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Wisconsin State Cranberry Growers Association
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**WISCONSIN STATE
CRANBERRY GROWERS'
ASSOCIATION**

FORTY-FIRST ANNUAL MEETING

Wisconsin Rapids, Wisconsin

January 3, 1928

FORTY-FIRST SUMMER CONVENTION

Wisconsin Rapids, Wisconsin

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WISCONSIN STATE CRANBERRY GROWERS' ASSOCIATION

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LETTER OF TRANSMITTAL

TO THE HONORABLE FRED ZIMMERMAN,
Governor of Wisconsin.

Dear Sir: I have the honor to submit herewith the
Forty-First Annual Report of the Wisconsin State Cran-
berry Growers' Association for the year 1927.

Very respectfully yours,

CLARE S. SMITH,
Secretary.

Wisconsin Rapids, Wis., Jan. 4, 1928.

LETTER OF TRANSMITTAL

To the Honorable U.S. Senator

Dear Sir: I have the honor to acknowledge the receipt of your letter of the 12th inst. in relation to the proposed amendment to the law...

Very respectfully,
Your obedient servant,

Wm. L. ...

MINUTES OF FORTY-FIRST SUMMER MEETING

Pavilion, Nekoosa, Wis., August 9, 1927

Meeting called to order at 10:00 A. M. by President Albert Hedlar. Minutes of the January meeting were read and approved.

Financial report was read. Motion made and seconded that it be accepted. M. O. Potter and A. E. Bennett were appointed by the president to go over the membership list with the Secretary to check up on those listed.

A. U. Chaney gave a very interesting report of Eastern crop conditions.

We were fortunate to have with us Dr. H. J. Franklin of the State Experiment Station at East Wareham, Mass., who spoke on the false blossom problem. Mr. W. A. Duffy, Commissioner of Agriculture, Mr. E. L. Chambers, State Entomologist, and Mr. H. F. Bain, gave very interesting and convincing talks. Miss Margaret Wilcox, of the Federal Department, gave a brief report of her work here the past two months.

There was considerable discussion about the canning project which was introduced by Rev. Willitzer of Pittsville, an active member of the canning factory at that place.

Lucetta Case, Vere Johnson, and S. N. Whittlesey were appointed on the program committee.

Motion was made and seconded that the Secretary write a letter of appreciation to the Wood County National Bank for the fine luncheon served during the noon recess.

The President appointed A. E. Bennett to take charge of the cranberry exhibit at the county fair this month.

Motion made and seconded that the next association meeting be held on the same date as the Wisconsin Sales Company meeting.

Motion was made and carried to adjourn.

C. S. SMITH,
Secretary.

ADDRESS

By MR. A. U. CHANEY

I imagine you are all very much interested in the crop and marketing prospects. This has been a very peculiar fruit year. The climatic conditions that have affected cranberries have affected all fruits, especially tree fruit, so that we possibly have the shortest fruit crop, including peaches, pears, and apples, that we have had for twenty years. There is very little tree fruit grown this year east of the Mississippi River. The outlook from the west is fair, but throughout the big production parts of the east—New York, Pennsylvania, and Virginia—we have less than half the crop of apples and peaches, and fruit is selling very high. For instance, the ordinary California fruit crop was selling at \$1.75 per twenty-pound box, while last year they sold at \$.75. The northwestern outlook is about \$3.25 per box, against \$1.25 last year; a tremendous difference. We have the shortest cranberry crop that we have had since 1921. Barring that year, we would probably have to go back to 1917.

There has been no general survey of the coming crop of cranberries, and we can only pass a guess from talking to growers in different sections. New Jersey had a very bad frost in May; the worst that I have ever seen. On bogs that had no water, the crop was killed completely. Bogs that had water and did not use it were also wiped out. They looked just as if a fire had passed over them. Cape Cod had a slight frost, but not a serious one. The prospects on the Cape for a crop were very favorable until recently. Their bogs were in splendid condition. They had a splendid bloom of late Howes, and it looked like a big crop ten days ago. I have not heard what caused it—perhaps Dr. Franklin can give you a better theory—but the late Howes on Cape Cod are reported to be not setting well. I was down to the Cape last Tuesday. They had a big Homecoming Day, and cranberry growers from all over that country came. I think they served 1,200 at dinner. I had an opportunity to talk to many of them, and saw many bogs in the Carver section. The late Howes seem to be drying up and dropping off. But there are exceptions. Sometimes a grower has a good set on one bog. Sometimes one section will show a good crop, while the section next to it will show no set. It is impossible to arrive at a close estimate as to what the crop will be. A group of us got together and placed the estimate at about half a crop of late Howes. The state crop will be about 350,000 barrels. I am expecting that New Jersey may produce 100,000 barrels. Some of the best growers put it as low as 65,000 barrels, against 215,000 last year. One of the best growers puts it at 80,000, but Mr. Beckwith puts it at a maximum of 120,000 barrels, and thinks it will most likely go under 100,000 barrels. The native Jersey has almost disappeared this year.

In Wisconsin, I had hoped you would have at least a half crop, or 40,000 barrels. Some of the growers discouraged me this morning.

At best, we should have about 500,000 barrels. That couples up pretty well with the fruit crop. It is a very bad situation, just the other extreme of what we had last year. They all want cranberries this year, because there is no fruit to can, and cranberries are scarce. Last year we had too many, and there was a surplus of all other fruits. We therefore had serious difficulties with our crop.

In picking your berries, be sure the fruit is mature. Immature berries are very hard to handle; sometimes they are even worse than frozen berries in handling. I know cases where growers have picked too early to avoid taking a chance on the frost, and it was very disastrous. Some New Jersey growers will not start picking this season until the 20th of October.

I think it is a hard blow to our industry that we have such a short crop following such a big crop. There was a possibility of following with another big crop. We did a tremendous lot of advertising last year. A quarter million dollars was spent in advertising to develop a demand for cranberries, in competition with the biggest fruit crop this country has ever known. We had some wonderful publicity, and got the people to eat cranberries. Now, not having the cranberries to give them, we face the danger of getting them out of the habit of using cranberries. If we could have had last year's crop this year, coupled with the shortage of other fruit, and following the development work that was done, we would have had profitable prices, I am sure, and it would have helped greatly in firmly establishing a permanent demand for our fruit.

If you did not thoroughly understand it, you would say that the campaign in London was a disappointment. To me, it was not. The people in London knew nothing about cranberries. They did not know whether they were to be cooked or eaten raw. It was difficult to get them to take an interest. We distributed 8,000 or 9,000 boxes of berries over England, mostly in London. It was hard to get the retailers to take them and ask a reasonable profit. Most of them would take 200 per cent. They figured that they would have to throw away two-thirds of them, and in this way they would get enough to save them from loss. We arranged with a big department store to have a special sale and a big display in their store. The berries sold at seven pence, or fifteen cents per pound, and they sold fifty boxes in one week. The people became quite interested. A good many stores began to take an interest, and before the season was over they began to think it was a possibility to handle cranberries in London.

They appear to be quite enthusiastic to take hold this year. We have arranged with about ten of the big central markets around London to feature cranberries this year at a close margin of profit in co-operation with the campaign, and we had hoped that we would be able to put in 30,000 boxes in England this year. We were going to get them the twenty-five pound box, and have already had the special recipe folder printed by English people in their own way. Their language is different than our own. They use different expressions.

We arranged for some publicity work and advertising in English magazines. We give the retailers one-pound containers that they can distribute among their customers instead of using a bag.

We are confident that if we could keep this work up for five years we would have a great demand in England for cranberries. They eat a great deal of hard sauce and jam. They eat more meat than we do, and many of them eat five meals a day. They eat a great deal of meat, and they ought to eat cranberries; and they will if we educate them to it. One man from England is now attending the apple shippers' convention with my brother, in Kentucky. We are going to take him to Massachusetts and let him see the cranberry bogs on the Cape. He has never seen a cranberry bog. He goes from there to Nova Scotia. I am hoping he will take a trip through the bogs in the harvest period before he goes home.

I would like to touch on the twenty-five pound box. I did not originate the idea, but I think it is a good one. This box was tried out by a shipper who was very anxious to develop anything that was for the good of the industry. He was also one of the first to use the fifty-pound box. It took us rather a long time to change, because when an organization of our size starts with a new package, experimenting is very expensive. We hesitate to experiment until we are pretty certain that it is a good thing. Changing conditions of trade have made a requirement for smaller containers of every commodity. This was developed first by the chain store, and second by the truck system of rapid delivery. The chain store handles a great many commodities compared with the number handled by the old time stores. For instance, there is the number of cereals they handle compared with the one or two in former days. Then there are the different varieties of canned goods they have to handle. If they would have this variety in the old time containers, it would necessitate a big investment. The chain store found they carried just twice the number of commodities in a grocery store now that they carried ten years ago. The old style containers necessitate a large investment and a great deal of space. In most cases store rent is high, and they haven't the space for the quantity that the old style container requires. Certain commodities are slow moving, but they have to carry them. For instance, they probably have only one or two customers for a certain cereal, but they must have it to please those few customers. You can now get Cream of Wheat in one or one and one-half dozen packages to a case instead of three dozen, and one and one-half dozen packages of canned goods instead of four dozen. They are reducing the size of all packages with the purpose of not having such large investments, and having a quicker turnover.

The truck delivery enables them to deliver every day. The old method of jobbing was to send traveling salesmen out, and then ship the retailers a week's supply at a time. This shipment was made usually about Tuesday or Wednesday, so that they could satisfy the week end trade, and one or two weeks' supply was sent at a time. Now they deliver with trucks, a distance of fifty miles away. The

salesman sells his commodities right from the truck. They want a light truck so they can make speed, and they want to carry a big assortment, so they want a small container. Twenty-five of the twenty-five pound boxes of cranberries will not take as much room as fifteen or twenty of the fifty-pound boxes.

My brother went to see the Kroger Grocery Company, probably the largest chain store in the middle west, and asked what they thought of the quarter-barrel box. They said that last year they did not deliver any half-barrel boxes. The box was too large and the berries deteriorate too fast for the small stores. They wished very much that we would put out a quarter-barrel box.

He went to a large dealer in the South, who is the largest distributor of cranberries. He found him loading up a large number of trucks with oranges put up in half boxes, lemons put up in half boxes, some of the commodities put up in paper bags, and all sorts of small containers. This dealer said that he was through sending stuff out and having it sent back. Now he sends trucks out and delivers as he sells, and there is no comeback and no delay. Everything is fresh. He said, "We want a small package so as to carry an assortment. It causes a great deal of trouble to have to split the boxes. If you will give us quarter-barrel boxes, we will sell thirty per cent more berries." We went to see another large dealer at Fort Worth, and found the same condition existing in Texas.

We then called on the head buyer of fruits of the A. & P. Company, made up an assortment of quarter-barrel boxes in different styles, and asked his advice. He was convinced that the quarter-barrel box would be the best, and he chose the box that we have adopted. It is an exact duplicate of the half-barrel box, but half the size. They cost about 15¢ to 17¢ in quantities. In using three-eighths inch lumber, the material costs about ten cents more for the two boxes than for the one half-barrel box. There is the labor of putting it together, and a little extra handling charge, etc., so that we figure that it would probably be 15¢ to 17¢ more for the two boxes than for the one. We don't know how much premium we can get. In the large cities, where the bulk of the berries is sold, we must sell the berries on their merit. It may result in a premium, and may not. The premium will be what we ask on direct shipments. We can't force them to take quarter-barrel boxes if the premium is too high. If it is too low, they will want mostly quarter-barrel boxes.

I don't think that the quarter-barrel box will replace the half-barrel box in the same way as that box replaced the barrel. I think for Thanksgiving and holiday periods the half-barrel box will be sufficiently small, but for the beginning and close of the season the quarter-barrel box will be a great help. If prices are high, it will be particularly desirable, as they will then pay much more for quarter-barrel than half-barrel boxes.

I don't know whether you growers in Wisconsin are making use of the quarter-barrel box or not. That is up to the Sales Company. There were many shipped from the east, both independent growers

and sales companies. We have ordered quarter-barrel boxes for half the berries we expect to ship on my bog. If it is as successful as I fairly believe it will be, you will have to have quarter-barrel boxes sooner or later. I wouldn't ask you to carry over half-barrel boxes in order to use quarter-barrel boxes, because we can sell all we have this year, but if it is convenient for some of you, use some quarter-barrel boxes, especially for those that are likely to be tender, or that have to go to the large cities. No retailer should buy weak berries in as large quantities as fifty-pound boxes. They don't stand up long enough. We did not accept the quarter-barrel box in a haphazard manner. We went into a thorough investigation of it, and convinced ourselves that it would be worthwhile.

