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Wisconsin State Cranberry Growers Association
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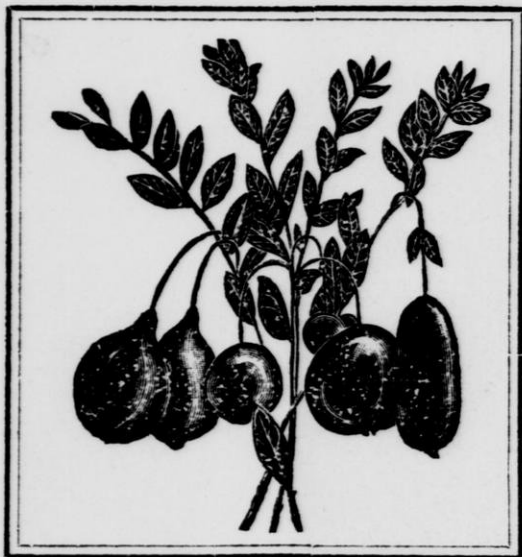
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WISCONSIN STATE

**CRANBERRY GROWERS'
ASSOCIATION.**



21st ANNUAL MEETING,
Grand Rapids, Wis., Jan. 14th, 1908.

LETTER OF TRANSMITTAL.

To the Honorable James O. Davidson.

Governor of the State of Wisconsin:

Sir:—I have the honor to submit herewith in requirement of law, the Twentieth Annual Report of the Wisconsin State Cranberry Growers' Association, containing papers read and discussions thereon, together with an account of moneys disbursed for the year 1907.

Respectfully yours,

Cranmoor, Wis., Jan. 28, 1908.

J. W. FITCH, Secretary.

21st ANNUAL SESSION

of the Wisconsin State Cranberry Growers Association

President's Address.

The meeting was called to order by President A. E. Bennett at 9:30 about fifty growers being in attendance. Mr. Bennett said that speaking was not in his line, that as the programme was long he had hoped to dispense with his address but he saw that the programme called for the president's address so he would give it to them. A. E. Bennett, Grand Rapids, R. F. D. No. 3 and anyone looking it up would find a square meal awaiting them there.

Minutes of Previous Meeting.

The twentieth annual meeting of the Wisconsin State Cranberry Growers' Association was held in the Circuit Court room on Tuesday, Jan. 8, at 9 a. m. and was quite generally attended and proved very interesting.

The meeting was called to order by the president S. N. Whittlesey, who in a brief address, said he could congratulate most of the growers on the successful season but that probably the successful ones had blundered into their success as the unsuccessful few had blundered into their failures. He spoke on the great success the Sales Co. had had in disposing of the seasons crops.

The acting secretary, J. W. Fitch, read his report and called attention to the greatly increased production per acre as shown by reports from different bogs.

Mr. M. O. Potter read the treasurer's report and the president appointed A. E. Bennett and J. W. King to audit same.

Mr. J. A. Gaynor, statistician, then gave the report of the crop. New England, 265,000 bbls. ; New Jersey, 90,000 bbls. ; Wisconsin and West, 42,000. Total 397,000 bbls. the second largest crop in the history of the country.

Mr. O. G. Malde of the state experiment station then gave a summary of the work at the station for the past year discussing also temperatures and fertilizers.

In the absence of Mr. C. B. Hardenburg his paper on the "Insect Enemies of the Cranberry and Treatment so Far as Had Been Tested," was read by the secretary. Mr. Hardenburg gave the results of the different treatments but stated that the time had been too short for anything definite, that another year's work would be more satisfactory. Adjourned to 2 p. m.

The afternoon session was called to order at 2 p. m. and Judge Gaynor gave an interesting account of his trip through the eastern bogs describing the country and also the chances for co-operation among the growers there.

Mr. Anderw Bissig's paper on the "Introduction of Cranberries Abroad" was very favorably received, the ideas being new and very practical. As the time was getting late Mr. A. C. Bennett waived the privilege of reading his address on the Wisconsin Cranberry Sales Co., as the same was to be printed in the report.

Mr. Anderw Searls spoke on the subject of "Raking on the Water and Care of the berries." He had found them very satisfactory.

The election of officers resulted as follows:—A. E. Bennett, President, Grand Rapids; O. S. Potter, Vice President, Grand Rapids; J. W. Fitch, Secretary, Cranmoor; J. J. Emmerich, Treasurer, Cranmoor; J. B. Arpin, Statistician, Grand Rapids; S. A. Warner, Member of Executive Committee, Warrens.

Mr. A. C. Bennett was elected to represent the Association at the meeting of the Horticultural Society at Madison.

The President appointed Mr. Emmerich, Judge Gaynor and J. B. Arpin a committee to secure pickers along the Green Bay railroad.

On suggestion of Mr. Malde a resolution recommending that all growers get standard thermometers and take records was passed. The president appointed Mr. Malde, J. W. Fitch and E. P. Arpin a committee for this purpose.

The President appointed Mr. Malde, A. E. Bennett and J. J. Emmerich a committee to correct the map made by Messrs. Jones and Marshall before having the same printed.

Mr. O. G. Malde had a well displayed exhibit of berries.

The meeting adjourned after passing a vote of thanks to Mr. Mahoney the janitor of the Court House.

J. W. Fitch, Sec'y.

Secretary's Report.

The report of Treasurer J. J. Emmerich and Secy. J. W. Fitch, follows:

RECEIPTS.

Membership dues and reports sold.....\$32.60

DISBURSEMENTS.

Jan. 8 Order No. 122 Sec'y. salary for 1906 and postage.....\$33.30

Jan. 8 Order No. 123 Mrs. S. N. Whittlesey Supplies..... 9.60

April 11 Order No. 124 Grand Rapids Tribune.....	26.50
Jan. 14, 1908 Order No. 125 Secretary for postage.....	15.30
Jan. 14 Order No. 126 Grand Rapids Tribune, Printing.....	6.25
Jan. 14, Order No. 127 Secretary's Salary for 1907.....	80.00
Jan. 14 Order No. 128 Mrs. S. N. Whittlesey Incidentals...	38.50

\$259.45

J. W. Fitch, Sec'y.

Treasurer's Report.

RECEIPTS.

Jan. 7, 1907 Balance	\$82.88
Jan. 26, 1907 From J. W. Fitch	12.00
Jan. 26, 1907 From State	250.00
Jan. 13, 1908 From J. W. Fitch	20.60

Total	\$365.43
	259.45

	\$105.98

DISBURSEMENTS.

Jan. 8, 1907 Order No. 122	\$83.30
Jan. 8, 1907 Order No. 123	9.60
Jan. 8, 1907 Order No. 124	26.50
Jan. 14, 1908 Order No. 125	15.30
Jan. 14, 1908 Order No. 126	6.25
Jan. 14, 1908 Order No. 127	80.00
Jan. 14, 1908 Order No. 128	38.50

	\$259.45

J. J. Emmerick, Treasurer.

Address of Secretary.

I shall try and be as brief as possible as I want to give as much time as possible to the rest of the programme. Our membership was approximately about eighty last year and it is earnestly urged that all persons interested in the cranberry in any capacity, join our Association. Through our Association the State and U. S. Government have become interested and valuable work is being carried on. Dean Russell of the U. S. College of Agriculture called attention to the necessity of growers taking hold of and profiting by the experiments already made. If this were done, our progress will be more rapid, and it will show our appreciation of the work. Another point to be considered is the fact that since the formation of the Sales Co. reports as to conditions of crops etc., made to our association are no longer necessary nor could they be profitably gathered as growers who would never take the trouble to send in such reports, now see how much it is to their advantage to make an accurate report to the Sales Co. We have a very promising field to operate in and that is, to in so far as we are able, educate the public to the merits of the cranberry when properly prepared. I do not think there is any fruit or vegetable which suffers so serverely at the hands of the average cook, as the cranberry, and I feel absolutely sure that if only a small percentage of our people could get cranberries properly cooked we could not begin to supply the demand. I have received a letter from Mr. M. J. Irish, Secretary of the National Council of Horticulture, which is exploiting the consumption of fruit along broad lines which I shall read to you later.

J. W. Fitch.

It was moved and seconded that the Secretary be instructed to cast the ballot re-electing the old officers. Carried.

List of Officers.

President—A. E. Bennett, Grand Rapids.
 Vice President—O. S. Potter, Grand Rapids.
 Secretary—J. W. Fitch, Cranmoor.
 Treasurer—J. J. E. Mmerick, Cranmoor.
 Statistician—J. B. Arpin, Grand Rapids.
 Member of Executive Committee—S. A. Warner, Warrens.

SUMMARY OF WORK AT CRANBERRY EXPERIMENT STATION.

O. G. MALDE.

Paper delivered at the annual meeting of the Wisconsin State Cranberry Growers' Association in City hall (West Side) January 14th.

The season of 1907 was one of the most successful in the history of the Experiment Station since placed under the control of the College of Agriculture.

The crop harvested was larger than any harvested heretofore, a little over forty-five barrels being marketed and more than two kept for a winter test in keeping qualities.

The setting of fruit was good, but blight took a large percentage, while the spraying kept the insects more in check than has heretofore been possible to secure with less thorough application and less effective combinations than was this year used in the majority of cases.

We labored under difficulties at times for lack of help, and this was to the disadvantage of some of the tests.

About one-sixth of this year's crop was of the first crop from the three-year old planting on the Station.

Throughout the season we continued our studies on the influence of local conditions of drainage, sanding and weeding on soil temperature.

From May 1 to November 15 we accordingly observed the temperature of the soil at depths of three and six inches below the surface, and the air temperature at two inches, three feet two inches, five feet, and forty-five feet over the surface on different soil plots, one station being added to those of last year.

The results of these observations together with some of previous seasons will be set forth in a separate bulletin to be issued in the near future. The results, however, support our previous conclusions and emphasize the influence of drainage, sanding and weeding on soil temperature.

DEPTH OF DRAINAGE.—The tests in deep and shallow drainage were continued this year on plots eight, seven and six of Section F with the water held at the surface, eight inches and fourteen inches respectively and the yields this year were 19, 32 and 34 barrels per acre, with an average of 32, 38 and 39 barrels per acre for the last four years. These results sup-

port our earlier conclusions as to the advantage of drainage.

These plots were pruned last November and vines at the rate 1,700 pounds, 1,540 pounds and 1,360 pounds per acre were removed. These plots will probably have about a half an inch of sand applied to them this winter.

FERTILIZER TESTS.—The test of fertilizers on plots three and four of Section E. were continued the past season with yields as follows:—

Treatment.	Barrels per acre	Average for three years.
Sulphate of potash	39	39
Sodium nitrate	73	47
Acid phosphate	60	44
No treatment	53	37
Potash and nitrate	60	57
Potash and phosphate	38	44
Nitrate and phosphate	52	67
No treatment	44	41

Again the nitrate and phosphate, both single and in combination, show good results. Tests were commenced at Mr. Whittlesey's and Mr. Bennett's the past season. The same fertilizers as used at the Station being used with the results in yields per acre as determined by the quantity of berries secured from each plot according to these gentlemen:—

Treatment.	Barrels per acre.	
	Whittlesey	Bennett.
Sulphate of potash	90	
Sodium nitrate	78	
Acid phosphate	101	33
Potash and nitrate	86	41
Potash and phosphate	79	18
Nitrate and phosphate	75	41
No treatment (aver. of two plots)	71	38

Some peculiarities cropped out in these experiments, however. On Mr. Whittlesey's bog the potash gave better results, when applied singly, than we have observed anywhere heretofore, as did also the combination of potash and phosphate. On Mr. Bennett's bog the potash and nitrate and the nitrate and phosphate combinations showed up best while the acid phosphate was very low.

