Wisconsin State Cranberry Growers' Association. 22nd annual meeting, Grand Rapids, Wis., Jan. 12th, 1909. 21st summer meeting, Cranmoor, Wis., Aug. 18th, 1908. 1908/1908

Wisconsin State Cranberry Growers Association
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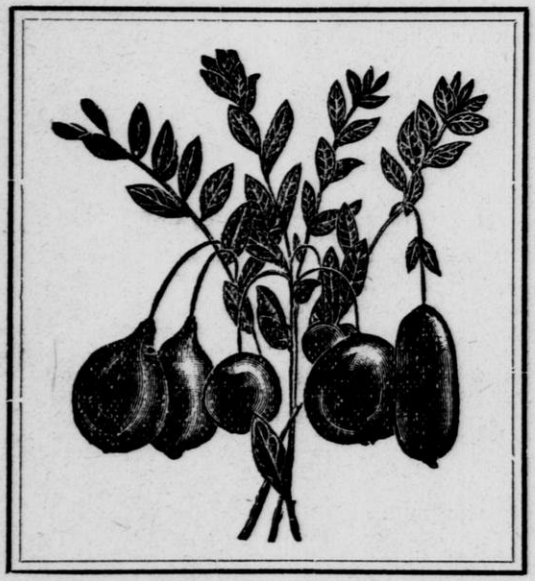
WISCONSIN STATE

CRANBERRY GROWERS' ASSOCIATION



22nd ANNUAL MEETING

Grand Rapids, Wis., Jan. 12th, 1909

21st SUMMER MEETING,

Cranmoor, Wis., Aug. 18th, 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 Twenty-first 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 1908.

Respectfully yours,

Cranmoor, Wis., Jan. 13, 1909.

J.W. FITCH, Secretary.

22nd ANNUAL SESSION

of the Wisconsin State Cranberry Growers' Association

Tuesday, January 12th, 1909
Held in Grand Rapids, Wis., Council Rooms, West Side
President A. E. Bennett presiding.

The President called the meeting to order at 9:30 a. m., a good number of growers being present considering the severity of the weather, the thermometer registering about thirty degrees below zero.

Minutes of 21st Annual Meeting.

The twenty-first annual meeting of the Wisconsin State Cranberry Growers Association was held in Grand Rapids, Tuesday, Jan. 14th, 1908, in the Council Rooms.

President A. E. Bennett called the meeting to order with a few pleasing remarks. The reports of the Secretary, J. W. Fitch, and Treasurer J. J. Emmerich being read, the president appointed Mr. M. O. Potter and Mr. F. J. Hoffman to audit the treasurer's report.

It was moved, seconded and carried that the secretary cast the ballot for the old officers for the ensuing year.

In the Secretary's address, attention was called to the valuable work of the State and United States, also to the possibilities of exploiting the proper use of cranberries through the press bureau of the National Council of Horticulture.

The report of Mr. O. G. Malde on the year's work at the station proved very interesting and called forth many questions and much valuable discussion.

The report on the Study of Insects Injurious to Cranberries during the Summer of 1907 by C. B. Hardenburg and O. G. Malde which was read by Prof. A. R. Whitson, brought out many new facts and promises of help in controlling these pests.

Mr. Charles Schlosser in an address entitled Cranberries of the Marsh vs. Cranberries of the Market, gave a very interesting and valuable talk on the necessity of the highest standard of packing to insure the best results when the berries were put on the market.

Dr. Charles L. Shear, Pathologist U. S. Dept. of Agriculture sent a very valuable address on the Diseases of the Cranberry in Wisconsin.

The meeting adjourned to 2 p. m.

The afternoon session being called to order, Mr. E. A. Richardson of Sparta, Wis., delegate from the Wisconsin S. H. Society, and Secretary of the Sparta Fruit Growers Association, gave a very interesting talk on Co-operation, telling of the great success in that line the small fruit growers of Sparta had achieved.

Mr. O. G. Malde gave a short talk on his observations while on his trip through the Eastern bogs, which gave the impression that Wisconsin was behind in the method of cultivation.

Mr. A. C. Bennett's paper on the Location of a Cranberry Bog brought out much general information as to the effect of climatic conditions on fruit.

Hon. J. A. Gaynor spoke briefly on the subject of Marketing.

It was voted to petition the legislature to create the office of State Vegetable Pathologist.

In regard to co-operating with the National Council of Horticulture for the purpose of advertising the cranberry as a food, it was voted to leave same to executive committee.

Mr. O. G. Malde, C. B. Hardenburg and J. A. Gaynor were appointed a committee to define the Nomenclature of the Cranberry.

Adjourned.

J. W. Fitch, Secretary.

Secretary's Report.

RECEIPTS.

Membership dues	$26 00
Old advertising account	8 00
	$34 00

DISBURSEMENTS.

Order No. 129 April 16, 1908 Grand Rapids Tribune, Reports	$41 00
Order No. 130 Aug. 18, 1908 H. J. Franklin's expense of attending August convention	45 00
Order No. 131 Account of advertising National Council of Horticulture	25 00
Order No. 132 Wis. Valley Leader. Invitations for August convention	2 50
Order No. 133 Gaynor Cranberry Co , expense for August meeting	15 80
Order No. 134 Grand Rapids Tribune for stationery	4 25
Advanced by Secretary for expenses for Delegate of S. H. Society, E. A. Richardson	$5 02
Advanced for postage	25 88
Total Advanced	$30 90

Due Association $3 10
Order No. 135 J. W. Fitch, Salary $80.00 less $3.10 ..... 76 90

$210 45

J. W. Fitch.

Statement of Account of Wisconsin State Cranberry Growers' Association with J. J. Emmerich, Treasurer.