The difficulty with a paper box is that there is no method by which you can open it and close it again without disclosing the fact that it has been opened. Then, it is not rigid enough to hold the berries as firmly together as I think they ought to be. Some people use a very thin box not stiff nor strong enough to hold the berries firmly, and they do not stay in as good condition. I don't think that the paper box, for anything larger than two or three pounds, will ever be found practical.

You can get a ventilated paper box, so far as that is concerned, but we have asked the paper box manufacturers to work on a method by which the box could be opened without disclosing the fact that it had been opened, and no such method has ever been invented.

The one-third barrel box is used in Oregon and Washington. It is a little larger than the quarter-barrel box, and I don't think it is as good a box. It is somewhat like the old style crate. We used to pack in bushel crates. They were good crates to keep them in, but poor sellers. I think the quarter-barrel box is superior. I think you can get as much for a quarter-barrel box as they get for a bushel.

The box that has been adopted by the sales company is fifteen inches long, ten and one-half inches wide, and nine and one-fourth inches deep after the inserted lid is placed on the box. Those are the inside dimensions of the quarter-barrel box. The sides, top, and bottom are three-eighths inch thick. The endboards are one-half inch. The cleats on the inserted lid are two inches wide and one-half inch thick. The other cleats, on the end of the box, on the bottom, and on top, are one-half inch thick and one and one-fourth inch wide.

FALSE BLOSSOM

By DR. H. J. FRANKLIN, *State Experiment Station, East Wareham, Mass.*

I received the invitation to come out here and address you from Mr. Lewis and also from your secretary about a month ago, and it came at a time when I was particularly busy. It looked to me as though I were going to have a pretty hard job to meet the require-

ments at home and also take a week off to come out here. I wanted to come, not only to renew acquaintances here, but to get information in regard to certain items which I was lacking and thought I could find out here. I also wanted to see several of the boys which I had heard about but had never seen. I tried to see how I could adjust things so that I could come. Then there was a little item in Mr. Lewis' letter that worried me. He wrote, "If you are any good, you will come." That was a pretty stiff challenge, and it may have been the thing that decided me.

The last meeting that I attended here was in winter. I am particularly glad to be out here in the summer, because it gives me a better opportunity to study conditions here, and a better opportunity to talk to the growers here effectively. I have been very much interested in the bogs that I have seen in the northern part of the state, Mr. Lewis', Mr. Colton's, and Mr. Hedlar's. It looks to me as though developments might go on in this state a good deal further than we now anticipate. I have learned a good deal about developments and apparent possibilities for further developments here that I didn't realize really existed.

I am always considerably in doubt as to just what to discuss when I address the growers in another cranberry district from our own, because of the differences which I know exist in methods of culture, climate, and all conditions which surround cranberry growing. I feel that it would be necessary for me to go to a cranberry district and live among the growers several years during the growing season to come to appreciate their problems from their standpoint, without the coloring they naturally have when viewed from the standpoint of the experience that I have had under quite different conditions. I have therefore decided to simply tell you about the things that are at present interesting me most, and I shall have to trust that you will also find these things somewhat interesting. If I neglect things which would interest you more, I trust that you will develop the blank space in the situation by asking me questions.

A problem which is coming very rapidly to the front with eastern growers is a problem which has also been present among you for quite a while, and which I anticipate will be present with you for quite a while to come, and that is the false blossom problem. It is interesting to note the history of this disease on cranberry bogs. As far as I have been able to learn, this disease had its origin in Wisconsin. That is as far as any of us have been able to learn. It possibly had a long history somewhere far back of anything that is known at present, and a distribution possibly much more extensive than anything we now know of. It evidently was absent originally in the east. We do not find it there on the wild bogs. I understand that you do find it on the wild marshes here, at some distance from any cultivated bogs. That I think may be taken practically as proof that the disease originated here so far as cranberries are concerned.

Some time before I became interested in cranberries at all, there was a grower in Massachusetts by the name of Emulus Small. I

didn't become very well acquainted with Mr. Small. He died two or three years after I took up the cranberry work. He had quite a large bog, and he was more or less intimately acquainted with some of the cranberry growers out here. I understand he had a life membership in your association, and I think he was well acquainted with Mr. Bennett. Mr. Small had on his bog some berries which he called Small's Number 1. He sold vines from that patch of Small's Number 1, and after they left his marsh they acquired the name of Mammoths. There was apparently another variety which was known as Mammoths. This variety we know had its origin in the town of Holiiston, which is some twenty miles west of Boston and quite a distance out of the main cranberry district on the Cape. The Small's Number 1 variety on Mr. Small's bog we found was infected with false blossom very liberally, and wherever the vines went from that bog they developed false blossom. We followed the other strain of Mammoths back to the town of Holiiston, to the bog from which they originally came, and we found that those Mammoths had no false blossom at all. Another thing that interests us is that the Bennett Jumbo very closely resembles this strain of Mammoths that came from the Small bog, and we have been very suspicious about this whole situation, and inclined to believe that those Small's Number 1 may have been Bennett Jumbos.

This makes a very interesting item in the problem. These Small's Number 1, and Howes also from this same bog which Mr. Small owned, were sold far and wide over the Cape, and appear to have been the source of infection for a large number of bogs on the Cape. Then, later, there were other growers who brought Wisconsin vines down there, and they have certainly been centers of later infection, but vines have not gone out as extensively from these later infections as they did from that old Emulus Small bog. So, through that early planting, and through later plantings, we got quite a wide distribution of disease, and especially in the last ten years the disease has been spreading from bog to bog. The agency that spreads the disease is not yet known, but we hope to find out. The same thing has been going on in New Jersey. Vines from this Emulus Small bog went down to New Jersey and started centers of infection, and they are having the same experience we are having on the Cape.

It is interesting to know that the Howes, our principal late variety, is very susceptible to the disease, and we find it showing infection everywhere on the bogs in the central cranberry district on the Cape. Before the disease was introduced down there, Howe vines had been sold not only in the main cranberry district, but also to growers in outlying stations, such as Worcester County, Essex County, and Middlesex County. The bogs in these outlying districts that received Howe vines before false blossom infection started are practically, or I may say all, free from the disease as far as we know. This shows that the Howe variety was a clean variety, originally as far as the disease is concerned.

Then we come to the third loop in the journey. Wisconsin wants

some Howe vines, so she goes to New Jersey and Massachusetts and buys some, and she gets her present back. I suppose, having had some experience in that line, she will be more careful in the future about introducing Howe vines from bogs she knows nothing about. The disease has been taken to the Pacific coast, so that it is now present in all of the main cranberry growing sections.

The manner of spread is receiving particular attention. We find the disease present in greatest quantities on the Cape on bogs which are not flooded often. This leads us to believe there is some carrier there which flooding destroys. We are strongly suspecting leaf hoppers, and are carrying on investigations with leaf hoppers. We are also suspecting bees, because we find that even on bogs which are flooded and where no leaf hoppers are present, the disease still spreads somewhat. The spread seems to be "jumpy." That is, a new infection may appear on the other side of the bog, a great distance from the first place of infection. This suggests that there is some carrier which may fly. You may say it is the wind, but wind can't be entirely responsible or we couldn't control it at all with water. The wind may be the cause of this jumpy distribution, however.

We are studying this problem. If this disease originated with the cranberry vine or any other native plant near the cranberry bogs in Wisconsin, where it apparently started, there seems to be no reason why it should not have spread from one wild marsh to another through centuries and have acquired a widespread distribution in the east long before man began to cultivate cranberries. This suggests—I do not say that it proves—that the disease may have had a foreign origin. It may have come into this country from Asia, Europe, Japan, or South America, on some plant perhaps not at all related to the cranberry. It has been shown that some virus diseases can have several hosts not at all related, and the evidence of the disease that the plants show is not at all the same on the different hosts. That is, you would never suspect from the appearance of the disease on two different hosts not closely related that it was the same disease. Therefore, it seems that we are likely to find the disease on some plant that was introduced many years ago, and is grown extensively here in the middle west, but is not grown very much in the east. The disease may be found presenting different characteristics on that other plant. It seems to me that there is a particularly interesting angle to the study of this problem which assumes an academic interest, because if the disease is present on other plants growing near the bogs, it immediately affects the problem of how to control the distribution of the disease. It seems to me that you people in the middle west are in a much better position to study this angle of the problem than we are in the east, because it is here that this other plant is present in abundance, if our theory is at all correct. You are in position to study the distribution of the disease over this territory, and so come to some conclusion as to the center of its origin on cranberries much more readily and accurately than we could in the east. I hope that you will do all you can to look into that side of the problem.

Now we come to the outlook in connection with this disease. I understand that you growers last winter were interesting yourselves a good deal in the matter of growing the Howe variety more extensively out here. The Howe variety is very susceptible to this false blossom disease. It is rapidly becoming worse on that variety in the east. The Howe variety is a good variety for shipping. It is a good market berry. However, you have to consider other things about it besides its marketability. It seems to me that if you plant Howes out here, except, perhaps, on bogs which are isolated from known centers of infection, you are running grave risks of having your Howe vines not only bring infection, but become infected soon after they get here and in a number of years amount to very little. If any of you are considering planting the Howe variety more extensively here, it may pay you to at least give that angle of the situation a good deal of attention. Other of our recent varieties showed much more resistance to the disease, while some showed even less. The Wales Henry variety seems to be particularly susceptible. The McFarlin seems to be fairly resistant. The early Black and the Pride varieties seem to be much more resistant than the Howes.

Another thing that is interesting us is the relation of weather to cranberry culture. This is claiming our attention along three principal lines. The first is that of frost prediction. Our first study was given to this problem, and we have developed a formula for predicting not only frosts, but the actual minimum temperatures. We are conducting a frost warning service based on the operation of those formulas. We think that the service has been fairly useful, and believe that it can be made much more so in the future. There is yet a good deal to learn about this line of weather relationship, but the progress that we have made so far has made us hopeful about the progress that we can make in the future. Some things we have discovered recently have opened up entirely new lines of investigation in this connection.

Another line of investigation is the relationship of weather to crop, independent of the effects of frost. This hasn't gone as far as the frost studies, and I think that in some ways it is of less value than the frost studies, for the reason that you can't control weather anyhow. Though the weather for several months may seem to be in favor of a good crop, that weather must be continued until you get the crop, or your guess is liable to be quite erroneous. However, some things seem to be apparent not only because of what our observations have shown by actual statistics, but also because they agree with the fundamentals of the factors affecting plant growth. In general, the relation of weather to the production of rye and other crops, as well as cranberries, seems to prove that the higher the temperature you can have, and the more sunshine—as long as the high temperature and sunshine is not so prolonged as to dry out and kill the plant—the better crop you will have. The more cloudy and cool days you have, the less berries you will get. I think that that relationship has bearings in other directions. The less water you have

on your bogs, other things being equal, the better, because the vines will get more air and light.

Another line of study has been the relation of weather to keeping quality of the fruit. This line of weather study has been carried on by Dr. Stevens alone. He has produced some interesting data and conclusions, and I think he has presented them to you before. I understand that you growers here do not do any spraying at all, and attempt to handle your fireworms entirely by flooding. I hope that you are successful with that. We do not feel that we can take care of them entirely with flooding down on Cape Cod, so we are still spraying there much as we have been for many years, only we are using different sprays than we used to. When I first came in touch with cranberry growing, about the only spray that they used for insects was arsenate of lead, a stomach poison. What flooding and arsenate of lead did not get, were allowed to multiply unmolested. Finally Mr. Scammel of the University of Entomology of New Jersey, found that nicotine sulphate would handle the fireworm better than arsenate of lead. That lead to giving up arsenate as a spray for that insect, not only in New Jersey, but in Massachusetts also. Arsenate of lead is used for the span worm, cutworm, gypsy moth, and other insects that nicotine sulphate did not get very well. That has been used, and is still being used very much. The nicotine sulphate is used for the black-headed fireworm and various other insects that arsenate of lead will not control.

