags -- 4 bags of 6 sweet potatoes each; non-bruised in polyethylene bags -- 4 bags of 6 sweet potatoes each; bruised in poly mesh bags -- 4 bags of 6 sweet potatoes each; non-bruised in poly mesh bags -- 4 bags of 6 sweet potatoes each.

The fungicide materials were mixed as follows:

1/2% treatment: 0.1 pound of material to 19.9 pounds of water at 70°F.
1% treatment: 0.2 pound of material to 19.8 pounds of water at 70°F.
1 1/2% treatment: 0.3 pound of material to 19.7 pounds of water at 70°F.

The method code letters in Table 3 are identified as follows: B=Bruised, NB=Non-bruised, PE=polyethylene bag, PM=Open mesh (poly mesh) bag.

Twenty-four sweet potatoes were washed and placed in a large burlap bag and treated with a 10-second dip in the fungicide solution. This was done 4 times for each fungicide treatment. The dry check sweet potatoes were allowed to dry after washing and before being placed in the consumer packages. The Dowicide treatments were given a brief rinse in a 5-second dip after treatment. The bags were placed in full telescope fiberboard boxes, 8 bags per box. The boxes were placed in a controlled atmosphere room at 68°F. and 55% relative humidity.

In the third lot, 88 sweet potatoes (these were not intentionally bruised) were treated with a 1 1/2% Mycoban solution and placed loose in a full telescope fiberboard box to determine how these roots might hold up in such a container when not first placed in consumer packs. At the end of 7 days, the first check period, there were no rotten sweet potatoes. There were 3 rotten sweet potatoes in this treatment 2 weeks after treating, and 13 rotten sweet potatoes at the third check period 4 weeks or 28 days after treating).

Some retail store produce clerks have a habit of holding sweet potatoes (including yams) in the coolers at 38°-40°F. until needed in the display. Occasionally, some roots stay in the coolers 4 to 6 days and on at least one occasion, one lot has been known to stay in the cooler in the back room of a large retail store for 9 days. Thus, it was decided to place one box of 43 roots (these were not bruised) in a control room at 36°F. for 2 weeks. No rotten potatoes were evident in this box during the first and second checks (at the end of 1 and 2 weeks). After 14 days in the 36°F. cooler, the sweet potatoes were placed in the control room with the other treatments in the third lot and held for 2 weeks at 68°F. At the end of

Table 3. Third Lot of Nemagold Sweet Potato Treatments for Decay Prevention[a/]

			Date checked and time elapsed since treatment					
			2/13/61		2/20/61		3/6/61	
Code	Method	Treatment	7 days	Total	14 days	Total	28 days	Total
A	B in PE bag	Wet check	2		5		11	
A	NB in PE bag	Wet check	2		5		10	
A_2	B in PM bag	Wet check	0		5		13	
A_2	NB in PM bag	Wet check	2	6	5	20	11	45
B	B in PE bag	Dry check	1		7		10	
B	NB in PE bag	Dry check	1		3		11	
B_2	B in PM bag	Dry check	0		2		14	
B_2	NB in PM bag	Dry check	1	3	1	13	14	49
C	B in PE bag	½% Dowicide A	1		5		19	
C	NB in PE bag	½% Dowicide A	2		3		14	
C_2	B in PM bag	½% Dowicide A	2		4		16	
C_2	NB in PM bag	½% Dowicide A	1	6	2	14	9	58
D	B in PE bag	1% Dowicide A	1		3		11	
D	NB in PE bag	1% Dowicide A	2		3		10	
D_2	B in PM bag	1% Dowicide A	2		4		17	
D_2	NB in PM bag	1% Dowicide A	2	7	4	14	6	44
E	B in PE bag	1½% Dowicide A	1		3		13	
E	NB in PE bag	1½% Dowicide A	0		1		4	
E_2	B in PM bag	1½% Dowicide A	0		2		13	
E_2	NB in PM bag	1½% Dowicide A	0	1	3	9	10	40
F	B in PE bag	½% CIPC	3		6		14	
F	NB in PE bag	½% CIPC	1		3		7	
F_2	B in PM bag	½% CIPC	1		1		10	
F_2	NB in PM bag	½% CIPC	1	6	3	13	8	39
G	B in PE bag	1% CIPC	1		2		5	
G	NB in PE bag	1% CIPC	1		3		6	
G_2	B in PM bag	1% CIPC	0		1		11	
G_2	NB in PM bag	1% CIPC	1	3	2	8	7	29
H	B in PE bag	1½% CIPC	2		2		9	
H	NB in PE bag	1½% CIPC	0		0		5	
H_2	B in PM bag	1½% CIPC	0		1		11	
H_2	NB in PM bag	1½% CIPC	1	3	1	4	9	34
J	B in PE bag	1% Mycoban	1		1		10	
J	NB in PE bag	1% Mycoban	1		2		6	
J_2	B in PM bag	1% Mycoban	0		1		12	
J_2	NB in PM bag	1% Mycoban	0	2	1	5	13	41
K	B in PE bag	1½% Captan	2		2		16	
K	NB in PE bag	1½% Captan	1		3		13	
K_2	B in PM bag	1½% Captan	0		3		18	
K_2	NB in PM bag	1½% Captan	0	3	0	8	11	58

[a/] This third lot was treated on February 6, 1961. The sweet potatoes were U.S.#1 in good condition. Each letter under Code represents 24 roots.

this period, 20 of the 43 roots were decayed. The remaining 23 roots were sliced in half to determine if there had been any internal change. All the 23 were streaky and greenish in appearance. This seems to indicate that the produce personnel in the retail store may "get away" with the consequences of holding the roots in the cooler, since evidence of cold injury will not show up immediately. However, if the roots are held by the consumer in the home for several days before using, the roots are likely to break down quickly. Also, chilling causes an off-flavor or taste, even if the sweet potatoes are cooked and eaten before they start to decay.