	Dr.	
Jan. 14, 1908 Balance on hand		$105 98
Receipts during the year:		
Feb. 1908 State Aid		250 00
Total Receipts for year		355 98
	Cr.	
Expense paid during the year:		
Order No. 129 April 16, 1908, Grand Rapids Tribune for printing January report	$41 00	
Order 130 Aug. 18 1908 H. J. Franklin for expense of attending August convention	45 00	
Order 131 to J. W. Fitch for account of National Council of Horticulture for advertising	25 00	
Order 132 to Wis. Valley Leader for printing invitations to August convention	2 50	
Order 133 to Gaynor Cranberry Co. for labor of preparation for August convention	15 80	
Order 134 to Grand Rapids Tribune for stationery	4 25	
Order 135 to J. W. Fitch for balance due Secretary	76 90	
		210 45
Jan. 12, 1909 Balance on hand		$145 53
		$355 98

M. O. Potter, C. R. Treat and Richard Rezin appointed by the President to audit the Secretary's and Treasurer's accounts.

Election of Officers.

President—E. K. Tuttle, Mather.
Vice President—Oscar Potter. Grand Rapids.
Secretary—J. W. Fitch, Cranmoor.
Treasurer—J. J. Emmerick, Cranmoor.
Member of Executive Committee—S. A. Warner, Warrens.

Washington, D. C., December 8, 1908.

Mr. J. W. Fitch, Cranmoor, Wis.

Dear Sir:—In reply to your favor of the 3rd inst., in regard to the coming meeting of your Association and the question of cranberry blight, I regret to say that I fear it would be impracticable for me to be with you at

your January meeting. I shall be glad, however, to prepare a short paper giving you such information as I can in regard to the blight. By blight I infer that you mean failure of blossoms to set and mature fruit from whatever cause it may be due. The question is a very complex one and is without satisfactory solution at present. I shall be glad, however, to give you the benefit of the observations I was able to make the past season and I hope to be able to study this matter still further.

It may be possible for me to attend your meeting next summer. I assure you I should be pleased to meet with your Association.

Yours very truly,

C. L. Shear, Pathologist.

BLOSSOM BLAST OR BLIGHT

C. L. Shear, Pathologist in Charge Small Fruit Disease Investigation U. S. Department of Agriculture.

During the past season we had an opportunity to examine some Wisconsin cranberry marshes while in bloom and beginning to set fruit. In order to determine positively the cause of the failure of any particular cranberry plant or large proportion of such plants on any marsh to set fruit, a long and thorough series of investigations and experiments would be required. We believe, however, that from our studies and observations of the cranberry here and elsewhere, as well as from the work of many investigators of the same problems in relation to other fruits, that some general conclusion in regard to the matter can be safely drawn and accepted as a basis for action.

This subject was briefly discussed in my paper presented at your annual meeting last January, and as my recent observations have confirmed what was then said, you will perhaps pardon a repetition in substance of some of the statements made at that time.

Factors Affecting the Setting and Production of Fruit.

These factors may be roughly classed in three groups as follows: climatic conditions, nutritive conditions and parasites. These may be briefly discussed in the order given:

Climatic Conditions.

Cold, as is well known and recognized, frequently prevents the development of fruit by either freezing the young embryo or by so badly chilling it that it does not become fertilized. Any climatic influence which prevents or interferes in any way with the pollenation of the flowers, will also prevent the setting of fruit. Cranberry flowers are, in part at least, CROSS-FERTILIZED and depend largely upon the visits of insects to accomplish this purpose, hence weather conditions which interfere with the visits of insects is likely to interfere with the pollenation of the flowers. Cold, cloudy or rainy weather is therefore likely to interfere with fertilization

of the flowers not only by preventing the visits of insects but also by interfering with the development of the pollen after it has reached the pistil. A wind either dry or damp, may also interfere with fertilization of the flowers and thus prevent setting of fruit. A dry wind, if continued for a sufficient period, will evaporate the normal secretions of the stigma of the flower which are necessary to the growth of the pollen and thus fertilization is prevented. Long continued damp winds may also interfere with fertilization as they are unfavorable to the distribution and development of the pollen tubes.

Unfortunately most of the climatic conditions mentioned are at present impossible to control. Frost may be avoided to a great extent, or entirely in many cases by timely and proper application of water to the cranberry marsh. It is, therefore, eminently important that wherever possible a provision should be made for filling ditches or partially flooding a marsh at short notice. This involves the problem of storage reservoirs and other questions relating to the handling of water which it is not our province to discuss. So far as wind and rain are concerned we have at present no practical means for regulating these factors The injurious effects of climatic influences can, however, be overcome in part at least by the careful seleciton and propagation of more hardy and productive varieties of the cranberry. This work, we are glad to note, is already under way at your Cranberry Station and is progressing.

Nutritive Conditions.

The nutritive conditions affecting the setting and production of fruit are undoubtedly very important and they are also frequently obscure and difficult to determine. The quantity and availibility of the plant foods are certainly important factors, and these are necessarily very intimately associated with the water supply and its disribution and control. On a cranberry marsh having a deep peat bottom the amount of nitrogenous food available when there is an abundance of water, is probably in excess of the needs of the plant, and if this unbalanced condition of the food supply prevails over a long period, it will be likely to interfere wih the fruit production of the plant, as an excess of nitrogenous plant food is likely to overstimulate vegetative growth and thus reduce fruit production. If the growth of the leaves and vines is abnormally stimulated at the time fruit is setting it will be very apt to result in the blighting or blasting of the blossoms and young fruit.

Excessive vegetative growth, at the expense of fruit production, can, we believe, be largely regulated by better control of the water supply, by pruning the vines, by sanding and also perhaps by the application of certain fertilizers where these are known to be needed to adjust an unbalanced food supply. The control of the water is undoubtedly a very important matter. An excess of water apparently tends to excessive vegetative growth and if continued late in the season prevents the proper maturing of the buds and wood and also the proper storage of food in the plant. Thus to a certain extent the crop of one season is determined by the treatment of the plants

the previous season. From our observations we are inclined to believe that excessive amounts of water are used on many of the Wisconsin cranberry marshes, and we believe that to lower the water in the ditches in most cases, especially during the latter part of the season, would result in great improvement to the vines.

In regard to the exact amount of water necessary for the best fruit production on any particular marsh no exact rule can be given. Each marsh is a special problem to a great extent owing to the great variety of conditions prevailing on different marshes. Just how much reduction of the water in each case is necessary to produce best results must be determined by experiment in each case.