The results on the acid phosphate treatment are not altogether reliable, as the plot was not quite so free from moss as the others nor has it ever seemed as heavily vined as the other plots. The vine while normal on Mr. Whittlesey's bog was abnormal on Mr. Bennett's, and this undoubted accounts for the difference in yields. The tests have been very interesting and have shown the need of continued tests before the established rules for

amounts of fertilizers to be used and time of application.

The vines planted in 1904 yielded a light crop the past season. Our planting had all been of the cut vines planted with a disk. All vines planted in that way on sand yielded at the rate of from eight to seventeen barrels per acre, while those planted on peat alone yielded at the rate of from one to three barrels per acre. (Vines were planted at the rate of about three-fourths ton to the acre in these cases.)

One nursery plot planted in June, 1905 with vines at the rate of one and one-half ton to the acre yielded at the rate of about 26 barrels to the acre.

During May the past season the desirable vines in the old nursery were removed to the Station and the old nursery abandoned. In the future it shall be our policy to devote more attention to the propagation of the most desirable of the vines at the Station.

MOSS.—Wood moss being quite common where the sanding is shallow on the Station and in 1906 tests with the application of dry salt for eradicating it were conducted with results that were not of sufficient value to supplant any recommendations.

This year a salt spray was used with good results, and we find that a spray of a solution of fifteen pounds of salt to fifty gallons of water or approximately one pound to three gallons of water, applied with a brass ryeoind bucket pump or barrel pump.

Mr. Malde stated that in the east the fall was considered the best time to apply fertilizers. He intended to test it. The spring applications had given the best results here. That cutting the vines two years old had yielded at the rate of 26 bbls. per acre. That more attention would be given to cultivating the best varieties. Young vines produced better fruit because the vines were shorter and did not have to carry the fruit supply so far. The eastern marshes are better in this respect, here we have vines 3-5 feet long. Our vines would yield better if better cared for. In regard to wood moss dry salt was difficult to apply without killing the vines. In 1907 he tried a spray mixture, a solution of 15 lbs. of salt to one bbl. of water or one lb. of salt to three gal. of water was strong enough to kill wood moss in active growing condition and must use a brass cylinder bucket or barrel pump should be applied twice, in May and just before the terminal buds appear. It might be necessary to use for two seasons as latent spores might develop second year. Apply enough so that everything looks wet. For spangnum moss use air slacked lime about two bbls. to an acre, better use a sprayer with 10 lbs. of quick lime to 50 gallons of water, two applications while the moss was growing. It was not as good as generally supposed to sand old vines. It took so much sand to cover the mass of vines that it was better to mow then sand. Sanding was essential to the best success in growing cranberries. Mr. Potter thought that his bog would not stand the sand that some others might, being shallow. Mr. Searls thought sand a benefit to any bog. Mr. Malde said that you got a better vine on sand, earlier, more sure of a crop and would stand a much heavier frost. Mr. Searls said that it was a waste of time to sand a grassy bog as it made the grass grow worse. The bog should be clean, well drained, not less than 12-16 inches. A light coat of sand without drainage makes a perfect bed for spangnum moss. Prof.

Whitson thought it more necessary to sand shallow peat in order to protect the peat.

Mr. Tuttle had mowed vines and put on two inches of sand with good results.

James Gaynor, In planting on sand one must plant deep to prevent vines from heaving or being raised by the ice in the spring.

Mr. Malde, one must watch in the spring and flood gradually. Sometimes a hard frost in the fall would heave new planted vines.

Cranberries of the Marsh vs. Cranberries of the Market.

It was suggested to me by one of your members ^{Charles Schlosser Chicago} that it would be appropriate for me to make some remarks at your meeting about cranberries after they arrived in the market.

As a representative of the selling agency, I realize that there is undoubtedly a vast difference at times between the appearance of cranberries as they come from the marsh or from the cleaning mill and the appearance after they have reached destination. Many things may happen to them after they have been carefully gathered before they reach the consumer. Some of these may be slight in themselves, but work a manifold injury in many instances in realizing a value.

Many of the members of this association who have worked long and faithfully to bring a crop to maturity, carefully gathered and gotten it ready for market are undoubtedly greatly disappointed when the results are at times not satisfactory, but, as I have just stated, many little things may happen, even after they have left the careful packer's hands, to cause some change in their appearance or quality before reaching the consumer, and we, at the other end, who are anxious at all times to make every package bring its full value, realize that it is difficult indeed to always satisfy the producer as well as the buyer.

If it were possible in each instance to have the producer personally inspect each lot in question as they went to the retailer, there would undoubtedly be no feeling but what your selling agent had done his level best, because I don't believe at times you realize how vastly different some of these cranberries look when they have reached the market, in comparison to what they appeared when they were put in the barrels. I do not assume for a moment that this is altogether the fault of the packer himself, have no hesitancy in saying that in many instances they are not to blame, but a much better average uniformity could be maintained if every individual grower would use the extreme care necessary in having the grade and pack fully maintained at all times.

For illustration: This season was undoubtedly a disastrous one for some of your growers in the fact that the crop was short and the season very backward. This late maturing of so much of the crop was necessarily a disadvantage to the maintaining of a high grade and quality and, from the appearance of some of the berries I have seen this year, undoubtedly, hail damage in some spots was more or less serious, because a good many lots that I have inspected were badly scarred from this source, making them unsightly, while perfectly good and wholesome and suitable for any cooking purpose. The dealer who is catering to a certain class of consuming trade

would not buy them because of their appearance.

I will not attempt to illustrate any particular lot of berries, but in a general way, want to impress upon you the fact that the selling agent this season was working under some considerable difficulty. The grower, on account of his having a short crop, was undoubtedly anxious to make every barrel of berries that he could possibly produce go through and undoubtedly, in some instances, smaller berries were allowed to grade into a certain grade than would otherwise have been loaded into these barrels if the crop had been a large and abundant one.

While this slight difference in the grade might not seem to be very serious, with a financial crisis that came to us at mid-shipping time, many of our dealers were looking for an excuse to reject and get release from a purchase that they had made two or three weeks before, and just some little incident like this gave them the opportunity, forcing us to use every possible resource that we could conceive in coaxing these dealers to accept the goods, and, realizing the position we were in, we naturally were forced to make some concessions, otherwise cancellations would have been so numerous and the quantity of berries left on our hands such that we would never have been able to have marketed them to advantage, because a consumptive demand once lost can never be regained.

It is on account of this particular fact that I want to impress upon you the importance of maintaining to the very highest standard every brand under which the Wisconsin Carnberry Sales Company are handling their crops, because so to do will increase the confidence between the purchaser on one hand and the consumer on the other hand and if each individual grower will do his individual part and be as careful with his own berries as he possibly can be and use every effort upon his neighbor to be equally as careful of the mutual selling arrangement it is absolutely necessary to have the same brand, although grown in different spots, as nearly uniform as it is possible to make them. When this is once fully realized, as it should be, and never to be forgotten and the brands once thoroughly well established, there will be less quibbling between the selling agent and the purchaser and when the purchaser has absolutely no ground for complaint, the chance for his trying to take advantage of us is certainly reduced to the minimum.

On the other hand, there are unscrupulous merchants. We realize this in the greatest degree. We have had rejections that are hold-ups, pure and simple. We have been forced, owing to the conditions and circumstances surrounding these transactions, to make concessions. Of course, a burned child is less apt to run into the fire a second time and we hope by these experiences to avoid spots where we feel that we were unjustly held up and thus be better equipped in future seasons to protect ourselves against such trade as have taken advantage of us without any legitimate cause.

Another important item in connection with the handling of the crop, we, from necessity, are forced, in order to move them promptly, to offer the dealer in remote places where it takes the railroad anywhere from one week to three weeks for each destination we are forced to promise shipment at a specified time. In order to do this, the grower himself must use every possible effort to be prompt in getting the crop ready for market. In fact, I might urge upon you the great necessity of having the crop as near ready for

market as possible, so that they can be gotten out quickly when the trade are in the mood and want them. I can say to you without fear of contradiction that even this year, had we been able to get the cars out as quickly as they should have been gotten out, at least half of our rejections would have been avoided and I am inclined to think nearly all of them would have been avoided. You will thus realize the great importance of having the crop ready and of getting it into the barrels and cars quickly when the orders are received.

When we are able to say to the purchaser that we have fulfilled in every detail our agreement we certainly stand in a much better position when it comes to an argument than when we are forced to admit any fault or failure on our part to faithfully fulfill the bargain that had been entered into a few weeks before.

One other item I would like to mention in connection with some of the berries that have been shipped, particularly to the Chicago market this year. I have inspected some berries in the cars. They looked to be very nice, well graded and in good condition. Twenty-four hours later I inspected the same identical berries after having made delivery to some of our customers, and found them in bad condition. I am willing to admit that my experience with the cranberry has been limited and I was at a loss to account for the erratic condition of these berries, but a careful investigation and careful inspection of them convinced me that many of these berries were flooded a good many times during the picking season and, so long as they were kept cold, and in an even temperature, the berries themselves seem firm and in perfect condition, but when this temperature was changed to the ordinary temperature that a merchant keeps his store, the action of the air itself softened a portion of them and they looked like frozen berries that had thawed out they were so soft and mushy. You can readily understand that the consumer or retailer does not understand this feature of the business and these barrels were promptly condemned and caused us unlimited worry and bother. We have still some of this class of berries on hand in Chicago.

I might continue to enumerate other little things that would be of importance, but, as I have already stated, the careful grading and proper packing will, without question, bring the desired results and this feature must be carefully taken care of. I cannot impress upon you too strongly the urgent necessity of keeping the grade where it ought to be. It is true, there may be conditions arise that force us at times to sell good berries at a lower price than we have succeeded in getting for poorer berries during the same season, but, on the whole, the uniform, well graded and properly packed berry will average better results and show for itself.

While the items mentioned are all of the utmost importance there are others that will arise that will become of equal importance. I, for one, realize that the acreage is increasing; this means there must be a proportionate increase in the consumptive demand if a good high average of results is to be maintained. A natural increase in our population will, of course, help some, but it looks as if the increase of production would be faster than the increase in consumption from this source, therefore, the necessity for making the cranberry as staple in the grocery or provision store as any other commodity he sells is important. The carefully graded, fine looking berry with

equally fine keeping quality will greatly encourage the retailer to keep them always in stock, on the other hand a barrel such as we have just described is so discouraging that it is with difficulty this particular dealer is induced to keep a supply on hand. He is in fact, very apt to tell his customers who ask for them that they are out of season and thus a regular consumer is cut off. This only adds to the inducement and the necessity for having every package as near perfect as possible.

Nearly all of us are also aware by experience that cranberries are often improperly served for the want of knowledge on the part of someone in not knowing how to properly cook or serve them. Many people in all sections of our great United States have a poor opinion in the real merits of cranberries. It therefore, behooves all of us who are interested in the welfare of the industry and its continued development to use every means in our power to educate the masses everywhere how to cook and serve them and thus force an increased consumptive demand. We have thus, as you are aware spent considerable money in issuing advertising cards and recipes for free distribution. These are undoubtedly beneficial and will, I believe, be more beneficial the coming season than the past, but it has occurred to me that it would be desirable and beneficial to periodically call attention of the general public everywhere to the real merits of cranberries and their many virtues through the daily and weekly press at various points in order to increase and create a demand in new districts if possible. I suggest these things for your consideration. Markets. We may have started the price too high, but logical conditions were never so favorable for a high average as this season. Every commodity in the way of provisions was high, had been high for several months and it looked as if they would simply have to have our cranberries but the unforeseen happened. The banks, through some unforeseen currency stringency through the entire country into a panic. This came like a thunderbolt out of a clear sky. A few sections were not seriously handicapped and moved along in the good old fashioned way, but many firms were doing business beyond their limit of capital and were seeking every loop-hole to escape, taking on a perishable commodity. This forced us in order to move the crop to meet this emergency promptly and in a manner that would consume the stock and not allow it to accumulate. This was accomplished in various ways; some by time extension, some by voluntary reduction in price, and in others we were imposed upon but the crop was moved or nearly all of it. While some of the results were somewhat disastrous, the general average was good, and I think the Wisconsin growers as a whole, should congratulate themselves that they have passed through a financial panic with such a good showing.