Assuming two weeks is a sufficient length of time for most sweet potatoes to move through the marketing channels from the packing shed into the consumers home (and possibly be used), then the 14-day check might have more meaning in analyzing the effects of these treatments. This is particularly relevant if some fungicides are to be selected for further treatments. The least decay at the end of 2 weeks occurred in the following treatments, ranked in order of effectiveness in decay control in this third lot: (1) 1 1/2% CIPC, (2) 1% Mycoban, (3) 1% CIPC and 1 1/2% Captan, tie, and (5) 1 1/2% Dowicide A. The follow-up checks 2 weeks later indicated that the CIPC treatments were most effective in controlling decay. Actually, the 1 1/2% Mycoban treatment on the 88 sweet potatoes placed loose (not in bags) in the full telescope fiberboard box resulted in the least decay over the 4-week test period. However, none of the roots in this treatment were bruised.

There appeared to be little difference in the amount of decay occurring in the polyethylene and the polymesh (Vexar) bags. Actually, at the end of 2 weeks, the roots in the polyethylene bags had more decay, whereas after 4 weeks the sweet potatoes in the polymesh bag had greater decay (Table 4). This would seem to indicate that since both types of bags were already in a closed box, the higher temperatures and higher relative humidity in the polyethylene bag caused no additional damage. Part of the decay problem in the polymesh bags at the end of 4 weeks could result from the fact that skin abrasion was possibly greater on the roots placed in the polymesh bags than in the polyethylene bags. However, this is only conjecture. Certainly, sweet potatoes would not normally be left in the bags this long before use.

The bruised sweet potatoes in the third lot treatments tended to have more decay than the non-bruised sweet potatoes (Table 4). Thus, even though the sweet potatoes were treated after bruising, the bruised roots appeared to be more susceptible to various decay organisms since they decayed more readily than did the non-bruised roots.

Table 4. Analysis of Effects of Bruising and Types of Bags Used in the Third Lot Treatments (Summation of Treatments A through K_2)

	Number of Decayed Roots		
	Polyethylene Bag	Polymesh Bag	Total
Seven Days Elapsed Since Treatment			
Bruised	15	5	20
Non-bruised	11	9	20
Total	26	14	40
Fourteen Days Elapsed Since Treatment			
Bruised	36	24	60
Non-bruised	26	22	48
Total	62	46	108
Twenty-eight Days Elapsed Since Treatment			
Bruised	118	135	253
Non-bruised	86	98	184
Total	204	233	437

Thus, even though the sweet potatoes were treated after bruising, the bruised roots appeared to be more susceptible to various decay organisms since they decayed more readily than did the non-bruised roots.

SUMMARY

The treated and check lots of sweet potatoes were not intentionally innoculated with Rhizopus spores, which are likely to cause soft rot where-ever a cut or injury exists on the root. It was thought that enough Rhizopus spores were present in the laboratory and on the original containers and roots themselves to do a good job of innoculation. There was some evidence to support this belief since Rhizopus growth did develop in a few bags after the second week. However, if the Rhizopus had been present in greater density in the atmosphere, the dry and wet checks which were bruised would have decayed within the first week. After we had completed the series of treatments reported herein, Mr. L. J. Kushman, a U.S.D.A. researcher working at North Carolina State College on preventing decay on sweet potatoes, informed the senior author that he "cultivates" or grows Rhizopus spores on sweet potatoes and uses this growth to deliberately innoculate the treatment room the day before treating the sweet potatoes. In this manner, sufficient spores are present in the air to settle in any cuts or open places on the root, and if not treated, the root will show evidence of soft rot within the first week.

Since this was a preliminary study to investigate several fungicides which might hold promise for control of decay in sweet potatoes, no recommendations as to fungicides or treatment levels will be made at this time. It does appear that several of the fungicides hold promise and should be included in any further study.

Fungicide treatments in the laboratory on the 1961 sweet potato crop were discontinued since all the Nemagold variety sweet potatoes have been sold out of storage. The 1962 sweet potato crop (both Jersey and Porto Rico varieties) will be available for treatment in August or September when the harvest of the new crop begins on the Eastern Shore and in Princess Anne County. Part of our difficulty in running continuous treatments is the long distance between Blacksburg and the Eastern Virginia's primary sweet potato producing area in the state. The costs of handling and transporting the sweet potatoes in small lots to Blacksburg poses a real problem in having sweet potatoes on hand for experimental purposes.

In the projection of this study, it seems essential that arrangements be made whereby sweet potatoes can be obtained in the fall and stored in Blacksburg for use as needed. Any further treatments should include both the Porto Rico (yam-type) sweet potatoes produced primarily in Princess Anne County, and the Nemagold (Jersey-type) sweet potatoes produced primarily on the Eastern Shore.

Present plans are to continue experimentation with various fungicides with both freshly harvested and cured sweet potatoes beginning next fall. Several Eastern Shore sweet potato packer-shippers have expressed concern over the physical and economic loss suffered due to Rhizopus and other types of decay. At least one grower-packer-shipper who has a large storage house is interested in working with V.P.I. research personnel in efforts to reduce the amount of decay taking place in the storage house, as well as to reduce some of the decay caused by Rhizopus soft rot and black rot during the marketing process, from packing shed through the retail store.

Certainly, if the trend towards prepackaging continues to expand into the sweet potato marketing process, there will be a definite need for a fungicide to prevent decay in the consumer packs, at least for a reasonable period of time.

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