Pruning is anoher important means of counteracting in part the tendency of the plant toward excessive growth of vines. This may be accomplished in various ways. Knife rakes are perhaps most generally used for this purpose at present. The sanitary conditions of a cranberry marsh also undoubtedly affect its fruit production. It could scarcely be expected that a plant overgrown and crowded by weeds would be able to produce the highest quality or quantity of fruit. No one expects good crops of any other cultivated plant under such conditions, why therefore expect it of cranberries. In old marshes there is also usually an accumulation of quantities of dead leaves and vines beneath the plants and upon these decaying leaves and stems injurious fungi are apt to develop and infect plants and fruit. The first condition can only be prevented by removing the weeds from the marsh and the second condition can be quite satisfactorily improved by sanding. The burial of the dead and diseased matter is, however, only one of the advantages to be derived from sanding. Its influence upon the temperature of the soil has also been shown to be beneficial.

Parasites.

The part which parasites play in the destruction of flowers or fruit which is just setting is perhaps one of the least important in Wisconsin, so far as our present information on this subject extends. Your entomologsits are most competent to speak with reference to the insects. There has been reported, I believe, some injury to flowers by a snout beetle. In regard to fungus parasites, which in some localities in the East are quite destructive to very young fruit, we may congratulate you upon the fact that so far as known at present, these parasites cause a comparatively small part of the blast or blight of the fruit in Wisconsin.

Blast of fruit due to fungi could be, we believe, largely prevented by proper treatment with Bordeaux mixture, but we doubt whether there are many instances in which the amount of loss from fungi would justify the application of Bordeaux mixture for this purpose alone.

To summarize briefly, we may say, first, that in regard to climatic conditions the injury from these causes may be largely avoided by a sufficient storage reservoir to prevent injury from frost, judicious sanding and the selection and production of more hardy varieties which can better withstand the other unfavorable climatic conditions.

In regard to nutritive conditions, which we believe to be of primary importance at present, these may be greatly improved and remedied by reducing the water supply in most cases, by removing the weeds from the marsh, by sanding and by pruning, and perhaps in some cases by applying such fertilizer as may be needed to provide a more nearly balanced ration for the plants.

In regard to parasites, spraying with Bordeaux mixture may be practiced where injury from this or other causes seems to justify it.

Given a good peat bottom, the successful and profitable production of cranberries in Wisconsin will, we believe depend, largely upon proper atttention to the following things: DRAINING, CLEANING, SANDING and PRUNING, and in some cases probably spraying must be added.

Synopsis of Remarks of Prof. A. R. Whitson, (U. of Wis.)

Professor Whitson said that on account of trouble with his eyes he had not been able to attend to more than routine work, but that Dr. Shear's work had covered some points which he would like to discuss briefly. He said that the work of the station had developed until it included investigations in several lines, and that it was hoped that aid could be secured from the Federal Government for the prosecution of some of those requiring special investigation.

With reference to the conditions influencing fruiting and reliability of fruiting of the cranberry, it was pointed out that the plant is continually forced to struggle with various elements of its environment, such as frost, drought, lack of sufficient fertility, etc., and that it is not necessary for the cranberry to produce fruit every year in order to maintain itself because its reproduction is in large part secured by runners. In developing the fruiting under cultivated conditions, therefore, it will be necessary to select varieties which are characterized by greater certainty in the matter of fruiting, and are able to withstand those conditions which tend to prevent fruiting. The work of selecting varieties, therefore, as started by the Cranberry Growers' Association and being carried on now by the State Experiment Station, is of the very greatest importance and it will take several years to reach the desired results. It is imporant also that growers should have varieties that are well established, and do everything possible to keep them pure and develop a variety which successfully meets these conditions.

In regard to the nutrition of the plant, it is dufficult to state just how much growth of vines is necessary in the cranberry. The Cape Cod marshes are in such a condition that the growth is relatively little although very heavy yields are secured. On some of the New Jersey marshes, on the other hand, a very rank growth takes place also with heavy yields of berries. Practically all Wisconsin marshes would rank between these two extremes in regard to rankness of growth of vine. It does not appear probable, therefore, that our vines have an over feeding of nitrogen. On the other hand, many marshes will doubtless be improved by an application of a mixture of nitrate, phosphate, and potash at the rate of 100 pounds of

nitrate of soda, 50 pounds of sulphate of potash and 200 pounds of acid phosphate per acre. It would probably be well to apply this mixture at two times, one in the early fall and the second in the late spring.

With reference to phosphorus, it was suggested that this element could be applied in the form of untreated rock phosphate or floats at the rate of half a ton to a whole ton per acre at the time of preparing the ground for planting and that if this is done no further treatment of phosphate would be necessary for a number of years.

With reference to water supply attention was called to the fact that the past season has demonstrated that the Cranmoor region is not adequately supplied with water, but that if a suitable arrangement of reservoirs were planned, so that the water could be used over again more than it is at present, the supply even of the past year would have been sufficient. Such arrangement will require thorough co-operation and mutual helpfulness among growers. This kind of co-operation it was suggested is similar to that developing rapidly among those interested in other lines of fruit growing, of stock raising, etc.

General Discussion of Blights, Etc.

Judge Gaynor asked if any one knew when pollenization took place after the blossom opens. Prof. Whitson said it would vary, might take place immediately or a short time afterward.

Mr. Hackney wished the term partial cross fertilization explained. Judge Gaynor said that the cranberry plant was a perfect plant, could fertilize itself, but many perfect plants develope so that the pollen goes to another plant, thus combining the advantages of both plants.

Mr. A. C. Bennett said that he had studied for a long time to find the animal that fertilized the cranberry. One year ago he found a large quantity of inferior bumble bees about one to a square rod. They carried pollen on their legs, gotten from the blossoms.

Judge Gaynor said that on a Cape Cod bog of rank growth two weeks of foggy weather had caused complete blight. The grains of pollen adhered to each other on account of being wet and did not separate and fly out. It may be so dry that it drys up and does not form. All this requires close watching. It was hard to get cranberry men to get down amongst the vines, they always looked up, thought they knew it all.