Recently, however, we have discovered still another spray that will control black-headed fireworm, and which I think is very likely within a few years to take the place of nicotine sulphate as that took the place of arsenate. The basis of that spray is what we used to call "insect powder." The poison in it is Pyrethrum, only it is now worked chemically into a water spray. That kills the black-headed fireworm more promptly than the nicotine sulphate, so we ought not to have the same trouble that we have had in the past with the interference of the weather. It sometimes takes two or three days for nicotine sulphate to take full effect. If it rains within two or three hours, you lose a good deal of money, as it is an expensive spray. The Pyrethrum spray has another advantage, in that it will kill effectively quite a number of other insects that nicotine sulphate will not kill, and so will save extra spraying. It will kill span worms, gypsy moths, caterpillars, and similar insects, even when nearly full grown. It is a very efficient control for leaf hoppers, the insect that we suspect of carrying false blossom. All in all, it comes nearest to taking the place of flooding of any spray with which I am familiar. We think, also, that it can be used freely while the vines are in bloom. We can use nicotine sulphate while the vines are in bloom, but we cannot use soap with it, and it is most effective with soap. We have been trying to get over that difficulty for several years by using the nicotine sulphate without soap but adding arsenate of lead, which made it a still more expensive spray. The new spray uses a neutral soap rather than an alkaline soap, so it should not injure the blos-

soms. We should be able to use it during bloom without difficulty. If we find that that is the case, I feel that it opens up a prospective treatment of value even for the fruit worm on dry bogs, although that is a feature we have not yet tried out.

DISCUSSION

MR. VERE JOHNSON: In the case of false blossom appearing on other plants, how would it affect those plants? How would we be able to know it?

DR. FRANKLIN: That would perhaps be a matter of some difficulty. It should show some sort of unusual manner of growth, or deformity in foliage or branches, or something of that sort.

QUESTION: What would you imagine it would appear on? Is it likely to appear on hardack?

DR. FRANKLIN: I have no idea. It would probably be on a plant introduced from some foreign country. Hardack is a native plant.

MR. F. R. BARBER: I would like to have Dr. Franklin give us some information in regard to the tip worm.

DR. FRANKLIN: I sprayed some plots infected with the tip worm with this Pyrethrum spray. I inspected some of the vines with eggs of the tip worm in the tip of the vines, and the results of the examination seem to indicate that the spray killed most of the eggs. I hardly feel warranted to say that without more study, but it seems to have killed three-fourths of them.

QUESTION: If false blossom plants were completely destroyed, would other plants planted on the same bog become affected?

DR. FRANKLIN: Not if the false blossom plants were completely destroyed. That would include the roots. As I suggested to Mr. Hedlar in connection with his trouble, it seems to me that you could burn off an infected piece and bury it in five or six inches of sand. Then you would be safe enough.

MR. C. L. LEWIS: May I ask if it has ever been attempted to transfer false blossom to healthy vines artificially?

DR. FRANKLIN: I am not sure. It seems that Dr. Stevens did try that, but I am not certain.

QUESTION: Is it a mechanical injury that the leaf hopper is the agency of?

DR. STEVENS: Of course, they do a mechanical injury, but it is altogether probable that there is an actual injection of virus.

PRES. HEDLAR: Is the leaf hopper a borer?

DR. FRANKLIN: No, it is something like a plant louse, but somewhat larger, and has the power of jumping. It is a sucking insect.

PRES. HEDLAR: I think we realize what Dr. Franklin has been getting at. I can give you an example of what it means to have air, sunshine, and water together. In 1924 we had the makings of the largest crop that we ever had, but as you remember that was a very cold season. It takes us a long time to flood, and of course the lower our water level the longer it takes. Mr. Lewis raises practically the same kind of berries that we do. He has a few varieties, but the number he gets outside of the Searles Jumbo is very small. He had a high water level, and could flood in a very short time. Mr. Lewis told me himself that he often stayed up all night and didn't flood until the thermometer came down to the danger point. We can't wait. When it is going down, and we have every reason to think it is going to keep on going down, we have to flood. Consequently, we flooded a number of times when it wasn't necessary. I attribute the fact that our berries didn't get as large as Mr. Lewis', and didn't mature, to the fact that our berries didn't have air enough. That comes in line with drainage, to me. If you keep your bogs too wet, things

won't grow. I can show you places in Lorry Lake where we have pockets that we cannot drain, and where we are unable to make even vines grow, say nothing of berries. The fact that Mr. Whittlesey had that little experience with the Bennett Jumbos may prove the other side of this question. I believe the berries need sunshine or air as much as any other plant does.

MR. C. L. LEWIS: Last winter Mr. Oscar Potter brought up the fact that he had water cured a spot that had previously had 90% false blossom, and after the water cure had only 10% false blossom. I think in talking to Mr. Bain, he mentioned a party whose berries had gone very strongly to false blossom after the water cure. I would like to ask Mr. Potter how these berries are showing up this year.

MR. OSCAR POTTER: There isn't much that I can say in regard to this matter. There are no berries on that piece this year. There is no false blossom evident, however.

PRES. HEDLAR: You evidently did eliminate a large part of the false blossom. Did the inflected plants die?

MR. POTTER: I couldn't say.

PRES. HEDLAR: I think we are all aware of the fact that false blossom is becoming a serious thing. I am very glad that the state department and the federal department, also, is taking such an active interest in this problem. I am very hopeful that they will find something that will enable us to rid ourselves of the devastation that this disease is causing on our bogs.

ADDRESS

By W. A. DUFFY, *Commissioner of Agriculture*

One of the first items that I noted in going over the plans, budgets, etc., of the Department of Agriculture, for this year, was an item that had to do with the Cranberry Growers' Association. Shortly afterwards, some one called at my office and wanted to know something about this item. I said that I didn't know very much about it, but assumed that it was morally all right. The idea of an association was all right to my mind on general principles and we all are interested in cranberries. Some time later I had an opportunity to look into the work that is being done in relation to the growing and development of the cranberry industry of our state, and I learned some very interesting facts indeed. As an example; I saw some cranberry growers mowing grass and other vegetation beneath the water by means of a machine on a raft, which was run by a gasoline engine. The idea struck my mind that the old American ingenuity and invention had not gone to sleep.

When I view the work of the cranberry growers it reminds me of a certain experience that I had in my boyhood. I owned a cocker spaniel pup. I usually took him with me on fishing trips. When we would come to a log in the way, the dog would stand on the ground and whine, instead of jumping over. I learned that by standing aside and encouraging him to try to climb it, and by putting my hand back of his neck when he was almost to the top, in order to help him,

he could get over the log O. K. A little later I learned, in handling a large group of pupils in a rural school where there are a good many things to do, that by giving the pupils a very slight touch of help, they managed to get along pretty well. In extension work, the same principles apply in dealing with organizations and individuals. If they are given a bit of help at the beginning, they soon show considerable interest and help themselves. I think the old proverb, "God helps those who help themselves," is a very good one. That is the thought that comes to me as I look over the work that the cranberry growers are doing. This type of ability is manifested in handling the whole industry, and you need only here and there perhaps a touch of help from the state departments.

In my observation of the work done by the cranberry growers, I have found that they are setting a standard in doing several outstanding things. In this country of ours, those people who, either through fortune or superior ability, acquire certain resources have a tendency to place those resources where they will best draw interest or dividends. Sometimes they send their resources across the waters for an investment. The cranberry growers take what resources they have, and put more money per acre into their industry than most any other group of people having to do with agriculture. That, to me, is evidence of a superior type of courage and confidence in their industry.

As I looked over a bog one morning, I saw a group of boys at work. I was impressed with the fact that this industry was furnishing employment to people who would probably otherwise be unemployed. I am not opposed to the law that prevents child labor. I do not want to discuss that. I do believe that it is a mighty fine thing for anyone who wants to do a reasonable amount of work to have the opportunity to work. I know that when I was a boy one of the things that I desired most during my vacation was a chance to work. If this industry will help to give boys about fourteen or fifteen years of age and older an opportunity to work during the summer, I think it is a mighty fine contribution. That is one thing that is outstanding about your industry; the building up of the home community with the investment of your resources, and furnishing a certain service in the way of giving employment.

The second thing that I note about this industry is perhaps the most important. The cranberry growers are taking land that is unproductive and making use of that land. They are establishing a standard for the utilization of land. They are setting up an ideal, in other words, for I believe that the proper utilization of our land is one of the most important and fundamental problems that faces the state of Wisconsin today; not only the state, but the entire nation.

The third point has to do with the matter of marketing. It seems to be generally known and recognized throughout the country that the Cranberry Growers' Association is one of the most outstanding marketing organizations existing. I am informed that there is no association that is better known, except, perhaps, the California Fruit Growers. You have set up a standard of marketing that might well

be emulated by the producers of other commodities. You have demonstrated, as I understand it, that it is possible to control the market in the sense of curtailing or controlling production, in that you, up to the present time at least, have not over produced, have used a fine method of merchandising your product, and have put that product on the market in a salable fashion. I am further informed, that your organization has never shown a tendency to monopolize. That is one of the arguments that is steadily advanced by enemies of co-operatives against the development of any co-operative; the fear that they tend to gain a monopoly of their product. That is not a pleasant thing for Americans to contemplate. You have demonstrated great ability in handling a powerful marketing organization in a way that will not antagonize the public, but will rather tend to create good will.

When I had summed up and considered these three things that your organization has accomplished, I could not help but feel an admiration for such a group of people. You have well carried out the ideas back of this old proverb; you have "helped yourselves." There may be times when we can be of help to your organization. I frankly admit that much of what Dr. Franklin said rather "went over my head." Yours is a specialized industry, and although we have studied agriculture and specialized in some branches, we haven't learned a great deal about the cranberry industry.

I was pleased to cooperate with your organization recently in making arrangements to have your representative go to Washington so that he may be able to get the best information possible to bring back to, in turn, be of help to you. We stand ready and willing to cooperate with your organization in every way possible and the individuals which must make up the rank and file of an organization that has demonstrated these factors of leadership so well.

I am glad to have had the opportunity to be with you today.

ADDRESS

By MR. E. L. CHAMBERS, *State Entomologist*

I have been looking forward with pleasure to coming here. Dr. Fracker has always told me that there was no organization he liked to talk to better than the Cranberry Growers' Association. Although I have never had the pleasure of appearing before you, I have met several of you in the office when you came down to convince the legislature that your organization was entitled to some assistance. At that time I could readily see that Dr. Fracker's reaction to you people was absolutely correct, and that you are an unusual group of people working well together, and appreciative of our assistance. If I would tell you how I spent most of the forenoon with another group of people who didn't work quite so well together, you would well understand why I feel so amiable to the cranberry growers.

The army worm is causing some worry at present in Barron County, which will probably give you some consolation in the fact that you do not have all the pests on your bogs.

As you know, the University has a special service in Door County for the fruit growers so that no time may be lost in applying the various sprays to the fruit trees at the proper time. The situation is the same with the cranberry industry. The only way you can get this type of service is to have a man with you. No one in an office at Madison can tell you how to handle your problems. The control measures and recommendations we might make would very likely apply at Tomah and not here, and unless the man is working with you and knows what your cultural problems are, he isn't in a position to make effective recommendations.

Several years ago I was working on greenhouse insects with the Federal department, and that work necessitated my working with the florists in the Philadelphia section. I learned that it was impossible to do anything without taking the cultural practices into consideration. For instance, the rose grower can, by pinching the rose buds, time his crop so it will come in at various seasons. If wood ashes or tobacco is applied to kill pests, it will cause a stimulation that will cause a lot of growth, and the flowers will bloom too soon or too late. The florist naturally will lose money. It is absolutely necessary that you have a man like Mr. Bain working right with you, so that he will be able to give you the best of service.

I understand that false blossom is spread by an insect, and, as far as we know, is spread by the leaf hopper. My work takes me into the same type of degenerative diseases: the mosaic diseases of raspberries and other plants, such as potatoes and strawberries. The process of controlling raspberry mosaic has been to rogue out the mosaic plants in order to prevent the spread of virus from one plant to another by plant lice. The potato mosaic is also spread by a plant louse. The hopper burn on potatoes is spread by the leaf hopper. The aster yellows, a disease of asters, is spread by the leaf hopper, as is the false blossom. We are having a lot of trouble just now with the hopper burn on potatoes, due to the leaf hopper spreading the virus from one plant to another. The people working on the control of the disease are trying to find disease-resistant plants. I understand now that even in the case of the European corn borer they have a variety of corn from China that the borer will not attack. The drawback is that it is a 200 day corn instead of a ninety day corn. The problem is to hybridize that with our short season corn and develop a variety still resistant to the corn borer.