Report on the Study of Insects Injurious to Cranberries During the Summer of 1907,

C. B. Hardenberg and O. G. Malde.

Wisconsin Agricultural Experiment Station.

Read by Prof. A. R. Whitson.

The three most injurious insects.

As heretofore the most three injurious insects have been the black and yellow-headed vine worms and the fruitworm. Considerable information concerning the life histories of these three insects has been gathered.

Owing to the lateness of the season this year the dates on which the insects made their appearance were much later than usual, the difference amounting to from ten days to two weeks.

The injury done by the **BLACK-HEADED VINEWORM** has been considerable, both in the region around Cranmoor and in the Berlin district. The first evidence of hatchlings of the eggs was noticed on May 23, and about a week later the small caterpillars were out in numbers. The first brood began to pupate on June 19, and the millers were noticed on June 29. Eggs were found abundant during the following week or ten days, and during the latter part of July the second brood was doing the greatest damage, while about the middle of August millers were out in abundance laying their eggs, which will remain on the vines over winter.

Although as a rule the cocoons are found on the tips of the spun up vines, this is not without an exception, the larvae often travel down the vine a short distance and spin their cocoon on the stem near the ground, while there is a tendency, especially among those of the second brood, to go down into the ground and make an oval cocoon of sand in which they pupate. The eggs are in the majority of cases laid on the under side of the leaves and usually on the five lowest leaves of the lower uprights. The millers in our breeding cages laid their eggs indiscriminately upon the upper or lower surface of the leaf. If the larva hatched upon the upper side of the leaf it would always travel downward to the underside before beginning to feed and remain here a couple of days before traveling to the tip of the vine. On the bog, when attacking the tip, it bores in at the base and after devouring the center uses the shell as a place of retreat. The number of eggs laid upon one leaf may be as high as eleven, though from one to three is the number most frequently found. One single female has been observed to deposit fifty-one eggs. This shows the importance of preventing the development of the first brood of worms, as it needs only a few surviving females to infect an area with a great number of the second brood larvae.

The lateness of the season had one fortunate effect in causing the first brood of black-headed vineworms to develop slowly. A large percentage was found to be infested with parasites. Under ordinary conditions it is not until the second brood appears that these parasites become numerous, but our breeding cage records show that about one-fourth of the first brood black-heads which were picked off the bog and bred at the Experiment Station were affected by the larvae of a parasite wasp.

The yellow-headed vine-worm, ordinarily greatly dreaded by the growers, has not been abundant around the Cranmoor or Berlin marshes this year, and only from the vicinity of Mather have reports come of its being present in large numbers. The first brood was late in appearing and its development was slow. Larvae and pupae were brought in from the Mather region on June 26 and all millers had emerged by July 15. A large percentage of the larvae of the second were found to bear parasites, the lateness of their appearance and the delay in reaching maturity having given the parasites a better chance to attack them. In addition to the ordinary

intestinal parasites, we have found a small yellow-banded wasp upon the larvae using them for food for their young. As many as thirty six were found in one nest.

The millers of the cranberry fruit-worm appeared at the usual time this year, the lateness of the season having had apparently no effect upon the development of the cocoon in the ground. The first millers which emerged July 1, did not find many berries on which to deposit their eggs, as the cranberries had not yet set fruit except on nursery plot 30 where the moss berry was grown. On this there were a sufficient number of berries developed, and as a result the greater number of these were destroyed by the fruit-worm. Normally the moss berry is said to be free from attack. The egg-laying extended over a considerable period, for eggs were still found during the latter part of August. They were invariably found to be laid underneath one of the calyx lobes, no cases having been observed where the eggs had been deposited on the side of the fruit or on the peduncle or hook, so that the young larvae upon hatching must travel the entire length of the berry before it begins to eat its way in.

OTHER CRANBERRY INSECTS.—In addition to the principal insect pests above mentioned, a number of others were found to be more or less injurious. The life histories of some of these we have been able to work out more or less completely, that of others only in part, and they will be only briefly mentioned here.

(a) **CRANBERRY TIP WORM.**—This was found fairly abundant but confined to small local areas, especially during the earlier part of the season. The damage done was comparatively slight, but, as there are several broods in a year, the later broods may inflict considerable injury by destroying the terminal bud and thus preventing the setting of fruit the following season. No direct remedies are known, but the suggestion presents itself that the eradication of the weeds on the dams will be useful in keeping the tip-worms within limits.

(b) **CRANBERRY GIRDLER (CRAMBUS HORBUELLUS HCN.).**—Though the miller has been found in abundance, being attracted to torches at night in considerable numbers, we have not found nor heard of any injury caused by it to the cranberry vines. It apparently has thus far confined itself to its natural food plants—the grasses.

(c) **FALSE YELLOWHEAD VINEWORM (DICHELIA SUEFUREANA, Clem.)**—As the larvae of this is very similar to the yellowhead fireworm, it is generally mistaken for it, and the miller, which can be distinguished at a glance, is not recognized as the real culprit. The miller is about the same size as the yellowhead. The fore wings and anterior part of the body are a sulphur yellow with deep orange markings and the hind wings dark gray. There are two broods, the months being plentiful in early June and again in late August and September. They are attracted to torches by night. They were noticed last year but were not numerous enough to cause any perceptible injury, but this season they were found in greatly increased numbers. The larva has the same feeding habits as those of the blackhead and yellowhead vineworms and will yield to the same treatment.

(d) **THE OBLIQUE-BANDED ROLLER (ARCHIPS ROSACEANA, Harris.)**—This insect has been noticed for the first time this year and was

found widely distributed, but fortunately, not very numerous. The larva varies from olive green to dark green or nearly black with an orange tinged head and neck and each segment of the body provided with a number (generally five) of white dots each bearing a bristle. When full grown it is a little over an inch long and is a very voracious feeder. Its work is similar to that of the fireworm, and we have counted as many as fourteen uprights spun together and one half grown larva was found to eat an entire cranberry leaf in five minutes. When ready to pupate it makes a closely spun-up nest of the tip of some three or four uprights inside of which the dark brown pupa is formed. The pupa stage lasts from about ten days to two weeks, and the miller which emerges is of a dark orange color with two oblique bands of dark brown on the forewings, the hind wings being lighter in color. The millers emerged in numbers about July 17-22, and we suspect the species to have two broods in a year. In captivity the millers did not lay their eggs on the vines but on the walls of the breeding cage, and these eggs did not hatch, but later in the season some berries were found attacked by larvae, which showed a resemblance to the young larvae of this species, which at this stage can hardly be distinguished from a yellow larvae on superficial examination. The millers are very commonly attracted by torches at night.

(e) THE CHAIN-DOTTED GEOMETER (*CINGILIA CATENARIA*).—

This is the yellow spanworm or looper, which is found widely distributed, though not very abundantly. Our millers were reared from larvae found on the Gaynor bog north of the Experiment Station during the latter part of July. Pupation occurred generally about August 8th, the pupae being naked, pale grayish yellow with black spots, enclosed in an open network of coarse yellow threads through which the pupa could plainly be seen. The millers did not emerge until the latter part of September, about two dozen being observed each morning between the hours of six and nine.

The injury done by this looper is as yet comparatively slight. It is a slow feeder and is not numerous enough to cause serious apprehension on the part of the grower.

A number of other spanworms, mostly of a green color, have been noticed, and some we succeeded in rearing, but these did not appear to be numerous enough to cause an appreciable damage.

We also observed a small *SNOUT BEETLE* or weevil which attacks the blossom of the cranberry. During the beginning of August we noticed a number of blossoms which had apparently withered and dropped off the vine. This was at first attributed to blight, but upon closer examination we found that some of the blossoms had been punctured and inside of them we found the grub of a minute, dark red weevil in different stages of development. The adult weevil punctures the blossom by means of its snout and deposits an egg in the opening. This egg hatches into a small pinkish-white grub, which undergoes its entire development and transformation inside this bud. The bud may remain hanging on the vine, apparently uninjured, while the grub eats the inside parts, but the bud never opens and ultimately withers and drops off.

The extent of the damage done was hard to determine at this period as it was not possible to estimate the fraction of fallen blossoms due to blight,

and due to insect attack, but it may have been considerable.

Remedial Measures

(a) **FLOODING.**—Flooding as a means of getting rid of the insect pests must be considered, WHEN SUCCESSFUL, the easiest, quickest, and cheapest method to pursue. But the success of a flooding, which must be continued for forty-eight hours, depends upon so many circumstances beyond the control of the operator, as the temperature of the water, abundance of supply, weather conditions during the flooding, stage of advancement of buds, flowers or fruit, that for Wisconsin we would in general not advise this method of treatment because it is fraught with danger. Especially for the fruit worm or the second brood of the fireworm, we consider it a hazardous undertaking, as during the latter part of July or August the vines cannot safely be kept immersed for that length of time. Holding of the water until the middle of May can be beneficial in preventing the hibernating yellowheads from depositing their eggs on the vines in spring. This we do not advocate, however, when few yellowheads are found, as late holding is not advisable. A flooding of two days just after the first brood of fireworms begins to hatch followed by another flooding about a week later will prove an effective remedy for this insect, as there is not much danger from flooding at this time. Flooding for the second brood of the fireworm or for the fruit worm should not be attempted unless the following conditions prevail: abundant water supply, temperature of water not above 60 degrees F., cloudy weather, and the water to be drawn off quickly in the early morning.

(b) **SPRAYING.**—From the results of last season's spraying we felt justified in paying particular attention to this method of treatment this year as being likely to be successful. The mixture applied this year consisted of copper sulphate four pounds, lime six pounds and Paris green one pound, in fifty gallons of water. In some experiments arsenate of lead was substituted for Paris green, the quality of which was frequently poor. Spraying was done under adverse conditions at times, and sometimes had to be abandoned for lack of sufficient assistance. The results were therefore not as satisfactory as could reasonably have been expected under better conditions. Sprayed areas in nearly all cases showed benefit of the treatment.

SPRAYING ON THE EXPERIMENT STATION MARSH.—The nursery plots on sections I and J were sprayed with Bordeaux mixture plus one-fourth pound of paris green per barrel on June 22, followed by a second spray on July 17, and a third on August 10. In the last spray arsenate of lead was substituted for the Paris green and two pounds of whale oil soap per barrel added so as to form a more adherent coat of spray over the glossy surface of the berry. The results of these sprayings, especially in regard to the fruit-worm control have been highly satisfactory, showing a decided improvement over the preceding year. An examination was made on August 3 as to the effect of the spraying on fruit worm injury and the results as compared with the injury showing on July 21 the previous season is shown in the following table.

Table 1. The per cent of worm infested berries on plots sprayed in 1906 with their condition the previous year.