Two or three days of dry hot wind last season caused the blight. Those who flooded saved the crop by having conditions damp at that time.

Mr. Andrew Searles thought that the small berries were caused by frost in August that they were growing well until that time. Many being short of water, did not flow sufficiently, and the berries did not grow.

It was the opinion of some of the growers that the stems of the blossoms were affected as they appeared dry.

Mr. Malde said that when he was with Dr. Shear, who was looking for blight, they saw some of these dried stems and took them to the station, where a careful examination showed it to be the young growth changing into bark.

Most of the growers reported a very heavy blossom and that the earlier blossoming marshes suffered less from blight. M. O. Potter stated that his son took good care of his marsh in flowing and draining that the buds had started early but not as early as Bennett's. On the contrary his sons marsh had been kept dry for the purpose of weeding. that when his was starting to grow it looked dead and he told him he was ruining it. had better turn the water on, it started two weeks later than his but did not suffer from the blight though the berries were not as large as usual.

There seems to be good grounds for believing that the three days of hot dry wind before referred to great damage to the blossoms in a susceptible condition at that time. Prof. Whitson suggested that if the growers would keep diarys as to the progress of growth, weather, etc., these facts could be better determined.

Mr. Richard Rezin thought the cause was a large loose bud caused by too free use of water for frosts the proceeding August, that the bud should go into the winter. hard and compact.

Most of the growers considered the blossoming very strong. Mr. A. E. Bennett stated that a good share of the berries blighted after being formed. Mr. A. C. Bennett stated that in case of lack of fertilization, the blossoms stayed on longer, that the fig without fertilization grow to small size. then fall off, and that there was more in fertilization than we have ever thought of.

A brief statement Cause of Short Crop by O. G. Malde, Backwardness of Season of 1907, so called blight, which might be caused by non fertilization 60 per cent. Of the forty per cent left a further loss of ten to forty per cent by insects. Smaller size. There might have been the same number of berries as last year. Mr. James Gaynor once remarked "That it didn't take a much bigger berry to be twice the size of another." Meeting adjourned to 1:30 p. m.

Report of the Work of the Cranberry Experiment Station for 1908
O. G. Malde.

Afternoon session called to order by President Bennett at 1:30 p. m.

The past season has been a very unfavorable one for experimental work and also for the crop production. Of this latter fact, however, the grower himself is painfully aware.

The cranberry crop of the state appears to have been about seventy per cent of that of 1907 and about thirty-five per cent of that of 1906.

The crop harvested on the Experiemnt Station was the smallest in its history, since under control of the College of Agriculture. Nine barrels of berries were marketed of the 1908 crop and one and one-half was kept for winter storage at the College. This includes the berries from the small nursery sections.

The backwardness of the season of 1907 undoubtedly had considerable influence on the past season's crop, as it probably left the terminal buds less matured for going into winter quarters than they normally are, and they

would in that case come out in the following spring in that same weakened condition. It can readily be seen that if this was the case, the vines at blossoming time would be more susceptible to the "blight." Whether that be caused by atmospheric conditions or fungus attack (if caused by atmospheric conditions it is probable that the cause is improper pollinization.)

During February it seems that the station became uncovered by heavy thaws and the water settled away leaving the vines badly exposed when some of the severest weather of the month set in, and lasted for some considerable length of time. Nearly all of the old vines suffered badly during this period of exposure and to add to the severity the parts that had been pruned and had not received any application of sand within the past seven years, having had their roots badly disturbed, the result was that about ninety per cent of these vines were killed. The station nursery suffered severely from the winter killing, this being chiefly top killing. Such parts as had been sanded in March, 1905, viz. Section E. the east half of Plot 1 and all of Plot 3, Section F Plot 4 and 5, though pruned as severely as all other parts of Scetion E and F apparently suffered no killing of vines, though the crop was very light as should be expected the first year after severe pruning. The inference to be drawn from this is that severed pruning of matted vines is detrimental if poor protection is afforded them the winter following, while on well kept bogs where the runners have a covering the vines do not suffer, and the sand serves as an excellent protection for the mass of runners which it covers.

The crop this year was secured from the younger plantings and the yields were about fifty-five per cent of the crop of 1907. For the main cause of this shortage from the young vines which should really have yielded better than the previous season can be attributed chiefly to the so-called "blight" which was very severe, running as high as eighty per cent in some instances. The insects were also the cause of some of the shortage, though this was found to be a much smaller per cent by count than would appear on general observation.

The station did not suffer from the early May frosts, though some damage was done to the bogs about the state, and especially is this true of the wild marshes of the state, which this year bore scarcely any fruit.

The fertilizers test scould not be duplicated at the station this season, and therefore no report on this is necessary. No record of yields from the fertilized plots at Mr. Bennett's or Mr. Whittlesey's were secured this year, though early observations of the growth of vines showed the same results as reported for 1907.

Our test with the pumping of water onto one of our experimental sections did not show up in the yield this year, as the vines were badly winter killed and the remaining vines were in very poor condition. The dryness of the season has made it apparent that to a certain extent it may be to the advantage of the growing crop on well drained and sanded bogs to raise the water to the surface at intervals throughout the season.

Throughout the season the records of temperature of the air and soil and the daily dew-points were continued as in the past seasons. These

records have not yet been compiled but a brief summary of them used in connection with data secured from bulletin Q of the U. S. Weather Bureau has enabled us to plot a curve for the annual mean temperature and the annual mean rainfall for the period of years between 1871 and 1908. It is very evident from the curves thus plotted that climatically the last few seasons have been rather abnormal. The year of 1906, when we secured our very good crop, shows an annual temperature several degrees above normal, while the season of 1907 is shown to have been the coldest since about 1885, when the mean was 41.4 degrees while in 1907 it was 42 6 degrees, normal being 45.5 degrees. The curves for the rainfall show no radical fluctuations since 1901 The past few seasons also including the season of 1908, which we have considered rather a dry one, shows nearly a normal rainfall. The reason for its appearing to be a rather dry one is perhaps that the rainfall was not so distributed as to be available when most needed for the production of the cranberry crop. It will be necessary to plot curves for the individual seasons in order to be able to more fully demonstrate the actual distribution of the rainfall and also of the general fluctuations of temperatures during the growing season. The plotting of such curves may also greatly assist us in finding reasons for the occurrence of the so-called "blight" which, it is becoming more evident as the study goes on, is probably caused by imperfect pollinization. Especially may this be true in the blight of the very small berries, while in the larger berries, which we have also considered as blighted, may be the work of fungus.