It is problems of this nature that we have assigned to Mr. Bain. He must work with you, and put in all the known knowledge on the subject to your advantage. Most of you have been growing cranberries long enough to know the majority of the pests and diseases, but the question is do you know the exact time to apply the different recommendations? That requires, usually, some microscopic work that only a specialist can give you. In various mosaic diseases, for in-

stance, the spread is based on the number of plant lice present. Last year there was practically none on raspberry plants, because there were very few insects to spread the disease. If a raspberry bush is infested with mosaic, and is covered with plant lice, as soon as you touch the bush the plant lice will fall off and feed on healthy plants, and cause a new infection of the disease. The plants must therefore be scorched before they are rogued.

Understand that by flooding you are able to control false blossom to some extent. But there, again, your control measure is destroying certain parasites that are working on the fruit worm. In greenhouses it is very easy to fumigate and kill everything but the plants, (and sometimes them too), but you have more pests and problems to control. The parasites feed on eggs of insects that are hatching, and kill the worms before they are very destructive. If there were no parasites, there would be no end to the insect outbreak. Some insects, such as the grasshopper, run in cycles of ten years, and maybe longer. One year there may be so many grasshoppers that you think you won't be able to raise a thing the next year, and the next year they won't be noticeable, due to the activities of the parasites. Parasites are holding the potato beetle under control. The European corn borer is being controlled to some extent in the same way. It takes years to get parasites established. They are introducing parasites in Illinois, to have them ready when the corn borer arrives. The drawback has been that there haven't been enough borers in Illinois for them to develop on, since the smartweed borer, a closely related species, is the only host present for the parasite to develop on.

An officer in the army once notified his men that it was time for them to go over the top with their limited supply of ammunition. Every man was to shoot until the last cartridge and then run for his life. The captain said since he was a little lame he would start on ahead. In the same way, we have to start on ahead. We must get parasites for these various insects before they arrive. You can't control an outbreak without having parasites. We have gotten to a point now where we are getting back to natural methods of control.

I want to add, in closing, that I knew Mr. Bain in Washington. He was with the Federal Horticultural Board, and we were engaged in work in the same building. Dr. Fracker now is chief quarantine administrator, located at Washington, in charge of all of the domestic plant quarantines. As you know, he worked with you last fall on the idea of inspection of Howe cranberries to get false blossom down to, I believe, five-tenths of one percent. He is now in Washington, where he can be of more help to you. He can bring the problems of the various states together, and have a common and better understanding. I know that Dr. Fracker will be glad to do anything that he can for your organization, just as he did when he was in Wisconsin. I want you to know that Mr. Duffy and I are of the same feeling, and we stand ready to do anything that we can to help the cranberry growers solve their problems. If Mr. Bain needs assistance at any time, we are here to give it to him, and we hope that we may be able to be of continued service to you.

STORAGE LOSSES IN CRANBERRIES

By HENRY F. BAIN M. S., *Specialist in Cranberry Disease Control*

Introduction

With the unfortunate experience of poor keeping cranberries last year still fresh in mind and with another harvest season almost at hand, it seems to be a proper occasion to review the knowledge which has been accumulated up to the present on the causes of loss in storage and on some of the practices which are known to be helpful in reducing these losses. You will readily agree that this is a large subject to attempt to cover in one talk, since the discussion will need to be detailed in parts. I hope, however, that you will all bear patiently with me even if I tend to become tiresome in places.

Causes of Storage Losses

We may distinguish four general classes of storage losses, two of which are active to some degree each year and are the chief causes of loss in a bad year, while the others are mostly occasional in occurrence. These are, in the order of their importance, (1) fungous rots, (2) premature death of berries due to smothering, senility, inherent weakness, etc., (3) freezing injury, and (4) insects. The third and fourth items will be disposed of very briefly. Freezing injury, in both cause and effect, is so easily apparent that it needs no discussion except to point out that we have no accurate knowledge on how greatly temperatures low enough to freeze part of a lot of berries affect the development of the two most important causes of spoilage in the apparently uninjured remaining berries. Insect losses in stored berries are apparently of little consequence in Wisconsin.

Fungous Rots

In the United States Department of Agriculture Farmers Bulletin No. 1081 (1920, p. 17), Dr. Shear states that "By observation and investigation it has been found that about one-half of the loss of berries after picking is due to fungi." A storage test conducted by Dr. Stevens and the writer in Chicago last fall, to be described later in this paper, showed that somewhat more than 50% of the loss in 1926 was due to fungous rots. In view of the importance of spoilage due to fungi, it may be well to explain exactly what is meant by "fungous rots."

The fungi (singular, *fungus*) are a large group of plants of comparatively simple structure, which, unlike the higher green plants, are unable to manufacture their food materials out of the substance found in soil and air. Because of this inability they can live only upon food materials already organized, usually by green plants. When this food is obtained from a living plant the fungus is said to be *parasitic* on

the plant. The effect which the presence of a parasitic fungus has upon its host plant is usually evident as an abnormal appearance, such as dying or rot of plant parts, and this abnormal condition is termed a *disease*.

As just said, a fungus is a plant. It has the essential features of the higher plants, that is, a vegetative or growing stage and a resting stage to carry the plant over unfavorable seasons. However, the vegetative stage of a fungus, instead of being large and conspicuous like the trunk and leaves of a tree, is usually composed of a network of very fine, branched strands or filaments, so small that the individual filaments can be distinguished with ease only by the aid of the microscope. Molds are a common type of fungous growth with which you are all familiar, and many of you have seen the cottony mass of fungous growth in the interior of cranberries affected with the hard rot disease. Both are good examples of what the vegetative stage of a fungus looks like. When a fungus is actively parasitic, for instance on a fruit of the cranberry, this network-like growth generally extends throughout the substance of the fruit and cannot be distinguished from the fruit pulp without the aid of the microscope. Its presence then can be told by a softening of the fruit, a change in color, or by some similar change from normal appearance. The destruction brought about in the fruit is directly due to the growth of this invading parasite, which is obtaining its food from the fruit and is also breaking down the internal fruit structure by mechanically and chemically forcing its way through the tissues. In a cranberry rotted by the end rot fungus, for example, we find the following changes have been brought about. The normal orderly internal structure of the berry, with its various contents including water securely walled off in innumerable small cells, is entirely disrupted by the growth of the fungus, and most of the juice is set free. The freed juices together with gasses produced by the fungus growth are unable to escape readily through an unbroken berry skin, and consequently the berry remains plump and elastic. Such berry is the "popper" with which you are all familiar, and it is an excellent example of a disease caused by a fungus.

After existing for some time as a vegetative, growing plant, the fungus produces its resting form, as a higher plant produces its seeds. In the fungi these resting forms are exceedingly minute, exceedingly numerous, and are much simpler in structure than seeds. They are called *spores*. It is not necessary to describe spores in detail, because such description would mean little without a microscope to demonstrate them. The important things to know about spores are that they are produced in huge numbers, are often able to survive over considerable periods of time, are so small that they can easily be spread about in splashing water, in air, on insects, etc., and that when they finally come to rest in suitable surroundings they will germinate and give rise to a new vegetative stage similar to the one from which they came. They are the common means by which infection is carried to growing crops, into your cranberries. Many of

the cranberry rot fungi produce spores on dead leaves and stems as well as on old rotten berries.

There are six or eight different kinds of fungi which ordinarily cause most of the storage rot of cranberries. These fungi differ from one another in their way as much as cranberries and apples do in theirs. You will usually find them mentioned in publications under their scientific names. When we speak of *Fusicoccum* and *Sclerotinia* for instance, we are referring to two fungi which differ in a great many respects. Some characters in which they differ are time and temperature conditions under which they grow best and produce spores, methods in which the spores are set free and carry the infection into the berry, and temperature at which they will develop in the berry to cause the rot. Thus it is evident that in order to make a systematic effort to reduce the losses caused by these different parasites, it is first necessary to find out something about the following relations.

1. What particular kinds or species of fungi cause the bulk of the rot in a given locality.
2. The life history, or method of living under bog conditions, of each fungus.
3. The time and manner in which the fungus infects or enters the berry.
4. Cultural methods which will hinder or prevent this entrance or initial infection.
5. Methods of handling the berries which will delay the active development of the fungus after it has become established in or on the berry.

As all of you know, Drs. Shear and Stevens and their associates have spent many years studying the cranberry rot fungi, and as a result we have a reasonably complete knowledge of the life history of the more important ones. The rots usually found in greatest abundance are end rot, early rot, *Acanthorhynchus* rot, black rot, bitter rot and *Phomopsis* rot. Many of the rots produced in the berry are so similar in general appearance that it is necessary to study the fungi in the laboratory by means of what we call *cultures* to be certain which fungus has caused a given berry to rot. An immense amount of work has been done along this line in the past, but last year for the first time an effort was made to systematize these studies and to apply them under uniform conditions to berries from all the chief producing centers. The results of this study will be given presently.

Perhaps the most important single fact found in the earlier studies is that berries which rot in storage long after they have been harvested were infected early in the season, many of them during or just following bloom. With many crops the development of the diseased condition follows quickly upon infection, but in cranberries this rarely occurs. As a result of this unusual feature we cannot judge from the appearance of the berries at harvest time how badly infected they may be in fact, nor how quickly the infection will become active and cause the berries to rot. Or, in other words, whether we

are to have a good or a bad keeping year. Incidentally, this feature has led to the incubator test method now being developed in an effort to forecast the keeping quality of the crop. It is hoped that by subjecting the berries to severe treatment early in the season the dormant infection may be made to become active, at least to a degree that will throw some light upon the probable future development of rot in storage.

As said above, it has been demonstrated that infection by storage rot fungi takes place on the bog, much of it at an early date. If we want to prevent this infection from taking place we resort to spraying or dusting, the material commonly used being Bordeaux mixture or its corresponding dust mixture. In some cranberry sections, the Pacific Coast for example, spraying is a regular part of bog management, but in most other sections it is considered that the results from spraying do not justify the expense. Where practiced, the spray is applied two, three or more times, but always just before and after bloom to be certain to protect the berries at the time most infection takes place. The keeping quality of berries from carefully sprayed vines is invariably improved over that of berries from unsprayed vines, provided that proper care is exercised during harvest and storage. Spraying and dusting represent the only methods we have of *preventing* infection of cranberries by rot fungi.

It has been shown time and again, however, that the actual development of rot in berries which we know are heavily infected can be greatly hastened or retarded by the treatment given the berries during harvest and storage. A real understanding of this relation still remains obscure. It is so well known that bruising the berries greatly hastens the development of rot that you will find this point emphasized in every publication touching upon the subject of cranberry handling; yet as a rule too little effort is generally made to handle berries gently. A great deal of trouble in the market could be prevented by observing this precaution. Still more obscure is the invariable effect of a wet harvesting season on the keeping quality of the crop, particularly when the berries are stored for several days before being thoroughly dried. Last fall we had this experience in an aggravated form in Wisconsin. Spoilage of wet berries is undoubtedly due in part to premature death, a factor that will be mentioned later, but it is certain that the development of fungous rots is also greatly stimulated by the condition. The chief direct cause of much of the rot which I saw in certain Wisconsin berries in Chicago last fall was the end rot organism, and, as will be shown later, in our carefully measured tests there this fungus was responsible for 26 of the total 41% loss which took place in the Wisconsin McFarlins tested. Regarding Wisconsin's experience last year, Dr. Stevens wrote, "One thing must be remembered in this business,—that no cranberry yet invented can withstand the ill effects of a rainy harvest season."

Two other methods that help reduce the development of both storage rots and premature death of berries are better known and more widely practiced,—ventilation and storage at low temperatures.

We generally find warehouses constructed with the intent of facilitating ventilation and keeping the berries as cool as possible, berries are stored in shallow crates with air spaces between, and ventilated boxes are rapidly replacing the use of barrels in shipping berries. Yet it is valuable to keep in mind the fact that these practices have a direct relation to the prevention of spoilage.

Premature Death of Berries

The other major cause of storage losses we have designated by the term *premature death*, using the term to include all berries which spoil without evidence of fungous infection. The loss from this source is usually about 50% of the total annual storage loss. Our knowledge of the causes of this trouble, which are undoubtedly diverse in character, is much less complete than in the case of fungous rots. Again most that we know concerning this trouble has resulted from the work of Drs. Shear and Stevens, and of Dr. Franklin and others at the Massachusetts Cranberry Station. The discussion below is largely a summary of United States Department of Agriculture Bulletin No. 714, *Spoilage of Cranberries after Harvest*. Some of the causes of this type of loss may be classed as (1) smothering, (2) senility or natural death from old age, (3) varietal difference in normal length of life, and (4) possibly the effect of weather conditions, largely temperature during the growing season, on the normal length of life of berries in any particular year.