Plot No.	Per cent of infested berries on Aug. 23, 1907.	Conditions of plot in regard to fruit-worm injury on July 21, 1906.	Plot No.	Per cent of infested berries on Aug. 23, 1907.	Conditions of plot in regard to fruit-worm injury on July 21, 1906.
11	5	badly infested	47	free	no record
12	5	badly infested	48	10	free
13	1	badly infested	49	5	"
14	10	badly infested	50	25	badly
15	1	badly infested	51	5	"
16	5	practically free	53	5	"
17	1	considerably injured	54	1	entirely destroyed
18	20	badly infested	56	2	slightly
42	1	slightly	57	5	badly
43	5	considerably	58	free	slightly
44	10	badly	59	1	slightly
45	30	"	63	5	badly
46	20	slightly	64	5	generally

This shows a great improvement generally as regards fruitworm injury. Fireworm was found to be practically absent on these plots this season. The results would have been shown to be still more favorable if compared with the condition in the latter part of August last year.

On those plots where the fruitworm infection was considerable, it was noticed that always the high vines had suffered most, while the low berries had remained free from attack.

Sections FI, N. W. $\frac{1}{4}$ and S. E. $\frac{1}{4}$ and FII, N. E. $\frac{1}{4}$ and S. W. $\frac{1}{4}$ were sprayed three times—June 21 (Bordeaux plus 1 pound of arsenate of lead per barrel), July 17 (Bordeaux plus Paris Green, 1 pound per barrel,) and August 10 (Bordeaux plus five pounds of arsenate of lead.) The results of the spraying is as compared with the adjoining plots being given in Table 2.

Table 2. The effect of spraying on fruit worm development in 1907.

Section	Sprayed or Unsprayed.	Percentage of fruitworm injury on August 23.
FI, N. E. $\frac{1}{4}$	Unsprayed	10
FI, N. W. $\frac{1}{4}$	Sprayed	free
FI, S. W. $\frac{1}{4}$	Unsprayed	20
FI, S. E. $\frac{1}{4}$	Sprayed	1
FII, S. E.	Unsprayed	30
FII, S. W.	Sprayed	1
FII, N. E.	Sprayed	free
FII, N. W.	Unsprayed	15

On sections FIII and FIV to FVIII the last spray was omitted over the north or south half of the section. The condition of the plots on August 23 was as follows. :—

Table 3. The influence of the number of sprayings on development of fruit worm.

Plot	Number of Times Sprayed	Percentage of Injury due to Fruitworm on Aug. 23, 1907.
FIII	3 times	1
FIV	3 "	1
FV S. $\frac{1}{2}$	3 "	Nearly free
FV N. $\frac{1}{2}$	2 "	5
FVI N. $\frac{1}{2}$	3 "	1
FVI S. $\frac{1}{2}$	2 "	10
FVII S. $\frac{1}{2}$	2 "	10
FVII H. $\frac{1}{2}$	3 "	1
FVIII N. $\frac{1}{2}$	3 "	1
FVIII S. $\frac{1}{2}$	2 "	5

These results show the practicability of FRUITWORM control through spraying, three applications being more efficient than two. Arsenate of lead has been found, especially when freshly made, to be greatly superior to Paris green. The Paris green, as bought from different dealers is often impure; in fact we have used some brands which proved to be practically worthless. As we were often compelled to use Paris green for some of our sprayings outside of the experiment station, the results have not been as satisfactory as might be wished in those cases.

KEROSENE TREATMENT FOR FIREWORM EGGS.—Experiments at the station showed that the second brood of fireworm eggs can be prevented from hatching by contact with kerosene. This was also shown by the Gaynor Co., who applied kerosene about the middle of June at the rate of one-half barrel per acre to an area badly affected by the blackheaded fireworm, which treatment was quite effective in preventing their development, although some had flowed to the dams before the kerosene was applied and thus escaped. However, a large percentage of the young terminals were destroyed by this treatment. This would suggest a treatment in early spring for the winter eggs of the blackheaded fireworm. The area might be flooded, a film of kerosene put on, and the water drawn off, so that while receding the film of oil would be left on the eggs. Care should be taken, however, to apply the treatment before the terminal buds have opened, as otherwise the young shoot is sure to be killed. This treatment, while suggested as promising, should not be used on a large scale until thoroughly tried by the grower.

(e) **DUSTING THE VINES WITH LIME AND PARIS GREEN.**—This method for control of the fireworm and other leaf eating insects has been tried by some of the growers, but apparently the results have not been as favorable as spraying, probably due to the insufficient quantity of Paris

Green used. We doubt if the lime alone has any injurious effect on the larvae, and believe that beneficial results from the treatment are due to the admixture of the poisonous substance. In most cases the dusting was done with the lime spreader, described in the moss killing treatment on page—

CONCLUSIONS.—Flooding is only recommended for the first brood of the black or yellowheaded fireworm.

2. Spraying is the safest, though a more laborious method of control. For fireworms two applications are, as a rule, sufficient, for fruit worms, a third application about the beginning of August is necessary. The addition of five pounds of resin soap to fifty gallons of Bordeaux is strongly recommended, as it greatly enhances the efficiency of the spray.

3. The fruitworm can be controlled by spraying.

4. Arsenate of lead, made by mixing of a solution of 4 parts of arsenate of soda with one of 7 parts of acetate of lead (sugar of lead) is to be preferred to Paris green, as the latter article cannot be relied upon on account of its frequent adulteration.

5. Spraying is to be preferred to flooding because a well sprayed field is guarded against infection from an adjoining marsh which has not been treated, while to make flooding successful, co-operation of the neighboring growers is imperative.

6. Torches, burning at night, will catch the differnt span worm millers, false yellow heads, oblique banded roller, and to a certain extent the yellowheaded fireworm, but are ineffective as a means of entrapping the blackheaded fireworm or fruitworm miller. Are not the moths caught mostly males?

7. Lastly we again call attention to the advisability of clean culture and the necessity of keeping the dams free from vines. A weedy bog cannot be successfully flooded. As the insects, which have been dislodged from the vines, can crawl up on the unsubmerged weeds and thus save themselves. while in spraying a great part of the mixture is wasted on the weeds and does not reach the vines. Furthermore, on a bog which is kept clean, any injury due to insect attack is at once apparent, while if the vines are hidden by weeds the damage, when finally visible, has generally spread too far to leave any hope for successful control.

Prof. Whitson said they hoped to do better work in the future. They would have assistance from Washington which would enable them to continue the work, as the appropriation from the state would cease this year.

Adjourned to 2 p. m.

Afternoon Session, Called to order at 2 p. m.

Cranberry Diseases in Wisconsin.

By C. L. Shear, Pathologist U. S. Department of Agriculture.

Washington, D. C., January 7, 1908.

Mr. J. W. Fitch, Secretary, Wisconsin State Cranberry Growers' Association.
Cranmoor, Wisconsin.

Dear Sir:—Your kind favor of the first instant was duly received. I take pleasure in sending you herewith a short paper on Cranberry Diseases in Wisconsin. I regret that I have not been able to do more work in Wis-

consin in order that I might be better prepared to give you information and assistance in regard to your troubles. If there is anything in this paper which may be helpful to the members of your Association or any of the cranberry growers of Wisconsin, I shall be satisfied. If your Association publishes this paper, I should be much pleased to receive ten or a dozen copies of the publication in which it appears.

In regard to being with you at your summer meeting, of course, it is too early to say anything definite at present, but I shall be glad to do so if circumstances permit. I shall be glad to receive a list of cranberry growers which you mention and will arrange to supply them with our Bulletins on cranberry diseases. Wishing your association a pleasant and profitable meeting.

I remain, Yours very truly,

C. L. Shear, Acting Pathologist in Charge.

Members of the Wisconsin Cranberry Growers' Association:

I regret very much that I cannot be with you and meet you face to face, as the question of cranberry diseases could be discussed much more satisfactorily under such circumstances. What I may be able to write you in regard to cranberry diseases in your state will be based upon two visits; the first made in September, 1903, and the last in September, 1907; and also upon specimens and information received from your Cranberry Experiment Station and some of the growers.

Scald, rot and Anthracnose, the three fungus diseases most common and destructive in the cranberry meadows of the East, have been found in Wisconsin, but thus far have not proven very serious and it is possible that the climatic conditions prevailing in your State are not sufficiently favorable for their development to cause great anxiety regarding them at present. Scald is, however, undoubtedly the cause of some loss of fruit in Wisconsin, especially stored fruit, and it is also the cause of some blight or blast of blossoms. All the diseases just mentioned, as we have demonstrated in our work in New Jersey and Massachusetts, can be controlled by spraying, should the conditions here justify it.

The three most serious diseases in Wisconsin seem at present to be Sclerotinia, the blossom blight or blast and what has been called by some of your growers "false blossom."

SCLEROTINIA. But very few of you are perhaps acquainted with this disease but as it may become very serious it is desirable that all the growers should become familiar with it and take every precaution to prevent its spread. The fungus which is the cause of this trouble first makes its appearance on the tips of the young green shoots in July just as the plants are beginning to blossom. It causes the young tip to wither up and produces a thin, soft, white, mould-like outgrowth on the stem and leaves. An abundance of the spores, which are the germs of the parasite, are produced here and are probably carried by the wind and insects to the stigmas of the open blossoms and thus the fungus gains entrance to the young fruit which is just setting.

Having gained entrance to the young fruit the fungus continues to grow in the interior of the berry until the fruit is nearly mature without any external evidence of its presence. Some of you have perhaps noticed, upon cutting or breaking berries, that the interior was filled with a downy, white

cotton-like growth. This is the mycelium or vegetative portion of the fungus. At picking time many of these berries will begin to show a grayish, more or less wrinkled spot, of greater or less extent on the surface. Later the whole berry becomes gray and shrivelled and frequently spotted with dark brown masses just breaking through the skin. These diseased fruits can be most readily found in screenings at the time the fruit is sorted for marketing. So far as known at present, it is from these diseased berries, and these only, that the disease is spread the following season. Hence all such diseased fruit should be destroyed if possible; otherwise the second spore form or germ of the fungus will be produced from these diseased berries the next spring and the young shoots again destroyed in the manner described.

Destruction of all diseased fruit by completely burying or burning it would probably control this disease, unless it has some other means of passing the winter with which we are not acquainted.

BLOSSOM BLIGHT OR BLAST. — We find there is a very general complaint among the Wisconsin cranberry growers that the greater part of the blossoms which appear in the summer fail to set fruit. We have found a similar condition of affairs to obtain in many cases in the East where it is due chiefly to the attacks of the scald fungus which destroys the young fruit at about the time the blossoms fall. We have also found that some of the injury in Wisconsin is due to this same cause but, from the observations we have been able to make here, the greater part of the failure of the fruit with you is due to other causes.

In the first place the cranberry, like other fruits, when in a healthy and vigorous condition, almost always bears more blossoms than it can possibly bear mature fruit. This is a wise provision of nature to meet the loss which always arises from various accidents to the flowers, especially lack of pollenization. Five or six flowers are frequently found on the flower shoot, whereas a fruiting branch on a normal cranberry plant cannot grow to maturity without injury to itself more than three or four full sized berries. If a plant over-bears one year, it does not usually recover sufficiently to bear a full crop the following year. When, however, a plant has five or six blossoms and only produces one or two berries, or as is sometimes the case none at all, there is something radically wrong. Now this failure to set fruit or this blighting or blasting, as you call it, may be due to various causes, some of which may be remedied and some of which, under our present conditions, cannot be prevented. A long period of cold, wet weather at the time of flowering may prevent the flowers from being pollinated and this prevents the setting of fruit. This is one of the causes which cannot be remedied but which fortunately does not occur very frequently. Frost, of course, may also kill the blossoms.