The tests with killing moss were duplicated the last season and the conclusions drawn from the experiments in 1907 were verified, viz. that the application of a solution of fifteen pounds of common salt to fifty gallons of water, or approximately one pound of salt to three gallons of water, applied by means of a spray pump to young wood moss early in May and again some three weeks later is very effective in killing this same moss.

Through the courtesy of the American Steel and Wire Co. we secured a thousand pounds of iron sulphate to use in test on the killing of weeds, and this was carried on throughout the season. No conclusive results were obtained, however, but it is evident that a solution of sufficient strength to kill grass by spraying or sprinkling cannot be secured, though a twenty-five per cent solution sprayed on ferns and false sun flower (pitch forks) is shown to be very destructive to those plants.

Iron sulphate was also used in an experiment for killing weeds and algae that are a nuisance to our waterways. This was started rather late in the season, and no statement can be made until further trials in earlier parts of the season when the plants are more tender. It may be said, however, that we have hopes of this turning out successfully. Furthermore, it may be well to state right here that such a method of killing the weeds or algae means death to the "mud minnows" which are so plentiful in the ditches. Copper sulphate was also tried in the killing of weeds and algae with results much similar to those stated above. The much greater cost of the copper sulphate over that of the iron sulphate, however, makes us hesitate to recommend trials with that material.

The paper of Mr. Charles L. Lewis Jr. of St. Paul, Minn., was read by Mr. E. C. Lewis of Chicago, who in a few interesting words told how he had become interested in the cranberry business, and was with his brother, Judge Charles L. Lewis, developing a bog in northern Wisconsin, on the Cape Cod plan under the leadership of Charles L. Lewis Jr.

Charles L. Lewis, Jr.

In consenting to write a paper for the meeting of the Wisconsin Cranberry Growers' Association, I took upon myself a more difficult task than I at first supposed. Having spent a summer at the cranberry experiment station at Cranmoor with Mr. Malde and Mr. Hardenberg as constant associates, I have been asked by your Secretary to note some of my observations for the possible interest of the members of this association.

I went to work at the experiment station with the object of learning as much about the cranberry business as I could in a short summer of three months. I had in mind at all times the fact that I fully intended to go into the business and with this in view I endeavored to gather such information as would be helpful in the development and conduction of a cranberry marsh.

It may be well at this point to relate what attraction there is in the cranberry business that induces one to put his life work into it. The factors that appeal to an outsider are in brief: health, independence, the kind of work, and the prosperity of a cranberry grower. The out-door life contributes to the health. The manner of living, the locations of one's interests and the fact that a grower is his own master, gives independence. The work is intensely interesting, speculative in a sense, and under careful guidance progress can be traced with the eye. Prosperity is bound to come to one who pursues the business with love, patience, energy and unselfish ambition.

To the uninitiated the cranberry business appears quite simple. At a glance an outsider pictures a grower as owning a large track of land covered with fruiting vines. A reservoir, a few ditches, a good man, a building or two and a little money; perennial vines, cranberries at eighteen cents a quart, one hundred barrels an acre, ten dollars a barrel, one hundred acres, and the dreamer pictures his annual income up in the thousands. This is the point of view seen by an inexperienced man. But the first step into the practical side of the cranberry business convinces the investigator that his path is not strewn with roses. It is soon discovered that a successful grower must be familiar with all the branches and details of his business. Included in these are the careful study and observation of weather conditions, the knowledge of the rudiments of engineering, the study of botany and soils and the elements of entomology. One soon learns that the cranberry business cannot be conducted successfully as a side issue. It must be the most important and uppermost issue in the owner's mind. It demands his undivided attention during the summer months and his interest and guidance at all times.

One of the first points that an investigator learns is, that location is the most important factor of all in the establishment of a cranberry marsh. An ideal location includes a constant water supply, proper soil, drainage, sand, and accessibility to market. A combination of all these factors is rarely found, one or more being absent in most cases. In the Grand Rapids district the water supply and the sand seem to be the weakest factors. In this locality water is almost entirely supplied by the summer rains and held in readiness in the reservoirs. The growers are forced to depend to a large extent on the character of the season for flood water. A long drought followed by two or three successive frosts will exhaust the water of the average grower in this region, and after such a period of cold, luck plays a great part in the outcome of a man's crop. Rains may come and relieve the situation, if not, the crop must suffer. This was the outcome at numerous marshes last fall.

The question arises, what can be done to increase the water supply or decrease the need for water during the summer months? It is not in the power of a man to run the weather to suit, and hence the actual amount of water cannot be increased. But it has been demonstrated that the water on hand can be distributed differently and in a way that it will fill the demand easily. This has been brought about partially by the use of sand, the greatest aid to the cranberry grower in the east. Every Wisconsin grower has heard of the great cranberry bogs of Massachusetts and New Jersey. A marsh of two hundred acres, yieling eighty or one hundred barrels per acre is no uncommon thing. As to whether Wisconsin has the same possibilities of the east and as to whether cranberry culture in this region can be brought to the same degree of perfection that is found on Cape Cod, I am not prepared to say, but I do not hesitate to state a few conclusions reached after my summer's work. By the use of sand minimum temperature at the surface of a marsh can be raised from four to ten degrees. This has been conclusively proven on many eastern marshes and at the experiment station at Cranmoor.