Smothering has been proven by experiment to be one cause of this type of breakdown. Sound cranberries are living organisms, and as such demand a certain amount of air to carry on their living processes. When deprived of the necessary amount of air they die. Berries spoiled by smothering do not show the extensive internal disorganization, the freeing of juice in the interior of the berry, nor other similar symptoms that fungous rots often present. They simply lose their bright color, appear dull and lifeless, and feel more or less rubbery to the touch. Smothering can be largely prevented by giving the berries sufficient ventilation at all times.

The soundest berries will die of old age in time under the best of conditions. We all recognize that some varieties have a longer inherent natural life than others, Howes being the best example of the former varieties. The early development of this trouble, however, can be lessened to some extent in all varieties by providing favorable storage conditions, as for instance storing at low temperatures, thereby slowing down the active life processes of the berry. The best correction of course, as is well-known and practiced, is to be found in the proper regulation of marketing, selling first those varieties which normally do not keep well late in the season.

It is now thought that the temperatures prevailing during the growing season affect both the normal length of life of berries and the rapidity with which fungous rots develop in storage. If this eventually proves to be true it might be possible to make an approximate

prediction of the keeping quality of a given crop based upon a study of the season's weather records. Dr. Stevens has been trying to analyze this relation in Massachusetts for several years, and we are glad to note that he intends to go into the problem more thoroughly in the future.

All that has been said concerning the causes and prevention of storage troubles may be briefly summed up in the statement that cranberries are really rather delicate living fruits, subject to parasitic diseases and other troubles, but quite responsive to careful handling. The wonder is that they withstand as much rough treatment as they do. It is very important to remember that they should not be handled carelessly or stored without regard to their life-continuing demands.

Chicago Storage Tests in 1926-1927

The Chicago storage tests last fall, referred to at times above, were made with two or three different purposes in view. The primary purpose was to obtain data on the fungi which were responsible for the storage decay in berries from each of the most important growing regions in the country in 1926. Thus if the crop proved to be of unusually poor condition in any section we would have data at hand to show the cause of the trouble. The tests were carried out in such manner that they would show which fungi caused most rot at different periods during the storage season. Another important value, which will require a repetition of the test for several years to be fully realized, is found in the fact that we have accurately measured the behavior of a sample of the crop from every growing center. The need for such a measure of keeping quality, determined independently of the less reliable general impression gained from selling experience, has been emphasized every time it has been attempted to classify a year in regard to keeping quality of the crop. After records similar to those of 1926 have been compiled for a number of years we will have a much sounder basis than at present on which to build up the correlation between seasonal conditions and keeping quality.

This experiment had been planned before the writer came to Wisconsin, and we are indebted to Dr. Fracker for agreeing to the arrangement by which the writer was allowed to handle the sorting and storing part of the work in Chicago. The major part of the work, of course, was done in Washington, where cultures were made from some 3,000 berries. We are also under obligation to the American Cranberry Exchange for furnishing storage space and other assistance in Chicago, and to Dr. Franklin for supplying the Massachusetts berries for the tests.

The plan of the experiment was as follows: Samples of two varieties of berries were taken from Massachusetts, New Jersey, Wisconsin and from Oregon to represent the Pacific Coast. The berries were shipped in the chaff in ventilated half-barrel boxes, by freight or express, to Chicago, and were there stored in the warehouse of the American Cranberry Exchange until needed. At monthly intervals

from Oct. 15 to Jan. 15, inclusive, a fresh box of each of the eight lots was opened and a peck of sound berries was carefully sorted out from each by hand. The peck samples were placed in small ventilated boxes and held in storage for two weeks, after which they were re-sorted by hand and the percentage of berries which had spoiled or begun to spoil in the two-week period was determined. The spoiled berries were immediately sent to Washington, where cultures were made from 100 berries from each lot or from all the berries when less than 100 spoiled in a sample. When the fungi in the cultures had developed sufficiently for identification, the percentage of times each fungus occurred in each lot was determined, and the resulting figures were multiplied by the total percentage decay which had taken place in that lot; the product giving a value that represents the proportionate amount of decay caused by each fungus during the two-week period.

This brief outline illustrates well the limitations under which it is necessary to do work of this kind. In the first place we have to choose a single bog to represent an entire growing section, which all of you recognize as only an approximation. Then it is necessary to limit the number of varieties selected for the tests, in the present case to Howes and McFarlin, and further to take only a small sample from each variety (four boxes in our tests). In the actual test lots the quantity of berries was reduced still further, to peck samples. The developments in the final peck samples, however, were followed with a high degree of accuracy. That is, we know what caused the spoilage in the peck samples, but from this point on we have to generalize, or assume that each sample was fairly representative of its variety on the given bog, and that the bog was likewise more or less representative of the region as a whole. It is impossible to follow in this exact manner as many different samples as might be desirable.

Before giving the results obtained, certain features of the tests will be explained more fully. The two varieties used were chosen because they were available from all four regions and because the Howes is the most important late-season variety while the McFarlin is the most widely grown "fancy" berry. Perhaps it should be emphasized that at the beginning of each two-week test perfectly sound berries were used, that is, all berries which had spoiled beforehand were removed. The rot recorded in the individual tests all developed during the two weeks that each test ran. The figures in Table 1 do not represent the total amount of rot that developed throughout the season. However, we made percentage counts of rotten berries in the previously unopened boxes every time a new test was begun, and some of these values will be given separately.

The 7-cup-sample method was used in determining the percentage of rot in all cases. Seven cups of berries were taken from different parts of a box and sorted into two lots, sound berries and those showing any trace of rot. Both lots were then counted and the percentage of rot calculated from the counts.

The berries were all stored together in the Chicago warehouse from

the time of arrival until completion of the last test, thus insuring uniform conditions for all the lots. Since the berries were not run through the mill at any time, and since storage temperatures were comparatively low for the greater part of the storage season, the berries were not subjected to as severe treatment as commercial shipments often are. These facts may have affected the results in two ways,—less rot may have developed than would have in comparable commercial shipments, and the percentage of low-temperature fungi such as end rot may have been somewhat higher than would have developed at less favorable storage temperatures.

The last three lots of Wisconsin Howes were accidentally lost after it had become impossible to duplicate the samples. This proved most unfortunate, because the Wisconsin crop as a whole proved to be of poorer keeping quality than the average, consequently the Wisconsin results were additionally valuable.

The results of the entire series of tests are given in table 1 and are shown graphically in the diagrams. The total percentage of rot during the individual tests is indicated by total height of the column for each test lot in the diagrams, and the proportion of rot due to the different causes is shown by the fractional parts of the column shaded according to the legend.

Series number 1 of each lot shows the rot present on Oct. 15, 1926, shortly after the berries reached Chicago. The amount of rot at that time varied from 1% in the Massachusetts McFarlins to 10% in the New Jersey McFarlins. Wisconsin Howes showed 4.7% rot, a greater amount than the same variety from any other section except Oregon. Wisconsin McFarlins had developed 5.2% rot up to this time, second only to the amount in New Jersey McFarlins. Of course the berries had been under entirely different conditions before they reached Chicago, some of them having been in transit for a week or longer. Nevertheless it is interesting to note the cause of this early spoilage. In every section except Wisconsin the typically early-developing rots were responsible for most of the spoilage, such as *Guignardia*, *Acanthorhynchus*, *Ceuthospora* and *Phomopsis*. Both lots of Wisconsin berries, on the other hand, owed their relatively high loss chiefly to end rot. Sterile breakdown was low in berries from all sections except Oregon.

The second series of results, number 2 in the table and diagrams, represents the spoilage that developed between Oct. 15 and Nov. 1, entirely under test conditions. New Jersey and Wisconsin Howes each had in excess of 4% rot in this test, while the other Howes had much less. In McFarlins, Wisconsin led with 3.8% rot. The spoilage in this test was caused by several fungi acting simultaneously in all lots except both varieties from Wisconsin. In the Wisconsin material more than three-fourths of the loss was caused by end rot.

The third series was stored from Nov. 15 to Dec. 1. End rot was now developing in greater abundance, and premature death became more noticeable, especially in Oregon berries. Wisconsin McFarlins showed the highest percentage of rot of all the lots in this series, 6.4%, and of this amount 5% was due to end rot.

The fourth series was stored from Dec. 15 to Jan. 3. The spoilage in the different lots varied from 3.5% in Oregon Howes to 9.9% in New Jersey McFarlins. Wisconsin McFarlins showed 8.6% loss. End rot and sterile death of berries together caused a still greater proportion of the total loss in this test, with end rot predominating in all berries except Massachusetts McFarlins and both Oregon varieties.

The final lot was stored from Jan. 17 to Feb. 3. The loss during this period varied from 8.1% in Massachusetts McFarlins to 16.8% in Wisconsin McFarlins. Again most of the increase in loss was due to end rot and sterile breakdown. Of these two causes, end rot predominated in Wisconsin and New Jersey berries, sterile breakdown very decisively in Oregon material, and the two were about equal in the Massachusetts berries.

Looking at the results as a whole, the importance of end rot and sterile breakdown stand out very strikingly as the principal causes of storage losses in both varieties tested. They predominated in all four localities, most conspicuously, as was to have been expected, in the latter part of the season. The ratio between sterile breakdown and end rot during the entire period was about 1:1 in both Massachusetts varieties, 1:2 in New Jersey Howes, 1:1½ in New Jersey McFarlins, 1:2 1/3 in Wisconsin McFarlins, 5:1 in Oregon Howes and 4:1 in Oregon McFarlins. Their outstanding importance is demonstrated in table 2, derived by adding the losses for the five series together for each variety tested.

TABLE 2
SUMMATION OF LOSSES OCCURRING IN CHICAGO STORAGE
TESTS IN 1926-7.

	Total per cent spoilage	Total per cent sterile	Total per cent end-rot	Total per cent end rot plus sterile	Total per cent all others
Massachusetts Howes ...	19.0	8.0	8.5	16.5	2.5
Massachusetts McFarlin.	19.6	7.6	8.0	15.6	4.0
New Jersey Howes.....	26.1	7.4	13.4	20.8	5.3
New Jersey McFarlin....	41.7	11.2	17.1	28.3	13.4
Wisconsin Howes*.....	8.9*	0.9*	5.8*	6.7*	2.2*
Wisconsin McFarlin	40.8	11.4	26.4	37.8	3.0
Oregon Howes	30.4	21.0	4.8	25.8	4.6
Oregon McFarlin	27.5	18.6	5.0	23.6	3.9

*Spoilage developing prior to Nov. 1 only.

Some significant differences are also to be noted between the causes of spoilage in the four localities. Guignardia (early rot) and Acanthorhynchus (rot) were abundant in the early tests in New Jersey berries and Ceuthospora (black rot) in Oregon berries, while all three were rather uncommon or entirely absent elsewhere. Gloeosporium was recorded only from Massachusetts and New Jersey. Fungus rots were low at all times in Oregon berries, but premature death developed in them late in the season out of all proportion to its development in the other lots.