The primary causes, however, of the general failure of your plants to set mature crops of fruit are, we believe, either lack of general vigor and vitality of the vines or exhaustion of the fruiting power of the plants by excessive vegetative stimulation and growth. In this connection, let us consider for a moment one or two of the generally accepted principles and practices of fruit growing. The food and water supply must be suited to the needs of the plant and the purely vegetative growth must be kept under control. An apple grower would not expect a good crop of fine apples from a

tree which had been allowed to go without pruning until it had become a tangled mass of limbs and brush, some of which were dying for want of air, light and nourishment, and we have no more reason to expect a good crop of fine sound fruit from cranberry vines which have been making excessive vegetative growth for years until they have formed a thick tangled mass of vines, the under part of which is dead or dying. The point that I wish to make in this connection is one which seems to have escaped most cranberry growers and that is that a cranberry plant needs pruning as much as any other cultivated fruit in order to secure the best crop of fruit and keep the plants in a healthy and vigorous condition. In the East pruning, or the desired result of pruning, is frequently accomplished by means intended primarily for other purposes. The practice of sanding a bog, generally followed in Massachusetts and, to some extent in New Jersey, has much the same effect as pruning; as the dead and decaying vines lying on the ground and much of the older useless wood is thus buried and the vines are given an opportunity to make a fresh and vigorous growth under more sanitary conditions. Pruning is also accomplished now in many cases by the use of the knife rake. The primary purpose in the use of this implement, thus far, however, has not been to prune the vines but to thin them out sufficiently to permit of the use of scoops or rakes in picking the fruit. Growers who have been using the knife rake have already noticed the decided improvement in bogs which have been treated in this way and this improvement is undoubtedly due to the pruning of the vines. This is a rather crude method of pruning but perhaps the most practicable one available at present.

Another important feature in securing a good setting of fruit is to have the plants go into the winter with their buds and new wood in a well-matured condition, and in order to do this vegetative growth should neither be encouraged nor stimulated late in the seasons. The presence of an excessive amount of water on the cranberry marsh the latter part of August and during September tends to keep the vines in an active growing condition at the time when they should be storing up reserve food and hardening their tissues preparatory to passing the winter season.

We are, therefore, of the opinion that if the water supply could be better controlled and less water used, not only at the time the fruit is ripening and the plants maturing, but also during the whole season and as the same time either by sanding, where this is possible, or by pruning the vines with a knife rake, either bury or cut out the old dead vines and excessive growth of new vines, the loss from blast or blight would be largely prevented.

If, after having gotten the vines in a thrifty and vigorous condition for fruit-bearing, there should still be much loss from blast due to the scald fungus, this, as well as any other of the ordinary fungus diseases, could be controlled by spraying it with Bordeaux mixture.

FALSE BLOSSOM. This name is a very unfortunate one. Besides not being very appropriate, it is entirely misleading to anyone who has heard the name applied as it is in Massachusetts. There is a fungus disease on Cape Cod to which this name has been given and which is of entirely different origin and appearance from the trouble to which you apply the

name here. The so-called "false blossom" of the East, which we have called hypertrophy, we have never seen or heard of occurring in Wisconsin. The trouble to which you apply the name is a rather striking and peculiar production of various monstrosities and abnormalities in the terminal and lateral buds and the flowers. Instead of producing normal flowers, the sepals, petals and stamens are frequently changed into leaves or more or less leaf-like bodies; and the ovaries or young fruit fail to develop or develop in an abnormal manner. In many instances also the axillary leaf-buds of the fruiting shoot which are normally latent develop and form a cluster of slender shoots about the terminal shoot none of which are able to set fruit. There appears to be no fungus connected with this trouble, and from observations we have been able to make, it seems probable that it is due to an unusual disturbance of the physiological functions of the plants, brought about by abnormal conditions of growth and an excessive amount of nitrogenous plant food, derived chiefly from the great quantity of decaying vegetable matter present and associated with an excess of water. These may stimulate a highly abnormal vegetative growth throughout the season and so unbalance the plant that it is unable to produce normal flowers and fruit but instead attempts to change them into vegetative organs. We are inclined to believe that relief from this trouble might be secured by following the same course recommended in the case of blast and blight. That is the reduction and regulation of the water supply, accompanied by thorough pruning of the vines with a knife rake and applying a liberal coating of sand to the marsh. Wherever practicable to carry out this plan, or any portion of it, we believe that much benefit will be derived.

We shall be glad to answer by mail, so far as we are able, any inquiry in regard to these matters. We shall also be glad to receive specimens of diseased plants. We will gladly co-operate with your Association and your Agricultural Experiment Station in studying and devising means of combating cranberry diseases in so far as our time and the funds at our disposal will permit.

Two Farmers' Bulletins relating to the cranberry have been published by the Department of Agriculture. No. 176 treats of cranberry culture and No. 221 of the fungus diseases of the cranberry. These may be obtained by anyone free of cost by sending a request to the Department of Agriculture, Washington, D. C.

Dr. Shear's paper read by the secretary.

Meeting adjourned to 2 p. m.

Co-operation

E. A. RICHARDSON, Delegate from the Wis. S. H. Society

For fear that some of you will get a wrong impression of my paper, I wish to make a confession that as to the growing of the cranberry I know nothing whatever, being a grower of small fruits I was at a loss to know what I would say, or what information I could get from being present at your convention that would be of mutual benefit to us both, but as the secretary of the "Wisconsin State Horticultural Society" in his communication informing me that I was to be their representative here left me no

chance for a refusal, I thought the matter over carefully and concluded that there might be one branch of the business where our interests might be mutual, that is, in the disposition and sale of our products. We are aware that the small fruit grower may have the requisite knowledge for the location of a strawberry bed, a raspberry or blackberry field, and yet either place selected for the growing of these fruits would not do for the location of a cranberry bog, therefore it would be useless for me to touch upon these subjects.

The time has passed when we may expect to realize as much for our products by each individual grower attending to the marketing of his own products as he can by co-operation.

What has made the Oregon and Washington fruits so famous but co-operation. How else would the California fruit growers have received remunerative prices for their products but by co-operation? What has made the name of the Neosho Fruit Growers Ass'n. of Neosho, Mo., famous for their Aroma strawberry, but co-operation in placing their fruit on the market in the best possible shape?

We have in Sparta what is called the Sparta Fruit Growers' Ass'n. which has a membership of 234. The object of this association is to dispose of the products of its members, and since conversing with some of the members of the Cranberry Sales Co., I think that our methods of doing business and making account of sales to the growers are similar to those practiced by you.

Each grower belonging to the association delivers his fruit to the manager taking a receipt for the same, with the number of cases, growers name, and the grade mark of the grade to which his fruit belongs marked on the receipt, the manager then disposing of the fruit and making returns on each days sales, pro rata, according to grade. In this manner, each grower receives the same price for his fruit providing his fruit is of equal grade. All berries are inspected by a competent inspector, whose decision as to grade is final, except, when a grower is of the opinion that he is not getting justice, he may make an appeal to the manager or any one of the board of directors, but no argument is allowed with the inspector.

By placing our product in the hands of one man. to be disposed of we find that we are able to reach a more extended market and secure a better distribution, avoiding the over-stocking of any one market, thereby securing a better average price than we were able to do when each grower sold his own fruit.

Before our present organization was perfected our principal markets were Minneapolis, St. Paul and Duluth. Last season we were shipping to these places and also adding Watertown and Aberdeen, South Dakota, Grand Forks, North Dakota; Des Moines, Iowa; Omaha, Nebraska; Winnipeg, Milwaukee and Chicago to our list of car lot shipments, and the coming season we expect to make our shipments cover a much larger territory, for we find that our production is increasing, having handled about 450,00 cases during the past season against 32,000 during the season of 1903, and from present indications our fruit shipments for the season of 1908 will amount to nearly 60,000 cases.

We find that it is not only in the sale of our fruits that we are bene-

fitted by co-operation, but our members are taking a greater interest in the better methods of cultivating, picking and packing their fruits and getting them on the market in much better shape, they all feel that they have a proprietary interest in all the transactions of the association.

Our office is headquarters for all its members where they can gather and talk over the best methods of cultivation and learn from each other the most suitable varieties to plant on the different kinds of soil. We are enabled to secure our fruit packages at a much better figure when buying them in 4, 6, or 8 car lots at a time than we can when buying them in smaller quantities.

I realize that the Cranberry growers were somewhat handicapped during the late money stringency, but what would they have done if they had not been thoroughly organized and in a position to take advantage of any emergency as it might occur?

What could the small fruit growers in Sparta, have done without co-operation, during the first week in July, when we were getting from four to seven cars of berries daily, with only about one-half enough refrigerator cars to handle them, and some of our principal markets over-stocked? The larger part of our growers would have had to let their fruit lie on the vines, but our association was able to move them, and the distribution was such that it gave the grower a good fair remunerative profit for his labor.

The Ozark Fruit Growers' Association of southern Missouri and Arkansas, comprising many of the smaller associations of that territory, have done much in distributing the fruit from that section, and have been able to secure special fruit trains to carry their strawberries to the northern markets, and also secure better rates, and better methods of handling them while in transit, at their last annual meeting arrangements were made to place a competent man at the various icing stations along the route to inspect each car on arrival, noting the quantity of ice, temperature of the car, and condition of fruit at that station.

Such careful methods are bound to win, and the sooner we realize the importance of working in harmony and for the best interests of all, discarding the old selfish ideas of every man for himself, the better we will be satisfied with our neighbor and realize that the occupation which we have chosen for our life's work is an ideal one.

E. A. Richardson

Mgr. S. F. G. A. Sparta, Wis.

Mr. Richardson's talk was very much appreciated by the members and liberally applauded.

General Observations on Eastern Methods.

O. G. Malde.

The first thing to come to one's notice when visiting the Cape Cod bogs is the absence of weeds or grass of any kind as contrasted with our western bogs. This I find is due only to persistent weeding from the time the bog is first planted, and on the older bogs the weeding process is carried on practically throughout the season. It is said that it costs about ten dollars an acre to keep the old bogs clean.

The number of small bogs present is very noticeable, and this is due not

only to the fact that available cranberry land is very limited, but it has been found to be very profitable to cultivate small areas. These small bogs are quite a contrast to the bogs of Wisconsin, where it is quite evident to the observer that large areas rather than concentrated efforts on small areas is quite popular at present.

The method of culture differs greatly in Wisconsin and Cape Cod. Cape Cod growers after having their bogs cleared and turfed apply from three to five inches of coarse sand before planting. Vines are planted in hills of from nine to eighteen inches apart and forced down with a hand planter or dibble. One form of dibble used has a pistol grip into which is set a piece of iron one inch by one-eighth inches and about ten inches long. The end is slightly notched to prevent the vines from slipping off. Vines are forced about five to seven inches into the ground.

Weeding on these new bogs does not, however, represent the task it would on the average Wisconsin bog, as the heavy sanding from deep pits reduces the weed growth to a minimum, while on our Wisconsin bogs with no sand grass growth is enormous each season.

The greatest difficulty that the growers in Cape Cod encounter is in the first clearing of their bogs. The most of the area suitable for cranberries on Cape Cod are heavily wooded, much like the heaviest tamarack swamps of central Wisconsin. Dr. Marsh of Wareham, who this year completed the planting of about four acres in the manner described, estimated the cost at \$750 per acre, labor costing him about \$1.75 per day and sand near at hand.

One great advantage of the bogs on Cape Cod, is the large quantities of coarse washed sand in the sand dunes or hills that surround nearly all of the bogs.

There is not so much waste of land in the reservoirs on account of the little danger of frost from June to September. May protection together with the flowing for insects and winter protection is about all that seems to be figured on for the water supply, and a few bogs are successfully managed without any water supply. Large bogs are very noticeable for the few dikes or dams on them.

For protection against insects, however, spraying is resorted to quite generally, although there seems as yet to have been no definite system worked out and no special spraying outfit that seems ideal for spraying cranberries, has been constructed. The nearest to this was seen operating in New Jersey on the bog of Mr. F. S. Gaskill at New Egypt.