A difference of four to ten dergees in the minimum temperature on marshes in this section would do away with the necessity of flooding at least 50 per cent of the time. In other words, sand can be substituted for water and water may be thus conserved for the extreme cold nights of late August and early September. Sand has other benefits aside from its power of heat radiation, viz., a decrease in the number of floodings would result in drier bogs, a condition striven for at all times in the east. A second means of decreasing the demand for water, which has been found very practical and profitable by a few progressive growers, is the cutting down in size of the marshes and the practice of more intensive cultivation. The less productive plots have been abandoned and the water, labor and capital formerly allotted to them have been transferred to the most promising areas with the result that the owner has realized an income over and above the former income when attempting to run a larger marsh. A small marsh has other advantages over a large one. It is less difficult to superintend, easier to harvest, and the same amount of attention by the owner produces greater results.

New methods of cranberry culture can only be introduced gradually and to the average grower the additional returns appear too distant to warrant the necessary expense involved. But, if Wisconsin is ever going to be on a level with the eastern country, the yield has got to be improved 500 per cent, and this can only be brought about by the adoption of new methods in cranberry growing. This means the cutting down in size of the marshes, and concentration of labor,and capital, the use of sand as protection against frost, the practice of clean culture, and the combatting of the cranberry insects which have been very destructive in this state.

The men who have been and are still spending their lives in the interest of the cranberry industy of Wisconsin have done a service that cannot be overestimated. They are the older men of this association and to them the younger men are greatly indebted. They have been through many severe struggles with the problems of the cranberry business, and they have handed down to the young men and the new men the valuable benefits of their experience. A man entering the business in this state at this time has countless advantages over the man who dug all these things out for himself. He is the man to take up the work where the veterans have dropped it and it is his task to improve it as much as they have improved it.

A few growers in this section have begun to reconstruct their marshes under modern methods and without doubt others will follow when their success is assured. Eastern methods in every particular are to be tried out on a marsh now under construction at Minong, Wis. It will be the first marsh in Wisconsin developed on the eastern plan and the outcome may be watched with interest by other growers. The proprietors of this marsh are convinced that a start of six acres is ample for the first year. Additional plantings can be made when desired, but no more than eight or ten acres will be planted in any one year. It is thought that six acres of young planting is all that an average grower can manage properly in one season. On this marsh the vines are to be dibbed in, one ton per acre on peat bog, which has been scalped and covered with four inches of sand. Weeding will be practiced and it is the aim of the owners to establish a marsh typical of Cape Cod, Mass.

The methods to be adopted in the development of this marsh are those advocated by the experiment station at Cranmoor. This, as you are aware, is the only state cranberry experiment station in the world. It was established on petition of certain members of this association to investigate and experiment with the various methods of cranberry growing, determine the methods best adapted to Wisconsin, and aid the surrounding growers by the free giving of the acquired knowledge. The work of the station comprises: the study of weather conditions and the issuing of frost warnings to the growers, the selection and determination of the best varieties of cranberries, the advisability of sanding and clean culture, the study of drainage, the methods of planting, the problems of flooding, and the measures of combatting the enemies of the cranberry, insects in particular.

The experiment station is not appreciated in this community as it should be. The growers want too much. They expect the station to carry

on all the work that has been mentioned above and besides they want Mr. Malde, or Mr. Hardenberg. to come around and tell or show them individually how they may improve their marshes. Mr. Malde is the busiest man in the country and always has a hundred and one things on the waiting list. During the last summer at the station there were more visitors from Washington, and other distant places, than there were from the neighboring marshes. Growers should show more interest in the work of the station, and should visit it as often as possible. It is certain they are always welcome, and they will profit much if they keep in touch with the new ideas that are continually coming up. The greatest compliment that can be shown to the superintendent of the station is by showing interest and appreciation of his work.

In closing this paper I want to say that I am not trying to criticize or dictate to any one. I have simply tried to note my observations and the benefits of my summer's experience. for all of which, I am greatly indebted to the members of this association. After having learned what I have about the cranberry business, and the life of a cranberry grower, I am more determined than ever to become actively engaged in what appears to me as one of the most desirable forms of business a man can engage in.

Ditches, Dams and Sluices
A. C. Bennett

The right and the wrong way of making them. If you take a square piece of board and saw it across from one corner to the other you make of it two right angle triangles. Place these pieces of boards in an upright position on a table so that the newly sawn surfaces will face each other and you will have the correct outline for the inisde of your ditch. move them apart as far as you desire the width of the ditch to be and make the ditch straight. This gives to the sides of your ditch an exact angle of just forty-five dergese making the ditch so it will carry off water fast when full and drain fast when it is needed and at other times move the water slowly.

The banks of such a ditch will never cave in and your pickers can tread on their edges. I have had them stand fourteen years years without being affected in the least by freezing and thawing and they remain perfect today. If you dig the sides of your ditches straight up and down the frost will expand them and throw them over in towards the center of your ditch and in time will close up your ditch and the pickers treading on their edges, help to fill them up or the running water undermines them and makes the ditches crooked.

To make such ditches straight and keep the slant true is a very difficult job. I invented a frame which enabled my men to do it quickly and exactly and two men took out their second rod of four foot ditch in exactly eight and one-half minutes at the rate of seventy rods a day.

I took two straight edged boards sixteen feet long and made a trough of them by nailing one edge to the other. Then I fitted boards in the ends and in the middle making a pig trough with a division in the center. Then

I made another trough in the same way. Then I turned them bottom side up, and on their ends I nailed strips of boards six inches wide which were long enough to hold these troughs the distance apart that I wished the ditch to be cut. I then nailed small upright posts in the center of these cross pieces six feet long. letting one end of the posts go six inches below the cross boards and sharpened them at both ends and the frame was finished. Now set up a single row of stakes in a straight line where the center of the ditch is to be and two men will quickly place this frame in range with the stakes and press it down level and cut out the sods and haul them over to the side where wanted. the outside edge of the board forming a straight edge by which to build the dam. Two men again raise the frame and move it ahead placing the rear post in the hole that was made by the forward post and then pushing the forward one down in range with the line of stakes. No lines to bother with either for ditch or dam and the sods taken out are exactly the right shape to form the dams which should have exactly the same slants on their sides as the ditches would have if turned bottom side up no matter how wide the ditches and dams are.