TABLE I—PER CENT LOSS DUE TO DIFFERENT FUNGI AND OTHER CAUSES IN THE HOWES AND McFARLIN VARIETIES OF CRANBERRIES FROM MASSACHUSETTS, NEW JERSEY, WISCONSIN AND OREGON, IN THE 1926-27 CHICAGO STORAGE TEST

Test number	Sterile	Fusicoccum putrefaciens Shear (End Rot)	Acanthorhynchus vaccinii Shear (Rot)	Cuignardia vaccinii Shear (Early Rot)	Gloeosporium sp.	Ceuthospora blanda Shear (Black Rot)	Phomopsis sp.	Total per cent spoiled
Massachusetts Howes								
1.A	.27	.09						1.3
2.	.48	.75			.19		.42	1.6
3.	.53	.44			.09			1.1
4.	2.82	3.23		.13			.53	6.7
5.	3.90	3.98						8.3
Massachusetts McFarlin								
1.	.24	.22			.08		.14	1.0
2.	.42	.32		.03	.11		.08	1.0
3.	.92	1.70		.11	.65			4.6
4.	2.50	1.66		.24	.05		.49	4.9
5.	3.57	4.04		.16				8.1
New Jersey Howes								
1.	.54	.49	.49	.27	.05		.15	2.7
2.	.53	1.53	.19	1.98				4.4
3.	.77	2.04	.06	.12	.12			3.2
4.	2.59	4.00		.07			.13	7.4
5.	3.02	5.30						8.4
New Jersey McFarlin								
1.	.60	.20	2.60	1.00			.60	10.00
2.	.43	.06	.61	1.22	.12			2.9
3.	1.73	2.90	.20		.10			5.9
4.	3.96	5.64		.39			.50	9.0
5.	5.10	8.26	.14				.28	13.8
Wisconsin Howes								
1.	.24	2.64	.09					4.7
2.	.68	3.16						4.2

TABLE I—Continued

Test number	Sterile	Fusicoccum putre faciens Shear (End Rot)	Acanthorhynchus vaccinii Shear (Rot)	Cuignardia vaccinii Shear (Early Rot)	Gloeosporium sp.	Ceuthospora lunata Shear (Black Rot)	Phomopsis sp.	Total per cent spoiled
				Wisconsin McFarlin				
1.	.78	3.11	.05	.07				5.2
2.	---	3.69	---	---			.07	3.4
3.	.58	5.00	.25	.32		.19	.19	6.4
4.	3.35	4.90	---	.34				8.6
5.	6.72	9.73	---	---				16.8
				Oregon Howes				
1.	1.30	.80	---	---		1.40	.60	5.00
2.	.90	1.32	---	---		.80	.08	2.8
3.	2.13	.99	---	---			.53	3.8
4.	2.94	.28	.04	.04				3.5
5.	13.75	1.37	---	.15		.15	---	15.4
				Oregon McFarlin				
*1.	1.26	.48	.09	---				3.0
2.	1.09	.73	---	---		.48	.33	1.0
3.	1.23	.01	---	---		.18	.05	1.3
4.	5.90	1.82	.08	.23				7.9
5.	10.85	2.00	.43	.86			.43	14.3

a The five lots under each heading represent the amount of rot developing in samples of sound cranberries which were sorted by hand at the beginning date of each test period and stored as follows:

- 1.—Oct. 16, 1926. Not stored.
- 2.—Stored from Oct. 15 to Nov. 3, 1926.
- 3.—Stored from Nov. 15 to Dec. 1, 1926.
- 4.—Stored from Dec. 15, 1926 to Jan. 3, 1927.
- 5.—Stored from Jan. 17, to Feb. 4, 1927.

The last tests were run from Jan. 17 to Feb. 3. The shipping boxes from which these berries were taken showed the following percentages of rot on Jan. 17:

Massachusetts Howes ----20.9	Wisconsin McFarlin-----51.3
Massachusetts McFarlin--25.0	Oregon Howes -----32.5
New Jersey Howes-----27.0	Oregon McFarlin -----54.8
New Jersey McFarlin ----40.6	

If we add to these figures the loss in the last tests we get for the total spoilage that developed by Feb. 3:

Massachusetts Howes----29.2	Wisconsin McFarlin ----68.1
Massachusetts McFarlin--33.1	Oregon Howes -----47.8
New Jersey Howes-----35.4	Oregon McFarlin -----69.1
New Jersey McFarlin---54.4	

As stated earlier, the samples used in our tests cannot be accepted as an exact cross-section of the entire crop in the different localities represented. The market history of the Wisconsin crop, however, substantiates the Wisconsin results in a large degree. We are reasonably safe in concluding from these tests that Wisconsin's exceptionally poor keeping record was due to fungous rots, principally end rot, and there is little question but that the great development of rot last year was caused by unfavorable weather conditions which prevailed throughout the entire harvest season.

ADDRESS

MISS MARGARET WILCOX, *of the Federal Department of Plant Industry*

I am a native of Wisconsin, and although I have been away from here for several years I certainly have enjoyed my summer, and have enjoyed being with you. I have been working with Dr. Shear and Dr. Stevens on fruit diseases for the past six years. This summer I am cooperating with Mr. Bain in the work he is doing in cooperation with our office at Washington.

Briefly, I am making large numbers of cultures of the leaves, stems, and berries each week, to arrive at the possible cause of sport production and the time and rate of rots, and when the infection takes place. At Mr. Johnson's bog at Tomah, we are starting an experiment by which we hope some day to determine the varieties least susceptible to false blossom, and to be able to tell whether false blossom infection is carried by insects or not. Those are the two things that I am helping Mr. Bain with, chiefly.

I am certainly enjoying my summer here, and am looking forward to the banquet and dance tonight.

PRES. HEDLAR: Miss Wilcox's work promises to be of great benefit to us. We have come to realize the importance of these problems.

ADDRESS

By REV. JOHN WILLITIZER

This meeting today is a source of education to me. I will be very brief, and begin by telling you the reason why we came here. Mr. Jensen of Arpin is in business selling Ford cars; that is not the only business he is in, however. The canning business is new to me, and probably is also new to you. I have no practical knowledge of it. Last year we began by canning beans at Pittsville. When we started, it was difficult for the people to understand it. It took men like Jensen to see the possibilities for a gain for the public as well as for those who would do the canning. This is the second season. Last year it was very successful. The company is in good standing as far as the canning process goes. They have something else to contend with this year, called the snail. It eats vines and all as soon as they come out of the ground, so therefore the crop is much shorter than was anticipated. It seems there is a general shortage, because our manager tells us that we have more orders now than we had last year in months. They would like to have the product as soon as it is put into the cans.

I understand that the cranberry growers are thinking of canning some of their berries which would spoil soon after being picked and could not stand being shipped. You can be assured that we are ready to cooperate on a basis which will be rational to all concerned. The canning season is about over at the time that the cranberries would begin to be ready for canning. From that time on the buildings, machinery, etc., would be idle, with the exception of the warehouse. The cranberry growers and the men of the canning company could get together and easily work out a plan to preserve the berries in whatever form you desire. When the crop is very large, like it was last year, it would be profitable to can a part of the berries. If the crop is medium, so that you can sell to Chicago markets to better advantage, the canning proposition could be dropped for the year. There are years when it would be very profitable to can. A plan could be worked out easily, and a large investment would not be necessary, since part of the machinery needed to process them is already in the plant.

PRES. ALBERT HEDLAR: I think we all agree that the possibility might become a probability. Last year, if we could have foreseen such a season, it might have been a very good thing. We will have to decide upon this thing in the future. As I intimated this morning, there are some serious problems that we must study before we take a step of that kind. I think we will continue our investigation along this line. We have a committee investigating this matter now. We don't want to can berries this year, so there is no hurry, but we want to keep the matter in mind.

MINUTES OF FORTY-FIRST ANNUAL MEETING

Hotel Witter, Wisconsin Rapids, Wis. January 2, 1928

The "thirty-five degrees below zero" weather that ushered in the New Year failed to chill the enthusiasm of about ninety growers and friends who gathered at the Witter for the 6:30 banquet. Attorney Theodore Brazeau acted as toastmaster and was responded to by Mr. E. L. Chambers, R. A. Peterson, L. P. Daniels, G. O. Babcock, and E. E. Schroeder. Through the courtesy of Mr. Daniels, we were favored with two beautiful solos rendered by Miss Ernestine Johnson of Port Edwards. The remainder of the evening was spent in dancing.

The meeting was called to order by President Hedlar at one o'clock, January 3, 1928, in the hotel convention room.

Minutes of the previous meeting were read and approved.

The financial report was read. Joe Bissig, M. O. Potter, and A. Searles were appointed to audit the accounts and found them correct. Motion carried to accept the report.

Motion was made and seconded that a vote of appreciation be given the Wood County Board for their timely appropriation.

Motion was made and seconded that the president appoint a committee to work with Mr. Bain next summer, Mr. Bain and County Agent R. A. Peterson to be ex officio members.

Principal speakers on the program were Mr. E. L. Chambers, State Entomologist, R. A. Peterson, and Lucetta Case.

Mr. H. F. Bain was unable to be present, but sent a paper which was read by the Secretary. Growers were unanimous in their appreciation of Mr. Bain's work since coming to the state.

A. E. Bennett, C. L. Lewis, and O. Potter were designated to draft resolutions on the passing away of Thomas McGovern.

A vote of thanks was extended to Mr. Brazeau, our toastmaster, and to Mr. Daniels for the use of the ball room.

It was decided to vote at the August meeting on the date for the next winter session.

Robert Rezin, Sr., Captain Guy Nash, and S. N. Whittlesey were appointed on the nominating committee.

Motion was made and seconded that the stenographer cast a unanimous ballot for the re-election of the old officers for the ensuing year.

Meeting adjourned.

C. S. SMITH,
Secretary.

FINANCIAL STATEMENT
OF
WISCONSIN STATE CRANBERRY GROWERS' ASSOCIATION

Calendar Year 1927

		Dr.	Cr.
1927			
Jan. 1	Balance on hand (\$1.85 State Treas.).....	\$310.04	
Jan. 17	Refund of Wis. Rapids Tribune.....	1.50	
May 20	Dues	4.00	
Jan. 3	Check No. 10—C. S. Smith, sal. and exp. to 1/1/27		43.89
May 23	Check No. 11—Erma Gaulke, clerical.....		1.65
July 1	Check No. 12—C. S. Smith, sal. and exp. to 7/1/27		42.50
July 28	Check No. 13—Mrs. A. C. Rockwood, en- velopes		4.77
July 28	Check No. 14—Hein & Sutor, notices.....		3.20
Aug. 9	Dues	51.	
Aug. 12	Check No. 15—L. P. Daniels, Franklin Hono- rarium		27.50
Sept. 7	Check No. 16—Dr. H. J. Franklin, Honora- rium		145.80
Sept. 7	Check No. 17—Erma Gaulke, clerical.....		15.00
Nov. 12	Check No. 18—Anna Bamberg, County Fair expenses		30.20
Nov. 16	Check No. 19—C. S. Smith, County Fair ex- penses		20.00
Dec. 21	Check No. 20—Wis. Rapids Tribune, notices		5.75
Dec. 31	Total Receipts	<u>\$366.54</u>	
Dec. 31	Total Expenditures	<u>340.26</u>	
Dec. 31	Total Balance on hand.....		<u>\$26.28</u>

IN MEMORIAM

Whereas, Death has called Mr. Thomas McGovern, a faithful member of this Association, be it

Resolved, That an expression of regret be recorded on the minutes of this meeting and conveyed to the family of the deceased.

Signed, A. E. BENNETT,
 C. L. LEWIS, Jr.
 O. O. POTTER.

ADDRESS

By PRESIDENT ALBERT HEDLAR

While the 1927 crop was small, yet I think there were some very encouraging indications about it. To my surprise, the crop was not as small as we had anticipated. According to the report, almost 500,000 barrels of cranberries were marketed. Even during the time in which I have been connected with the cranberry business, I know when 500,000 barrels of berries could not have been marketed as profitably for the growers as the crop was marketed this year. It goes without saying that this fact is due to the greater effort on the part of cranberry growers to pull together. The markets have been pushed to the utmost corners of the country.

Some people have expressed disapproval of the fact that berries from the west are being sold in Wisconsin. They are here, and they have to be sold. If they do not supply the market out on the coast with their berries, we will supply it. We got considerably over an average price of \$13.00 per barrel for our berries this year, and that is a good price for 500,000 barrels of berries.

I had the privilege of going down East this summer, right after we had our convention here, and I want to tell you that it was an inspiration to me. I think every cranberry grower who has any interest in his business ought to take two or three hundred dollars and go East. I came back with inspiration, as well as consolation. This inspiration came from the fact that I saw some of the most wonderful things pertaining to the cranberry industry that could be imagined; things I didn't imagine were possible. I saw a cranberry marsh of 100 acres in extent, where I would be willing to wager you couldn't pick up a bushel basket of grass. This seems impossible to us in Wisconsin; it is probably due to different growing conditions. The climate in Cape Cod, where I saw this marsh, in spite of the fact that a poet once called it "the bleak and rugged coast," is on the average much warmer than ours. They do not have extremes of weather, and very seldom flood for frost. The fact that they raise peaches on Cape Cod is an indication that the climate must be much milder. I saw beautiful peach orchards laden with fruit in August.

They do not have the problem of grass to contend with, although I saw grasses there that are common to our marshes. Those people have an easier time of it. They also spend a lot of money on their marshes. They believe in intensive production. They sand to a depth of four, five, or six inches. To my mind that accounts to a large extent for the absence of grass. That is a problem that needs to be studied. I have heard it said that deep sanding makes vine growth very slow. I do not think that has been positively proven in Wisconsin; if it has, the conditions do not apply there, because they do sand deeply.