The climatic conditions of Cape Cod are quite different from those of Wisconsin cranberry districts, there being less daily variation in the maximum and minimum temperatures than in Wisconsin, as can be seen from the average maximum and minimum temperatures for May, June, July and August on the Appleton marsh at Mather, Wisconsin and at Middleboro, Massachusetts, as taken from the monthly Weather Review of the U. S. Weather Bureau.

Middleboro—Maximum 87.75 degrees F., Minimum 37.5 degrees F.

Appleton Marsh—Maximum 87.5 degrees F., Minimum 32.25 degrees F.

Here it will be seen that the maximums differed only one-fourth degree, while the minimums differed five and one-fourth degree. Hightstown,

New Jersey, had for this same period an average maximum of 89 degrees F., and minimum of 42.75 degrees F. This indicates that New Jersey may have a higher average temperature for the cranberry growing season than has Cape Cod. This seems also to be true of the humidity of the atmosphere, which seems to be somewhat higher in New Jersey than on Cape Cod, both of which are higher than the humidity of the Wisconsin cranberry district. New Jersey, which seems to have several per cent higher humidity than Cape Cod seems also to have this more emphasized by the fact that fungus diseases seem to effect the cranberry industry there more than they do the industry on Cape Cod and in Wisconsin. New Jersey also has some advantages over Wisconsin in climate, they, as Cape Cod, having little to fear from frost, from June to September inclusive.

No other special advantage, however, was noted, except that it be the nearness to markets.

Sand, is in New Jersey considered somewhat detrimental, as it is claimed that fungus diseases are found to do more damage on sanded than unsanded bogs. This, however, has not been satisfactorily proved, as being directly caused by sanding. It seems quite probable however, that after sanding and the consequent warming of the atmospheric moisture at the surface would stimulate the growth of fungus diseases in the same way that it does the moss growth on Wisconsin bogs.

It has been observed on the Wisconsin bogs that when sand is applied to the depth of from one to two inches the drainage must be lowered three to five inches, otherwise the sphagnum moss will come in faster than on the bare bog previous to the sanding. This may be true of the drainage problem on sanded bogs in New Jersey, as the water was held higher there, (where observed), than was practiced on Cape Cod where I had occasion to make observations.

The Location of a Cranberry Bog.

A. C. Bennett.

Mr. Bennett said that he had been pretty nearly around the world that wherever one found large bodies of water they found fruit belts. California had had no fruit originally. He was born on Lake Ontario the best fruit belt in the world, equal to California. There, in the hilly country he had watched the fogs roll like thunder heads bringing the moisture necessary to the production of fruit. The coldest day he could remember was ten below zero, his boots froze on his feet going eighty rods caused by the dampness of the atmosphere. Fruit grew more perfect here than anywhere else the belt extended far into Canada. Canada legislates against putting poor fruit on the market. You find fruit growing to perfection around the New York lakes especially grapes, Michigan surrounded by water grows the greatest variety. He used to think the flavor of the New York apples best. The corn is green at Bayfield, Wis., long after it is killed in central Wisconsin. In Wisconsin you see no peaches on the west side of Lake Michigan, across the lake plenty of them. Why? Because the west wind is dried out coming from the west over land, crossing Lake Michigan, it is laden with moisture. Michigan has an ideal climate for

cranberries but the opportunities are not so good. He had looked it all over and knows what was there. We must not forget that three or four miles overhead was eternal cold, which we must protect ourselves against by moisture in the air below. There are thousands of little lakes in northern Wisconsin, the winds distribute moisture everywhere. Cranberries grow near Lake Superior the best wild berries he ever saw. This shows the climatic condition. Other things bring moisture, at the equator the sun produces rain. In the afternoon as the sun works to the north rain follows it five hundred miles wide. On Lake Superior once the captain said we would have rain in half an hour, I saw nothing to indicate rain, saw a black belt in the distance, in three minutes we struck a wind from the opposite direction, which carried the water right into the air, in twenty minutes rain poured down. We have places on our continent where it rains every afternoon. Some imagine northern Wisconsin too cold to raise cranberries, no more frost there than here the small lakes protect. They can raise plums, cherries, etc., in northern Wisconsin.

There are some fine locations there, two lakes on one farm, one above the other with a stretch of bog between. He saw one location in the bend of a river no need of dams for reservoir, surrounded by a wall from four to six feet high. only very high water overflowed it, four rods of dam would protect it. This was only one feature of locations. Soil and market conditions differ greatly.

Marketing.

J. A. Gaynor.

Judge Gaynor said that three years ago he sent a pamphlet on Marketing to all the leading growers in the country. But he would take time to call attention to a few things. People that have a common interest are learning to pull together. People say it's wrong, running into trusts, socialism; let's make laws to stop it. You may as well pass laws to stop the wind, for we see that in utilizing it to better account, we realize that the welfare of our neighbor is identical with our own. Our ancient forefathers used to kill each other in war and feast on each other. Each regarded the other as his enemy. We have grown somewhat out of this ingrained fear of each other, as a chicken is afraid of a hawk. This latent suspicion against each other is what keeps union work apart. Our Sales Co. is the best organized in the state, but we have no way of keeping outside growers from dumping on the market.

We have sharper competition than before on merits. We should realize that our greatest enemy is the poor packer. No one can injure you as a poor packer, also that your greatest friend is the consumer, the man who eats the berries makes the market. Prepare the berries so as to give satisfaction. We need also better distribution. Lots of work has been done. Right here in Grand Rapids, there were weeks when Johnson & Hill was the only store selling berries. Many more would have been sold if all the stores had them.

The peddler makes us buy things we never thought of buying. The small grocery man is all right in some respects, in others not. Some buy at six dollars a barrel and retail at fifteen cents a quart. You may think

this makes no difference, but it retards consumption. You can sell double the amount at ten cents per quart. We must watch all along the line and see that no one is imposed upon. We will profit by protecting all with reasonable prices.

Mr. A. C. Bennett said that about the eighth of November he was in Minneapolis but could only find one store having cranberries on sale. This was a case of unequal distribution.

Business Resolutions, Etc.

Judge Gaynor spoke in regard to petitioning the legislature to create the office of State Pathologist saying that much good had been accomplished through the state veterinarian that more depends on the vegetable kingdom, that we should have a professor to do for plants, as the state veterinarian does for the animals.

The following resolution was adopted. The Cranberry Growers of Wisconsin in annual convention assembled, realizing what has been done by other state universities in promoting the study of plant diseases and providing remedies for the same, would respectfully ask that our representatives in the next session of the Wisconsin legislature be and are hereby requested to introduce a bill to establish at the university a Chair of Plant Pathology with such provisions and duties as may best serve to put our farmers and horticulturists in possession of the best methods of combating the diseases to which the ordinary plants of cultivation are subject.

On the best authority at hand we submit the following estimate of the crop for 1907:

New England.....	300,000 bbls.
New Jersey.....	90,000 bbls.
Wis. and West.....	20,000 bbls.

The Secretary read a letter from Mr. H. C. Irish, Secretary of the National Council of Horticulture, inviting the co-operation of the association in a broad movement of educating the public to the benefits of a more liberal use of fruit. It was moved and carried the matter be left to the executive committee.

A resolution from the Alaska Yukon-Pacific exposition commending its aims, etc., was referred to the secretary for such action as he deemed best.

It was moved and carried that a vote of thanks be extended to those who had taken part in the programme. It was moved and carried that a committee be appointed to define the nomenclature of the cranberry and report at the August meeting. The president appointed O. G. Malde, C. B. Hardenburg and J. A. Gaynor to serve on the committee.

Mr. A. C. Bennett said that he would like to say something in regard to the use of arsenate of lead, he had used twenty pounds of it. It would not wash off like paris green, it was good for the codling moth and if used at the right time was effective for the fruit worm. One should get it from the factory or agents, be sure and get the pure article. The cost was \$24 a barrel, one gallon to five gallons of water.

The meeting then adjourned.

J. W. Fitch, Sec'y.

21st Annual Summer Meeting Cranmoor, Wis., Aug. 15, 1907

The twenty-first annual summer meeting of the association was held at Gaynor Bros. bog at Cranmoor the 13th of August, 1907.

The day was perfect and the attendance was large. The morning was spent in looking over the work at the experiment station and viewing adjoining bogs.

At noon a bountiful dinner, prepared by the ladies under the supervision of Mrs. S. N. Whittlesey, was enjoyed by all, it being estimated that over two hundred and fifty were present. Dinner over all gathered at the grove for the afternoon program.

As Dean Russell of the University and Prof. Stoddart were obliged to leave early in the afternoon, it was thought best to dispense with the usual preliminaries and thus give Dean and Professor more time.

Judge Gaynor opening the meeting spoke on the subject, "What We Would Like to Have the University Do for Us."

Judge Gaynor said in part that he had not prepared any address but that our advance and progress lies in the head, the capacity to produce food and shelter. Great progress had been made in the last fifty years, all industries were based on food and shelter. Deprive man of food and shelter and he would revert to barbarism. If man does not produce he is the world's debtor, the world's pauper. He had been puzzled to solve many problems, could not see the results of teaching and preaching. The capacity in all lines had more than doubled in the last fifty years caused by the development of the head by the teacher. The modern schoolmaster was the great producer. They now make one thousand nails where they formerly made one.

We naturally turn to the University for light and assistance. It is a most laudable piece of work to take the wild cranberry and cultivate it, doing for it what our ancestors did for the buffalo and the crab apple, bring out a large variety of berries. As to the difficulties of the insect pests it was impossible for the average grower to investigate them, therefore the state must help. Two years ago Prof. Whitson promised help for fire and fruit worm but the problem was not solved yet. His hobby was to break the cranberry into varieties, early, late and best keeping. This could be done better by the state than the individual.

The following is a synopsis of Dean Russell's remarks:

Dean Russell said that he had visited the station once before, that his experience was necessarily limited but he could see much improvement in five years. The University represents intensive cultivation, intensive farming builds up the best. At one time southern Wisconsin raised wheat largely, dairying had saved it, built up the land again. Wisconsin produces fifty to sixty million dollars of dairy products. The cranberry represents intensive farming and the University was glad to help in this line.

The University stands for more than teaching, though all people do not look at it in that way. It stands first for teaching, second research, third extension. The U. S. Government had voted large sums of money for research

The sugar beet industry had developed immensely, there was nothing more thoroughbred than the sugar beet from five per cent of sugar to

eighteen per cent. This would be true with all fruits but it took time.

The experiment station had been a success. The frost problem was better understood than before. Well kept bogs were freer from frost. They must convince the grower that it is to his interest to co-operate with the station and take advantage of their experiments.

The legislature had discontinued help but he had found the U. S. Government willing to help. The U. S. Government got money easier than the states and they were aiding the states.

He was glad to find so much harmony and good feeling among the growers. Cape Cod and New Jersey were ahead on extensive cultivation but behind on co-operation.

Judge Gaynor said that he wished to especially thank the state and the U. S. Government for the work done, though sometimes we have grumbled at both. We want them to know that we appreciate the work. Every grower had become a better observer. But we would claim the privilege of grumbling. Prof. H. J. Cox read his paper concerning frosts.

Mr. C. B. Hardenburg gave a short talk on the work of the station in combating the insect pests.

Mr. O. G. Malde gave a short talk on his eastern trip.

Mr. A. C. Bennett was elected a delegate to the Wisconsin State Horticultural Society with power to name his alternate.

Mr. E. P. Arpin moved a vote of thanks to the ladies which was carried.