If you place a board in a running stream and lay it flat on the surface. on bottom or top it will float up if you place one end of it on the bottom of the stream and gradually raise tthe other end you will find as you raise it that the pressure on the board increases until it stands at an angle of forty-five degrees where it is bound down with the greatest force; bring it to an upright position and the binding down force is lost and the board floats up.

Slant your dams at an angle of forty-five degrees and you find them down with the same force when you let water on them that the board was held down with water.

Nature slants the shores to all our ponds, lakes and streams unless they are made of solid rocks.

Sluices

I am a crank on sluices. All my first efforts in that line were failures I read and tried what others recommended and even bought a book an inch thick that treated only of dams and sluice ways by an engineer who had been in the employ of Uncle Sam but finally I went to Berlin and examined a sluice on the marsh of Mr. Hamilton which had stood proof against floods, muskrats. minks, craw fish and mud turtles. frost and heat for eleven years and remained as good as new, although the dam on both sides of it was honeycombed with muskrat holes. This sluice was ten or twelve feet wide and at times carried a large volume of water. at other times hardly any. I examined it thoroughly and what I could not see Mr. Hamilton explained to me.

Since then I have put in nine sluices across a running stream without making a coffer dam except for two of them. One of these holds water seven and one-half feet high and the other is rigged for six feet and sets the water back for over one mile. These sluices are eight feet wide some of them are built on sand and others on clear muck fourteen feet deep, one of them has muck under it that I did not reach the bottom in with shiplap birch spiling sixteen feet long not one of them has ever been washed out or

taken out except to enlarge it during the last ten years. I have many others built on the same priniciple which are holding equally well.

To make this kind of sluice.

1st select four straight edged boards four feet longer than you wish to have the inside of the sluice be and eight inches wide.

2. Nail two of these boards together as you would to make a pig trough, nail thoroughly.

3. Nail the other two in the same manner.

4. Measure off on these the width of your sluice outside to outside so that you can locate the position of the sluice when placed in the center across these boards.

5. Prepare spiling with straight edges enough to fill the space inside these lines tight.

6. This spiling should be long enough to reach within one foot of the bottom of the muck not less than two feet long in any case.

7. Sharpen the spiling carefully so it will drive straight.

8. Nail one of these spiling firmly to the wide side of one of these boards or the side that will give you the greatest width to nail to, nail it just even with the upper edge of the board.

9. Nail another at the mark near the other end of the same board, trying your spiling to see that they fill the space full using dry spiling so it will swell tight.

10. These two outside pieces of spiling should be narrow enough so they will drive down easily.

11. Nail the other trough on to these two pieces of spiling very firmly and if properly made it will leave a space between the boards to be filled in with the spiling.

12. Place it in the bottom of the ditch across the ditch where the center of the sluice should come in an upright position and drive gently on these two spilings until the top of the boards are as low as you want the bottom of the sluice to be.

13. This should be placed for the center of the sluice to rest on which gives a foundation seventeen inches wide. The boards beneath it act as guides to keep the spiling in place while being driven down so there will be no cracks under the sluice

14. Fill in the rest of the spiling and drive them down gently and evenly.

15. Use longer spiling on the outside so it will come up as high as the top of the side planks of the sluice and fit tight up to the sluice IN ITS CENTER and extending two feet each way out from the sluice.

16. Lay one of the bottom planks on the bottom thus prepared and with its straight edge so arrange the bottom that the front and upper end of the sluice will be one or two inches lower than the end where it runs out so that the water runs up hill a little to get out yet so low that it shall be below the botttom of the ditch at all times. If the water was to run down hill to get out of the sluice it would dig a hole in the muck that would be layer and layer as time went on and make a good hiding place for rats and minks to begin operations. They always like to work up stream so as not

to be sucked into the hole they are making. They like to have it easy to get out of.

17. The bottom of the sluice or ditch should have been previously packed tight with clean muck tightly driven or pounded down tight as possible and at least six inches to one foot deep, use nothing but clear muck and small stones. The bottom of the sluice should be low enough so as to be always entirely submerged in water.

18. Place a hard wood plank at the ends of the sluice front and rear, six to eight inches wide, turn them on edge and press them down until they are level with the bottom of the sluice and let them project out each way from the sluice from one to two feet.

19. Spike the bottom of the sluice on to the edge of these cross pieces and the broad center piece and as you do so continue to pound the muck down under the planks and see that no hole is left. The muck should be moist but not wet.

Across the front end of this bottom, nail a board firmly, as long as the inside of the sluice is to be and two feet wide or two one foot boards.

20. Baten the bottom planks on the inside of the sluice with boards that fit tight against the front board, leave no leaks anywhere.

21. Put a botten along the edges of the planks to securely spike the side planks on too.

22. Saw off the side planks so that both ends shall slant from the bottom towards the top of the sluice at an angle of forty-five degrees the same as your dams.

23. This gives the ice a chance to slide up on them and leaves nothing for the ice to get under and hitsout the sluice and gives a chance for the ice to pile on and hold the sluice down.

24. On the inside of the sluice nail on each side of the sluice a board two feet wide with a slant corresponding to the side planks for to fasten the guides for the sluice boards and to hold the side plans in position.

This should run eighteen inches or more above the top of the sluice to receive the cover for sluice boards.

25. Place other upright strips at regular spaces along the sides on the inside and cover the sluice with planks being careful to saw them off at an angle of forty five degrees at both ends, turning then the shortest side up and spiking them down to the side plank, never let them project over the side planks to give the frost a chance to lift on the sluice.

26. Then place some loose boards lengthwise over the top and do not nail them, the object of this being to allow the top boards to raise up with frost without pulling the lower or sluice out with it.

27. Pack clear muck all around the sluice and over the top of it not less than six inches thick and pack it in tight so as to squeeze the last drop of water out of it. Don't let anything but clear muck touch a board or plank anywhere.