One thing that will strike you as very peculiar, is the fact that they have very few dikes. They flood the whole marshes at one time, in-

stead of flooding a bed at a time, the way we have to do. They spend more money per acre than we do. They get weeds out as soon as they come in. I think it would probably be impossible for us to keep a marsh as clean as they do theirs, but I actually believe that if we put forth the same effort that they do we could keep ours much cleaner. That is why they raise so many cranberries per acre. Cape Cod, as well as Wisconsin growers, could not afford to raise cranberries unless they raise them intensively and make more money per acre. If our industry is to pay, we have to make it pay according to the investment.

When you get to New Jersey you find conditions altogether different. Mr. Lewis has been East, and has told you some of this. When you look at the New Jersey marshes, you find them more like ours. There is more grass in them. If you examine them closely, however, you find they aren't much like ours. There are great big beds taken care of in a helter-skelter way. I said to one fellow, "Your marsh doesn't look level." He said, "It isn't. We don't flood much because it isn't level. We spray for bugs, instead of flooding." On this bog, one end was sixteen feet lower than the other. In other words, when the winter flood was put on there would be sixteen feet of water on one end and sixteen inches on the other. Can you imagine us raising cranberries under such conditions? Where we spend \$1,000 or \$1,500 per acre to prepare it, they spend \$100 or \$150. While we do raise, on some marshes, a bigger average crop, they don't have to raise as much because they haven't as much money invested. They need fifteen or twenty barrels per acre to pay them on their investment, while we would have to raise fifty or sixty barrels per acre to make a proportionate profit on our investment.

Most of the marshes are much cleaner than ours. Some marshes have no water supply at all, and are called "dry marshes." These are mostly small marshes, and in a year like this when flooding has been necessary, those dry marshes suffer, and some don't get any berries. The large marshes are supplied with water. In New Jersey, flooding is even less necessary than in Cape Cod, because the climate is warmer. New Jersey has its own problems, however. In one marsh I picked up berries that should have been clean, and they were striped a dirty tobacco brown. They were getting the rot. They have to spray to fight it. I asked what was the matter with the color of those vines, and they said they had sprayed them. They looked as if they had sprayed with Paris Green. They go through the fields with expensive apparatus and big hoses, and spray three or four times a season. It costs \$5,00 or more to spray an acre. They are always afraid the berries will rot before they harvest. This was in August, and some were afraid their crop would rot before the harvest in September, because the rot had been in those places before. In spite of these problems, the cranberry growers here seem to prosper. There are many wealthy men in the East, several rated as millionaires, and some rapidly approaching it. They do business in a businesslike way.

They have wonderful warehouses. I learned more about ventilation in one warehouse in the East, than in all the warehouses in Wisconsin. Ventilation is as important in the keeping quality of your berries as it is in keeping your berries from freezing. They have warehouses where they store the berries early in the season when it is hot that are built on the corn crib plan—sides all open, but rainproof. After seeing these warehouses, I have reconstructed our warehouse very much. We have practically opened the entire roof of our cranberry warehouse by putting in large cupolas which can be shut up tight if necessary. We have put in six big doors on the south side of the warehouse, and have two large ventilating windows in the gables. We left it open all the time unless the temperature went near freezing. Some will tell you to keep the cranberries at an even temperature. I don't believe that applies when you first harvest your berries. I believe in letting them get all the air possible. We have proven it out to our own satisfaction this year. I believe you will all agree with me if you study it from the same viewpoint.

I came in contact with a man by the name of Moore who has made a scientific study of ventilation of warehouses of our kind. He has studied this problem out. There are certain poisonous gasses given off from cranberries, just as there are poisons given off from the human body. Monoxide is a gas which will kill the berries if you don't allow it to escape. The berry is a living organism up to the time of consumption. If it is not kept under the right conditions it dies and decays. We had a lot of berries last year, and had no complaint on them. If you kill the berry and the living organism in it, you will get bad berries. These are not theories with me. I am not giving the scientific reasons, because it would take too long, but I honestly know that those conditions prevail. The reason that we didn't have more trouble in 1927 was because our warehouse was large enough to adequately take care of our crop, and had ventilation.

I had royal entertainment in New York by Chaney Brothers. I met Chester Chaney, and went to Plymouth, where we made our headquarters. If you intend to go East, you will enjoy it most if you go in the summertime. Judging by your names, most of you people are English. You would surely enjoy a trip to the East; it is the cradle of your modern civilization. I am German by heredity, but I was thrilled when I got into the Memorial Building at Plymouth and saw those wonderful relics. I went to the Memorial Building one afternoon about 4:00 o'clock. It is supposed to close at 5:00. I was downstairs in the basement, and when I got upstairs it was after 5:00 o'clock. The custodian saw my look of disappointment, and she stayed another half hour, which I appreciated greatly, and which wasn't exactly what I would have expected in New England.

ADDRESS

By MR. E. L. CHAMBERS, *State Entomologist*

The reason for my coming up here was to find out what you folks were doing, and what we could do to improve the service we are giving you. I wanted to talk to some of the growers personally, to find out if there is anything that we can do that hasn't been done in the past. We are here to render service. We believe the arrangement we have made to allow Mr. Bain to go to Washington during the winter months will allow you to have better service during the summer months. It is necessary for Mr. Bain to be in the field during the growing season, and it is also necessary for someone to be in the office to take care of correspondence. If he is out in the field and cannot be located when someone wants him in an emergency, it is inconvenient. We feel that with this additional help from Washington we will be able to double our service, and at the same time give you a little better service through the research that is carried on under Wisconsin conditions.

There is a lot of work being done, and a lot that is still to be done. There is still a lot of local control work that requires investigation in Wisconsin under Wisconsin conditions. Unfortunately, my work covers such a large field that I have to depend upon several men to look after different projects. By keeping his nose too close to the grindstone, one can't see these problems as well as you can close at hand. I have to depend on these men to make the recommendations and necessary steps in the field.

It is hoped that Mr. Duffey, the commissioner, and I will be able to visit you during the summer a great deal more than either the commissioner or state entomologist has been able to do in the past, because we feel that the cranberry growers are entitled to more service than they have gotten in the past. Unless we get out and work with you and see your problems, we won't be able to help you and Mr. Bain as much as we would like. Mr. Bain is very anxious to give you all the service possible, and at the present time is working on ideas showing very good results for next year. He is working on some ideas on weed control, and hopes to be able to help solve your grass problem as well as some of your pest problems.

I came here to learn something about your problems, and I want you to feel free to tell me if there is any improvement that can be made in our service. We will surely be glad to help in any way possible.

Wisconsin Rapids, Wis.,
Dec. 27, 1927.

"Miss Clare S. Smith,
Secretary, Wisconsin Cranberry Growers' Association,
Wisconsin Rapids, Wis.

Dear Miss Smith: I regret that I will be unable to attend the January meeting of the Growers' Association and give a paper as invited. Plans made prior to the announcement of the date of this meeting

make it necessary for me to leave for Washington, D. C., too early to attend the meeting. I will be on leave of absence from the Wisconsin Department of Agriculture until April 1, 1928. There are a few matters relating to next summer's program, however, which I will appreciate your bringing before the members of the Association."

Fertilizer

It seems very desirable that we obtain more exact information on the possible advantages of fertilizing cranberries in Wisconsin. At present it appears that the opinion on this subject is even more variable than the wide variety of cranberry marsh types justifies. On looking into the matter it seems likely that one cause of disagreement on results may be due to the particular fertilizers used as sources of plant food for cranberries. For instance, the majority of "complete" commercial fertilizers contain one ingredient in a form which Mr. Beckwith has found in extensive experiments to be actually detrimental to cranberries in New Jersey, while it may be supplied in another form without any harmful results. I would like growers who expect to use any fertilizer this spring to drop me a card, especially if we can get comparative results from different treatments. I will gladly collect and keep the records from as many sources as possible so that we may eventually come to a better understanding of fertilizer possibilities here. I may also state that fertilizer manufacturers will sometimes prepare any specific formula that is ordered in large quantities, and that substantial savings may be realized on carload shipments, as in group orders. Several fertilizer companies have promised to send their spring quotations and I will gladly furnish these to interested growers.

Weed Killer

Dr. Franklin during his visit last fall suggested a method of using a very powerful weed killer, sodium arsenate, which we are very anxious to see tried out next summer. The procedure suggested is to employ the poison at a strength that will readily kill cranberry vines, but to apply it as a spray on exposed weeds on a full flood. The poison will readily kill the sprayed tops of a wide variety of weeds, and being easily soluble in water, sufficient poison should wash down the stems to kill many of the weeds outright. Cranberry vines will be protected with water when the spray is applied.

Through a member of the Wisconsin Department of Agriculture we have located supplies of this poison in a form easy to use, and we expect to order a quantity to have on hand if enough growers will furnish the bog to try it on. We will have to ask the grower to pay the cost of the chemical used on his place and to furnish the labor of applying it. However, if we foresee enough prospective use to justify the expense, the Department will buy an efficient hand-power sprayer to use wherever it may be easily carried. There is at present very little satisfactory equipment of this type on the cranberry marshes here.

Sodium arsenite is both attractive and very poisonous to cattle, and should not be used where there is any chance of cattle reaching it.

Let me urge any growers who would like to try this weed killer next summer to let me know at an early date so that the poison may be ordered in sufficient quantity.

Spraying for Fungous Rots

One or two cases are known where a grower is considering the advisability of spraying for fungous rots next summer. If these or other growers intend to spray, it is important to prepare in advance. Especially should a good spraying outfit be in readiness. The pump should develop at least 250 pounds pressure. Air-tight barrels in which air is pumped by means of a tire pump are not satisfactory for this purpose.

The Bordeaux mixture may be bought ready-mixed in powdered form, or, more cheaply, may be easily made as needed with copper sulphate (bluestone) and a good grade of burnt lime. A sticker and spreader should also be used, such as resin fishoil soap or a casein preparation.

Bordeaux mixture may be used for the general prevention of storage rots in badly-rotting varieties, or specifically for the control of hard rot or "cotton ball." The spraying program for the two purposes is somewhat different. The time of application for controlling "cotton ball" depends upon the development of the fungus causing the disease. For this reason I would like growers who intend to spray for this disease to let me know before summer. I will also be glad to give the formula and method of mixing the Bordeaux.

Thermometers

Price lists of minimum recording thermometers of makes recommended by the Weather Bureau are available in our office here. Some manufacturers offer special prices on dozen lots. If any of you wish to order thermometers we will furnish these price lists.

Variety Selections

Next fall the Federal Government in all probability will have one or more men in Wisconsin to carry on the project of variety selections started last fall. To those of you not familiar with this project, I will say that they have come to the conclusion that the most promising method of fighting "Wisconsin" false blossom is by the discovery or development of resistant varieties. Wisconsin, thought to be the native home of the disease, offers the best field to start this selection. While false blossom may not appear to be as threatening to the industry here as it is in Cape Cod, we nevertheless feel that the development of some good resistant varieties of cranberries will be of great value even in Wisconsin. I personally hope that all Wisconsin grow-

ers will offer hearty cooperation in this work. If you have any outstanding berries among your natives, especially if false blossom is present among the vines, tell us about them during the summer. If you know of any wild marshes having unusually good berries we will appreciate the information.

Briefly, the method of selection to be followed is to mark outstanding vines, one or a few obviously of the same variety, in the fall, when color, shape, size, earliness or lateness, etc., of the fruit is in evidence. These marked plants will be taken up in the spring and sent to Cape Cod, where they will be propagated until numerous enough to subject to a false blossom infection test. This work is somewhat similar to the variety selections started years ago in Wisconsin and so unfortunately abandoned, but it goes still farther: the quality of resistance to false blossom must be possessed above all others.

In conclusion I trust that the meeting is most pleasant and profitable, and again add my regrets that I am unable to be present.

Respectfully yours,

HENRY F. BAIN.

ADDRESS

By R. A. PETERSON, *County Agricultural Agent*

I am always glad to attend the meetings of the Cranberry Growers' Association. I feel that the idea of an experiment station which your president has suggested is a mighty good one. I think it offers possibilities for more or less study. Some of the growers may be in favor of having an experiment station again, and others may be against it, but I believe it should be investigated. I personally believe it would be a very valuable thing to have, not only in the work that the station itself could accomplish, but in acting as sort of a center of the industry. It would help to develop the industry.

There has been a good deal of work done in the last few years on a land classification program in Wisconsin, and I think this would apply to the cranberry industry somewhat. There are thousands of acres of land that have been drained and are lying idle now, and worse than idle. They are tax delinquent and a burden on the general community, county, and state. I think the land classification program might bring out the acreage of land that, so far as soil type is concerned, would be suitable for the growing of cranberries.