It was moved by Judge Gaynor that a vote of thanks be extended to the state and U. S. Government for their earnest and valuable work in our behalf.

J. W. Fitch, Sec'y.

FERTILIZERS AND THEIR USE IN GROWING CRANBERRIES.

Address of Professor Charles W. Stoddart of the Department of Soils of the University of Wisconsin delivered at the August meeting of the State Cranberry Growers' Association.

Before taking up the use of fertilizers on cranberry bogs, it may be well to say a few words about fertilizers in general and their action in the soil. A fertilizer may be defined as a substance applied to the soil for the purpose of increasing the yield of crops. It supplies one or more elements which are not present in the soil in available form. These elements which fertilizers supply are not entirely absent from the soil, because chemical analysis shows sufficient plant food material even in the very poorest soil; but they are there in forms which the plant cannot use. In order that the compounds in the soil may be of benefit to the plant they must be soluble in the soil moisture, but if they exist as compounds which are not soluble a plant cannot make use of them. Fertilizers are substances soluble in water and hence of use to plants; then why is it that fertilizers are not washed out of the soil by heavy rains? The answer is that the soil has the property of fixing certain compounds and preventing them from dissolving away in flowing water. A phosphate fertilizer, for example, is spread broadcast over the field and is dissolved by the first rain which soaks down through the soil. This solution of phosphate comes in contact with certain compounds in the soil which precipitate the phosphorus. that is they take it out of solu-

tion and hold it in the soil, so that the drainage waters do not carry away appreciable amounts. These compounds, however, are sufficiently soluble in the soil moisture to supply the needs of the growing crop, since the amount of material used by crops is very small.

There are many kinds of fertilizers, but we will confine ourselves to a few of the principal ones. For phosphorus we find rock phosphate, a material which is mined in the form of a rock or a mineral, and after being finely ground is used as a fertilizer. This material, however, is not very soluble in water, and its action ordinarily is not apparent for two years. Raw bones contain phosphorus in a form similar to that which is in the rock phosphate and is almost as slow of action. On being steamed, however, raw bones become more soluble, since it removes certain organic compounds which decompose very slowly in the soil. When rock phosphate or raw bones are treated with sulphuric acid the insoluble phosphorus compounds are changed to a soluble form, and we have what is called acid phosphate, the most common and the best phosphate fertilizer. For potash fertilizers there are the sulphate and muriate of potash, both of them manufactured compounds. Feldspar, a mineral which is found largely in granite, is sometimes used, but like rock phosphate is not very soluble. For nitrogen we have Chili saltpeter (sodium nitrate), a mineral obtained in Chili. The supply, however, is becoming nearly exhausted. For ordinary farming the use of nitrate is not to be recommended, since nitrogen can be supplied more economically by the use of manure or by raising clover or alfalfa or some leguminous crop. Fish scrap is frequently used as a fertilizer, containing both nitrogen and phosphate.

In the east the use of fertilizers on cranberries is very general. For the most part they make use of the so-called fish phosphate or fish scrap, a nitrogenous phosphate fertilizer. In Wisconsin fertilizers have not been used to any extent until very recently. Experiments on the Station plots have shown that an application of phosphate and nitrate together produce the best yields. A reference to our last two annual reports and the cranberry bulletin will give the detailed information as to the character of these experiments. Here, however, it is sufficient to say that the use of nitrate and phosphate together has practically doubled the yield over the blank plots for the last three years. Although in our published reports we recommend the use of a complete fertilizer, containing phosphate, nitrate, and potash, under ordinary circumstances it is hardly necessary to use more than potash and a nitrate compound, 250 pounds acid phosphate and 75 pounds sodium nitrate being sufficient. If these fertilizers are purchased in ton lots they will cost for acid phosphate about \$11.00 per ton and for sodium nitrate \$50.00 per ton. The freight to this point (Oranmoor) is approximately \$5.00 per ton. Used in the quantities just mentioned the fertilizer will cost \$4.10 an acre when spread broadcast. About five acres can be covered in one day, and with labor at \$1.75 per day, the total cost of applying the fertilizers will be about \$4.45. When cranberries sell for \$7.00 a barrel, as they did last year, you can see that it would not take a very large increase in yield to more than pay for the fertilizer applied; and where the yield is almost, if not quite, doubled the increased returns from fertilizing cranberries is very great.

Of course, it must be borne in mind that fertilizers will not do every-

thing for the crop. There is always the danger of frost and attacks by fungus diseases or insects. Your predatory cranberry worms are always with you and must be reckoned with.

In applying the fertilizer to the cranberry bogs it is best to put it on very early, even the previous fall, since if it is applied in the spring or early summer after the berries are set, or about the time they are setting, there will be no effect of the fertilizer until the following year. It may be a question among some of you as to the danger of loss of fertilizer if applied in the fall or very early in the spring due to heavy rains or the flooding which you give your bogs for the purpose of preventing frosts. As was said before, the soil has the power of fixing phosphate fertilizer, that is, of holding it in such compound that water-floodings will not wash it out. This is the chemical fact. Practically we have the results on Mr. Whittlesey's field where the fertilizer was applied about half an hour before a heavy rain, and at the present time the appearance of the vines on the fertilized plots is very much better than on the blank plots. Of course, the proof of the value of this fertilizer will lie in the yield of the cranberries and this, of course, we cannot tell until the crop is harvested.

Some of you may wonder why it is that a nitrate fertilizer is beneficial on cranberry bogs, since peat, that is, the marsh soil on which cranberries are raised, is used in many places on sandy or clay soils as a nitrogenous fertilizer. Peat does contain a relatively large amount of nitrogen, but in order that this nitrogen may be of use to the plants it must be acted upon by certain bacteria which work only in the presence of air. When the peat is mixed with sand or clay the air has free access to the material and hence nitrification is rapid. In the wet cranberry bog, however, air does not have free access to peat and there is little or no nitrification; hence the application of a nitrate fertilizer is beneficial.

Concerning Frosts.

Paper of Professor Henry J. Cox, District forecaster of Chicago, read at the W. S. C. G. Association summer meeting.

For the past three years, the Weather Bureau has been doing some special work in the cranberry marsh region of Wisconsin, with a view to securing data that might result in an improvement in the forecasts and frost warnings for the benefit of the growers. Observations have been taken and telegraphed to Chicago the forecast center, each morning during the past three seasons from the branch experiment station here, and from Appleton Marsh at Mather. Like observations were made at Cameron in Mr. Bennett's marsh, during the season of 1906 and work of a special character was also carried on during that season at the Fitch marsh near Berlin. The data collected thus far are considered to be of great value to the meteorologist, and it is believed that the work has already resulted in considerable improvement in the character of the warnings issued. It was hoped to complete the special work of our Bureau by the close of the season of 1906, but a delay, thru a strike in the receipt of important instruments constructed in France, resulted in the carrying of the work over the present season, after which a bulletin will be issued by the Department embracing the results of the investigations and copies be furnished to all growers.

The observation work now in operation at the Appleton marsh, Mather, is undoubtedly the most pretentious field undertaking of the kind ever attempted by any meteorological service in the world. We have there a vast number of instruments of different kinds—maximum and minimum thermometers at several points over soils of different character, heavily and thinly vined, sanded and unsanded, old sanded with thin covering of peat, sphagnum moss and wood moss—thermometers exposed at the surface and at many different elevations. We also have thermographs giving continuous records of the air temperature under different conditions, soil thermometers and soil thermographs giving records of the soil temperature at depths of 3 and 6 inches, water thermometer and thermograph giving a record of the temperature of the water in the reservoir and in the ditches, anemometers showing the wind force at the surface of the marsh and top of the warehouse near by, sycrometers showing the relative humidity and dew-point, sunshine recorder indicating the amount of sunshine each hour during the day, barograph which affords a continuous record of the air pressure, and rain gage recording the rainfall.

I am unable, of course, to present here a summary of the year's work, but I take pleasure in making a brief statement of some of the results of the observations made in the field in previous years, and especially in the year of 1906.

It is acknowledged by all growers that the greatest enemy to the cranberry crop in the state of Wisconsin is frost. There are other meteorological conditions which seriously affect the crop, such as floods, hail storms, drouths, extreme heat and abnormal cold, tho not necessarily down to the frost point. The eastern cranberry growing sections of Cape Cod and New Jersey are just as likley to be visited with floods, drouths and hailstorms as the Wisconsin marshes and especially is this so in the case of New Jersey, but low temperature conditions, as a rule, affect only the Wisconsin crop. The seasons in the east are much longer and there is not as much longer need of water protection and reflowing; in fact, the great majority of the bogs of Massachusetts are "dry bogs" so called, about 30 per cent only having water supply for reflowing, while about 50 per cent of the New Jersey bogs can be reflowed. The great majority of the bogs in Wisconsin are provided with ample means for reflowing in anticipation of frost, and it is only during a year in this state in which the temperature conditions are unusually favorable that the grower, without means of protection from frost, can hope to gather even a fair crop. Damaging frosts invariably occur in these bogs in the month of May, often in June, occasionally in the midsummer months of July and August, and usually again in September, while midsummer frosts are practically unknown in the east, and very rarely occur in the month of June. A comparison of the temperature readings near the surface in the bogs of Cape Cod, New Jersey and Wisconsin, is not possible thru lack of proper observations in the east, but minimum temperature readings on hard land at Plymouth, Mass., and Whitebog, N. J., in the midst of the eastern cranberry districts, have been compared for the months of May and September of 1906 with similar readings at Mather, Wis. In May, the minimum temperature at Plymouth, Mass., averaged 5.1 degrees higher than at Mather and 4.5 degrees in September while at Whitebog, N. J., the temperature averaged 8.1 degrees higher in May and 7.6 degrees in September

than at Mather. In 1906 the first frost which occurred at Whitebog, N. J., was a light one on Oct., 8, while there was a heavy one on Oct. 11, two to three weeks later than a similar frost in Wisconsin as usual.

The work carried on here at the Experiment Station under the direction of Prof. Whitson, the results of which have been published shows that the minimum temperature is higher on well drained, thinly vined and sanded bogs and the observations of the weather bureau confirm the results of Prof. Whitson's work. The conditions here at the Experiment station, were of course, specially created and are to a certain extent artificial and represent conditions not actually found in marshes in operation, while the weather bureau has taken observations in typical marshes preserving the original conditions as far as possible.

The coldest points on the marshes at Mather and Cranmoor were found over the moss while at the Fitch marsh, near Berlin practically no moss exists, the lowest temperature there being found at a point called "the ferns" where there was a rank growth of vegetation including grass and ferns as well as vines. The average difference between the coldest points on these three marshes during the season of 1906 was something less than 1 degree altho there were great differences on individual dates, chiefly on account of variation in nocturnal cloudiness and wind movement. Over newly sanded surfaces in these 3 marshes, the minimum temperature averaged about 5 degrees greater than at the coldest points, the difference being greater however at Cranmoor.

Our observations show that the temperature at an elevation of 3 ft. is higher than near the surface over peat soil, but very nearly the same in sanded sections. An increase in temperature from the surface to the height of 3 ft has been found by me not to be gradual; but on the contrary over various soils the temperature falls rather than rises during the first 5, 6 and inches but the change is less over moss than other soils. At Berlin the minimum temperature averages on a newly sanded and thinly vined section over four degrees lower at an elevation of five inches than at the surface and a difference of 6.5 degrees was observed on Oct. 1, 1906, between two thermometers at this point. The morning clear and cool with heavy frost on this morning the top berries were frozen hard, while those close to the ground were unharmed. This condition explains an additional advantage the Cape Cod growers have over the Wisconsin growers. Aside from the Massachusetts bogs being kept well sanded and clean, the vines are short and the uprights usually less than three inches in height, the berries being low down and lying very close to the ground, thus avoiding the lowest temperatures thru proximity to the warmer soil.