I feel that the cranberry industry, as all of you know, is quite a popular industry, in spite of the diseases, insect pests, and many other hazards. The State Department has a journalistic department at Madison which has been asking me for some time to write a story on the cranberry industry. They figured that I would be in the best position to write a story of this kind. I am in the center of the cranberry industry, but I did not feel that I knew enough about the industry to write intelligently about it. Some time ago someone wrote

a very nice story on this subject for the Consolidated News. I tried to find out who the author of the article was, but was unable to do so. I took the main part of the story, remodeled it a little bit, and sent it in to Madison. It was sent out to the weekly papers throughout the state. It appeared in forty-three weekly papers in Wisconsin, and a good many daily papers as well. The clippings were sent to me to show how popular the story had been. I brought these up to show that the industry is of special interest throughout the state.

I have jotted down a few figures on the production of cranberries in the United States during the last few years, which may be of interest: In 1914, 697,000 barrels were produced; 1915, 441,000 barrels; 1916, 471,000 barrels; 1917, 279,000; 1918, 352,000; 1919, 549,000. From 1920 to the present time, the production ran as follows: 449,000 in 1920; 384,000; 560,000; 652,000; 582,000; 569,000; 720,000; and 496,000 barrels in 1927. The average price per barrel runs as follows: 1914, \$3.97; the next year, \$6.59; \$7.32; \$10.24; \$10.77; \$8.37; \$12.28. In 1921 the average price per bushel was \$16.99, and the value of the crop was \$6,526,000. The average price in 1922 was \$10.18; 1923, \$7.15; 1924, \$9.42; 1925, \$11.20; and in 1926 the average price was \$6.75.

I noticed that the Massachusetts production has run a little more uniform than the Wisconsin production. Possibly the points Mr. Hedlar brought out, as to their conditions being more favorable, would account for this. Massachusetts produced 410,000 barrels in 1923, 324,000 barrels in 1924, 429,000 in 1925, and 430,000 in 1926. In 1927 they produced 370,000 barrels. New Jersey produced 205,000 barrels in 1923, 215,000 barrels in 1924, 115,000 in 1925, 210,000 in 1926, and 75,000 this year. Wisconsin produced 37,000 barrels in 1923, 42,000 in 1924, 25,000 in 1925, 80,000 in 1926, and, I believe, 24,000 this year. Possibly our more severe conditions and natural enemies, such as grass, insects, and disease pests, account for the variation in Wisconsin crops as compared with those of Massachusetts. The fact was brought out that the Washington-Oregon area had exceeded the Wisconsin area in production this year. We can't stand for anything of this kind. We will have to do something to bolster up the cranberry industry in Wisconsin.

I want to say a few words about the fertilizer program. Miss Case gave a very interesting discussion of the fertilizer problem two years ago, I believe, and many of you have possibly experimented with fertilizers since that time. Mr. Bain brought out the fact that there were a great many types of soil on cranberry bogs in Wisconsin. He stated that in the West there was more uniformity, but that here there was anything but uniformity so far as cranberry raising is concerned. One of the speakers following Miss Case on the program brought out the fact that he had used air slaked lime on his soil. This grower said he had gotten good results from the use of air slaked lime. This would be due to the fact that lime would reduce the extreme acidity to a point where the land was in the ideal condition for the growing of cranberries. Lime helps to make the plant food

available. I haven't seen any statements as to how much acidity is ideal for cranberry soil. We test hundreds of soil samples from land that is supposed to be planted to alfalfa or something of that kind, and we can tell how many tons of lime will be necessary per acre to sweeten the soil. I believe there is just a certain degree of acidity that should be ideal for the growing of cranberries. It seems that liming of the soil is against the principle of the cranberry plant; it is an acid-loving plant. It would probably be possible to add too much lime, and in that way affect the growth of the plant. Liming might prove very valuable, up to a certain point. We should have some way of testing the soil to know just what degree of acidity is necessary for the best results.

If your crop is growing just as it should, there isn't any particular need of using fertilizer, but if it isn't there is possibly some chance for experimentation in fertilizers. If the vine growth is as it should be, it would not be necessary to use much nitrogen. In tests, it is found that a complete fertilizer that contains some form of nitrogen, potash, and phosphate, generally gives better results than any single fertilizer that is used. Nitrate of soda is available readily, but leaches readily. Sulphate of ammonia is readily available to the plants, and yet doesn't leach out of the soil as soon as nitrate of soda. You generally have a heavy nitrogen supply in your natural cranberry bogs, but readily available nitrogen may help to stimulate vine growth. Potash and phosphate, using three to six hundred pounds per acre, would help. I don't believe there is any definite information available as to how often this should be applied, whether every year, or every other year. They are still experimenting along this line.

We find that, in fertilizing a crop, results may not be apparent the same season. Sometimes, in the case of clover or alfalfa, the first year's crop after being fertilized does not show much improvement, but it leaves the crop in better condition to go through the winter and to produce a better crop the next year. That condition has shown itself in the fertilization of cranberries. I think the fertilizing program can stand quite a bit of attention and study. It isn't necessary to fertilize the entire area you have planted; a section a rod square may be taken. Most of the fertilizer is put on after the last flooding in the spring. Care must be taken to put the fertilizer on when the plants are dry so the fertilizer won't stick to the plants and burn them.

There has been considerable agitation toward a change in the laws relative to delinquent tax lands, unused drainage districts, etc. It would be worthwhile, I believe, for the cranberry growers to interest themselves in that program, also. A good deal of this land could be used for water reservoirs, and some is available for cranberry culture.

Every effort should be made to make the cranberry industry of our state grow. The bigger your association is, the more power it has, and we certainly don't want the cranberry acreage or yield to de-

crease. I am glad to have had this opportunity of meeting with you, and if I can be of service at any time I will be glad to have you call on me.

ADDRESS

By MISS LUCETTA CASE

It seems to me were we, as a business unit, more inclined to visit one another's bogs, we might learn many things to our advantage. Personally, I have taken a day or two for the last two seasons and spent them in visiting and have regretted not being able to call on more growers. Some places we did not find any one at home and therefore did not feel free to look around much.

Perhaps the things that especially interest me would not attract you. I will, however, enumerate some ideas which I saw carried out. Each visitor will of course see many projects which even though he felt them worth while, he might not be able to apply on account of difference in location, water supply, soil, etc. For instance, there are doubtless no bogs in Wisconsin except the Sarles, so located that they can transfer fruit from bogs to warehouses on the railroad tracks.

Both Mr. Gebhardt's have a device whereby the amount of berries which the mill handled could be regulated from the sorting table; thus making it possible to handle either very good fruit or fruit needing much hand sorting with the same amount of help. These moving canvasses were connected to Hayden mills.

Mr. Henry Gebhardt has a device for circulating air through his berries while they are in storage. He has arranged this from a silo filler apparatus. I believe this is so arranged that in a cold time warm air could be circulated through the fruit and at any time fresh air could be supplied. It seemed to me that this might materially help in keeping fruit.

Mr. Regalia has installed a windmill for pumping seepage back into his reservoirs, thereby utilizing cheap power in conserving his water supply.

The marshes which I visited after harvest time I looked over especially for cotton ball fungus, with which most of the marshes in our vicinity are affected, and which seems to be our especial Jonah. I was glad to note that several of these places had no trace of this difficulty.

I found buck bean or trifolia crowding out many good vines, and that everyone is at a loss as to how to destroy this pest.

Many marshes are increasing their acreage this season. It seems as though nearly everyone planned on either planting new territory or replanting or improving an old piece.

This season we harvested our first late Howes from plantings made in the springs of 1924 and 1925. These vines were purchased from the Knight bog in Jersey and were delivered with vines for Oscar,

Guy, and M. O. Potter, who have doubtless had a like experience. We gathered thirty storage crates and therefore expected to pack ten barrels. There were eleven barrels and a few over, there being no pies nor seconds, and I noted in sorting that the poor berries in nearly every instance were natives that had come up in the planting. These vines, so far, have shown no tendency to false blossom. What interested us most was the fact that they sold for \$2.24 more than Banner brand, the finest McFarlands, though the cup count was higher, being ninety-six in ours and seventy-six in the Banner brand. These berries ripened thoroughly on the vines and did not have the bitter taste which I had supposed to be characteristic of Howes.

I noticed that Mr. Bennett has done a great deal of weeding this season—a great stride toward clean culture.

Someone asked about fertilizer problems. I didn't think about that subject today, but if there are any questions, I will be glad to answer them, if possible.

In closing, let me urge each and every one to make a New Year's resolution to visit—and what is most important, keep the resolution.

DISCUSSION

PRES. ALBERT HEDLAR: This suggestion in regard to visiting is a splendid one. I think we get a good deal of inspiration and help out of seeing what other growers are doing. I have scalped a piece on our marsh, a little less than an acre, that I am going to use as an experimental bog, and if Mr. Bain wants to try to experiment on a part of that, he is welcome to do that. He can use that three-fourths of an acre for any experiment he wants to. Of course, I wouldn't want him to do any experimenting with false blossom on it.

QUESTION: How often does Miss Case fertilize?

MISS LUCETTA CASE: I try to fertilize every other year. For three years we experimented with fertilizers, leaving treated and untreated plots side by side. The third year after treatment the treated plots were bearing twice the fruit the untreated plots were. This convinced us that the soil needed treatment and that there was considerable residual nourishment; the food was not all consumed in one year. We therefore decided to fertilize the whole marsh leaving no test plots.

In June 1925 we spread 7 tons of 3-10-4 (which means three parts ammonia, ten of phosphate and four of potash), putting on about 500 lbs. to the acre. We covered all plots previously untreated and parts of the marsh which had been treated longest, covering a little over half our bog. That year the Company had ceased to mix that particular brand but mixed this as a special order. It seems that fertilizers are ground early, allowed to stand and then reground, otherwise they are filled with hard chunks. Therefore ours, ordered late and ground but once, was not as satisfactory as usual, although we did derive considerable benefit.

In 1926 we covered all our vines with rock phosphate (12 tons being used) or between 5 and 6 hundred pounds per acre. We expect to derive benefit from that in 1928, or perhaps even later. For the past two seasons our best producing plot has been the one treated with rock in Nov. 22 and with 3-10-4 in the following June.

In 1927 we spread three tons of 0-12-12 choosing a fertilizer without an ammonia content because we felt that our vine growth needed no more stimulant at the present time.

We have noted that where the spreading of fertilizer is followed by heavy rains we derive more immediate benefit as the rains drive it into the soil where the roots can benefit by it.

Last season we experimented by spreading ash from burned dams—a cheap postash—as this was done late I cannot state results.

We plan to use some acid phosphate this season, also some complete fertilizer. We are firmly convinced that cranberry lands like any farm lands need replenishing—no crop can be successfully grown year after year on the same ground without feeding that ground in some manner. Nature gives green algae and other low forms of plant and animal life but lets help her a little and in so doing help ourselves more.

PRES. ALBERT HEDLAR: We used about 300 pounds. I think we used about a ton on six acres, and had very good results.

MISS CASE: We think we have crowded out the grass, with the exception of the grass which roots beneath the cranberry vines.

QUESTION: What type of soil have you?

MISS CASE: I should call it coarse peat.

QUESTION: Was the origin of your marsh a grass marsh?

MISS CASE: The origin was long before my time, but I presume that it was a grass marsh. I presume it was natural wild cranberry land.

MR. R. A. PETERSON: I wish to offer a suggestion in connection with the point brought out in Miss Case's address. The idea of visiting is very fine. Sometimes we need to be forced a little bit, so far as visiting is concerned. I am just wondering if the committee wouldn't be able to work out a program of experimental plots on the different marshes in the cranberry district so that they will be in operation this season. Then, during the summer, arrangements might be made for a tour or a summer picnic. The various marshes could be visited with the idea of studying the experimental plots and picking out the outstanding things about that marsh that would be helpful to the cranberry growers. In the live stock program we arrange for county tours of this kind, in which the owner of the farm explains just how he got results, and whether he was successful or failed.

MR. HEDLAR: I think that would be a good idea, and will be worthwhile for the committee to consider. Mr. Bennett, we would like to hear a report of the display at the county fair.

MR. A. E. BENNETT: I attended the fair, and the display was very fine, to the credit of Miss Smith and Miss Bamberg. I turned this matter over to them, and they took charge of it. It was a very creditable display, and the county board members were very well pleased with it.