On clear cool nights the cool air settles gradually toward the ground in the morlands and if it were not for the warmth of the soil itself the lowest temperature would be found at the very surface in every case. Where the soil is heated considerably during the day, as in sanded and well cleaned sections there is usually considerable difference between the temperatures at different elevations close to the soil and even in sections heavily vined and covered with dense growth the difference is often well marked. You have undoubtedly many times observed the effects of this condition. You have often noted damage from frost where the vines and berries stood up, well

exposed while near the surface no damage was apparent.

At the station called "the ferns" at Berlin, the thermometer exposed at a 5 inch height on two cool mornings were found covered with frozen dew drops, while the thermometers resting on the surface 5 inches lower down, were absolutely dry and free from frost. Frost is generally first noticeable upon a wooden surface, and at Berlin it was interesting to observe the variation of frost on the wooden car tracks; there often was no frost whatever on the cross ties, while on the tracks two or three inches above, frost was noticeable and here splices were placed on tracks at inter-sections at an additional elevation of one inch above the main rails, it was much more pronounced. This variation is of course due to the warmth of the ground. I took numerous, personal observations at Berlin during frosty nights in the fall of 1906 and found the data most interesting. We have not the time to go into this matter further but the information will be found in the bulletin that will be printed later by the Department.

Of course you know there is a wide range in the temperature conditions on each marsh and I believe it would be advisable for each grower to know about how much difference there is between the reading of a thermometer exposed at his house and the coldest place on the marsh. On cool, clear nights the difference is found to be at Berlin in extreme cases 20 degrees, and at Mather considerably less. The average difference in "the ferns" at Berlin and the shelter on hard land was 7.8 degrees during the month of August and 9.2 degrees during the month of September.

There was always supposed to be a close relation between the evening dew-point and the ensuing minimum temperature, and many growers have been lead to believe that a correct estimate of the probable minimum can be based upon the dew-point or relative humidity of the atmosphere. This is undoubtedly true in many sections where the air is usually comparatively dry, but the results of my observations show that there is no definite relation between the conditions named. It is a fact of course that during dry clear nights the minimum temperature is likely to fall lower, because just as soon as the formation of dew sets in latent heat is liberated and the fall in temperature is retarded yet we have many instances where the minimum temperature fell more than 20 degrees below the evening dew-point and even during nights after a fog had formed and the air had become thoroughly saturated with moisture a steady fall in temperature until five o'clock the next morning has been noted. Such conditions are certainly most remarkable, and confined solely to moorland districts.

But this dew-point matter as far as the marshes are concerned is a mere theory, a nice theory of course, but absolutely impractical for you to follow. It is good enough for dreamers, but it takes something more than a dreamer to make a successful cranberry grower.

We have found that a close relation exists between the minimum temperatures over the marsh and the temperature of the soil, that when the ground is cold and other conditions being present favorable for low air temperatures frost forms easily and copiously. There is generally a gradual warming up of the soil during the spring and summer until the latter part of August, except with occasional relapse during periods of cool weather, while in September and October the reverse is the case. This is largely the

reason why frosts occurs more easily in June than in July other conditions being then shown and more easily in September than in August except that of course in the former month the nights are much longer and the period during which the temperature may fall until day break is protracted as compared with the early summer. Generally speaking, however, frost is not probable when the maximum temperature of the air in the shade during the previous day has exceeded 70 degrees. This can be accepted practically without qualification for the months of July and August. During the month of June when the soil is colder the rule is not infallible. On the mornings of June 11, 12 and 13, 1906 frost occurred quite generally in the Wisconsin bogs and the maximum temperatures were as follows:—

	Cranmoor	Mather	Berlin
June			
10	70	74	71
11	68	72	66
12	68	71	67

The frost often begins to disappear so early in the morning that it is not always observed. Several instances of this kind have come to my attention and especiall was this the case during the June frosts of last year. Unless a man is on the marsh before daybreak he cannot positively state that frost did not occur. I have known the temperature at Berlin to fall as low as 28 3 degrees at a five inch height and 32 degrees near the surface without there being any white frost apparent, yet the ferns later in the day began to wither indicating that they had been damaged and even frosted alcho the frost was not apparent at five a. m.

Approps of the relation between the soil temperature and the occurrence of frost it has often been noted that frost is much heavier on the second cool night than on the first and this is due to the reason that the soil on the second night has become thoroly chilled and has had comparatively little heat left to warm the surrounding air.

Frost does not occur here during July and August except after unusual meteorological conditions. There must be a pronounced area of high pressure in the northwest with abnormally cold weather moving eastward toward the Wisconsin area. The pressure reduced to sea level must be approximately 30.20 inches. When such an area reaches the marshes it brings with it increasing pressure and clear and cold weather, and if the clearing weather sets in about sunset with the wind going down, following a cloudy and breezy day, a condition most favorable for frost formation is present, because the sun's rays have been screened during the day time preventing the warming of the soil and the wind, causing rapid evaporation of moisture at the surface of the soil, has still further accentuated the cold. The initial temperature at sunset therefore under such conditions is comparatively low and with further rapid cooling, as is probable during a clear night and slowly rising barometer an abnormally low minimum temperature is quite likely to ensue should the barometer begin to fall at any time during the night, the wind is sure to freshen with a consequent rise in temperature. In fact the sooner affect is produced as with increasing cloudiness. It was such a condition as this which caused the severe frost of August 8th, 1904.

The problems that confront, the forecaster in this work are both general

and local. It is of first importance for him to determine whether the movements of the areas will be such as to cause clear weather in the bogs during the ensuing night when low temperature is eminent. We all know that unless the weather clears frost is not possible and it is due occasionally to the inability of the forecaster to determine whether the ensuing night is to be clear or cloudy that failures in frost warnings have been made. But it should be understood that the local problem, the great variation of the temperatures in different marshes and in different parts of the same marsh have no connection whatever with this "clear and cloudy problem."

We must look to sections outside the state of Wisconsin for the solution of the problem which has a general character, and that is work cut out for the forecaster to do and I believe that during the past few years, he has made decided progress in that direction. Regarding the local problem, the one so near to all of you, we feel that we have gone a long way in its solution, and I propose hereafter to take advantage of the data that we have gathered in a large measure (at first hand,) because many conflicting reports have come to us. In order to make these forecasts as nearly accurate as possible I have concluded that in doubtful cases, the warnings issued from Chicago in the morning, should be supplemented by later advices issued in the afternoon the latter to be based on special observations taken both in the marshes and in the northwest. This plan should serve to increase the accuracy of the forecasts, considerably and should, I hope, do away with much of the "sitting up" of the growers on doubtful nights. I believe that there will always be a certain amount of error in these forecasts, altho it should be reduced to a minimum. When I started in this work two years ago, I was advised by a co-worker that it was up to the Bureau to develop a system which would produce accurate results in all cases but such in my opinion is impossible. It is a fact, however, that when the frost is severe in any bog it is quite likely to be general, and it is usually only a light frost that is purely local. You are all aware, as I said before of the great advantage in sanding, cultivating and draining, yet comparatively few of the Wisconsin bogs have been sanded regardless of the advice of the branch of the Experiment Station here while it is not possible to find an unsanded bog in Cape Cod. The warnings of the weather Bureau must necessarily have special reference to the unsanded bogs and each grower must use his own judgment to a certain extent in reflooding and this of course will depend upon the condition of the buds or the berries. When a temperature of 28 degrees occurs and no frost is observed, and no apparent damage ensues it often seems quite puzzling to the forecaster but an intelligent grower should know what degree of cold, his crop can stand.

A complete report of the work of the field stations of the weather Bureau will be placed in the hands of the members of the Association it is hoped during the coming winter. The data is so extensive that it would be impracticable to go into it in detail at this meeting.

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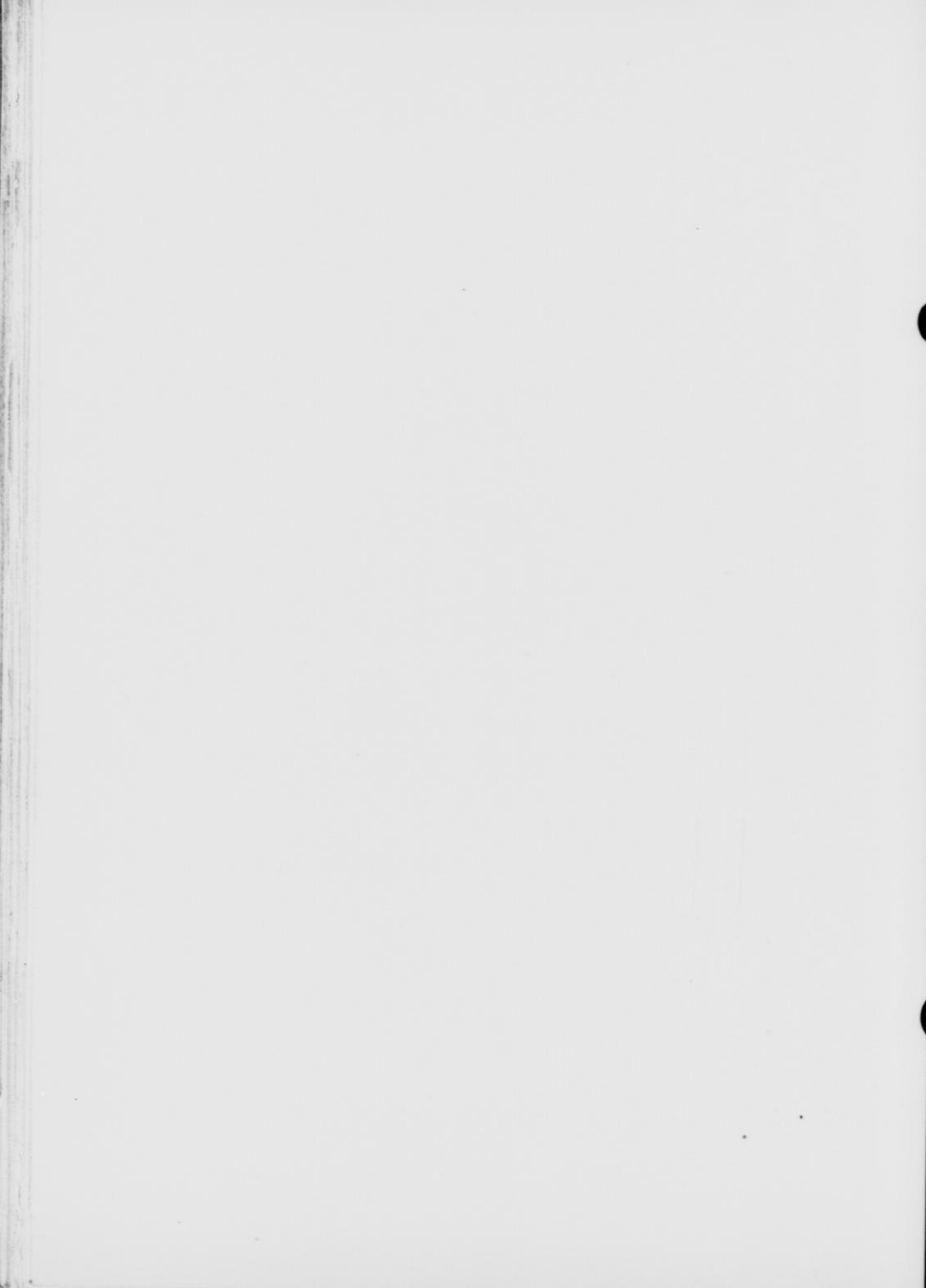
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