28. Then pack over the muck with stones if you have them or earth of any kind.

29. I once saw some men putting in a culvert under the Green Bay railroad and they found that the muck under the track had been packed

down so hard that all moisture had been squeezed out of it till it was nearly as dry as a stone. So there was very little if any expansion by heat or cold.

30. Build the sluices high enough so that the covers over them will be at all times above the water high and dry and rounded over so as to shed the water.

31. Rig a cover over the head piece of the sluice with a hinged cover wide enough to protect the sluice boards or planks when they are not in use.

32. If the sluice is to be put in on quick sand, dig the hole if possible two feet below where the bottom of the sluice is to go and fill it in solid with muck and stones and pack down with an upright maul. Stones do not shrink or swell by frost and when mixed with muck make it very firm and will never wash out or leak.

33. Spiling put in eight feet below the sluice in the ditch and in shape to be easily taken out and put in and slooping at an angle of forty-five degrees, backing the water up into the sluice making the ice pressure inside and outside equal, might be a great help.

At Cameron, Wis. I flood with one dam, backing the water over the dams, sluices and marsh so all is held in one solid cake of ice and I do not have to be so particular about the makeup of my sluices only to see that they are tight for summer flooding.

The advantages of this kind of sluice are these:

1. The spiling is in the center of the sluice extending two feet to sixteen feet below it and two to four feet wider than the sluice.

2. The bottom of the sluice is at all times below the ground water so that any animal attempting to go under it must first dig under the front or rear cross pieces and dig its way back to the center spiling all the time being immersed in water and no animal will stay that distance from its entrance long enough under water to gnaw a hole through the spiling.

3. The packing of muck and stones especially shuts off all leakage.

4. The upward movement of the water in passing out of the sluice is in imitation of the boiling spring which never digs a hole.

5. The loose false covering of boards on top of the real sluice permits the covering over with muck and earth to expand without disturbing the real sluice and being entirely above high water the two will never freeze together.

6. The slooping front and rear of the sluice allows the ice to slide up on these slants and binds the sluice down instead of raising the sluice up.

I don't suppose I need to tell you the wrong way to make sluices you all have them.

Possibilities for Cranberry Culture in Northern Wisconsin.

O. G. Malde.

The two northern tiers of counties of this state abound in lakes and adjoining these are low lands on which in the majority of cases cranberries are found in the wild state. The low lands lying between the lakes and through which flows the outlets of these lakes usually also abounds with wild cranberries, and these low lands afford excellent sites for cran-

berry bogs, as the lowlands are flanked by hills of sand that are of a good quality for sanding. There is a striking similiarity of these regions to that of Cape Cod. In many cases the natural conditions have been somewhat improved on by the work of the beavers. These little industrious animals have in many places built dams at the narrowest points of the low lands. These dams are even now very substantial.

Many of the low lands are open marshes, others are tamarack, spruce and cedar swamps. The great advantages of these locations are, the comparatively sure water supplies, accessibility of sand, small cost of reservoir construction, and the usual ample drainage facilities. The cost of preparing bogs in the open marsh sections of this territory are comparatively small unless one undertakes to change the course of a creek in a narrow strip of marsh where a considerable expense is added. On the other hand, the cost of preparing a bog on the swamp lands is increased by the cost of clearing, depending on the thickness of the woods on these swamps.

Comparing the natural advantages with those of the present cranberry growing centers of the state everything points to a much more economic maintenance of a bog after once carefully put in, though the first cost be much greater than that of preparing the same area in our present cranberry growing districts.

As to the climatic conditions, there is no good reason to believe that this lake reigon has any disadvantages over the large cranberry districts of the state.

The records of the cranberry experiment station show that for the last five years the average number of days between the last killing frost in spring and the first killing frost in fall in the Cranmoor district is 85. The average date of the last killing frost in the spring comes on June 9th and of the first killing frost in the fall on September 2nd.

In a summary of the Wisconsin climate published in "Cimatology of the United States," Bulletin Q of the U. S. Weather Bureau we find the average number of days between dates of frost is 100, but as most of these records are taken on the uplands, it is perhaps a little high, the statement also refers to the cranberry districts of the central part of the state as having frost five days later in the spring and five days earlier in the fall than occurs on the adjoining upland. It must be remembered, however, that on the vast lowland area of the central part of the state, where the largest cranberry districts are located, conditions are such that to the local observer air drainage is apparently not much of a factor, while in the lake region with which this paper deals, undoubtedly affords excellent air drainage owing to the presence of these bodies of water and the rolling nature of the country, and also the abundance of sand in these high lands.

Local studies will be necessary to determine the degree to which air drainage enters into the problem of fluctuations of temperatures during the cranberry growing season before any definite statement on this subject could be made. But all the indications are that this region possesses at least equal if not superior climatic conditions for the successful culture of cranberries.

To summarize would simply be to say that both from the physical and climatological aspect of this region it bids fair to the development for cranberry culture.

How to Insure Keeping Qualities.
J. A. Gaynor

It is a well known fact that the keeping quality of any variety of cranberries grown in Wisconsin is better than the same variety grown in the East. Even the varieties that are shunned by eastern growers because they are poor keepers, have proved to be good keepers when grown here. Whatever may be assigned as the cause for this, it is better packing and the keeping quality of our berries that has brought them to the front; and if we learn to harvest, handle and pack our fruit so as to still further improve its keeping quality, we can secure for the Wisconsin berry a still bettter reputation, get still better prices, and a more extensive market. It is difficult to deliver sound berries at points in the South, on the Pacific coast and in the British Northwest Territory. These places cannot be supplied by eastern growers as well as it can be done by us.

What can we do to promote the keeping quality of our fruit and thereby get control of those markets above referred to? I might give you the rules for this purpose without any explanation of the facts and principles upon which the rule is based; but one is more likely to remember a rule, and more likely to act on it, if he has a clear understanding of those facts and principles from which the rule has been derived. So allow me to explain:—

All forms of life produce what is known as organic matter, and when life is gone from it, we see this organic matter go through a process of change that we call decay, fermentation, rot or putrefaction, by which it is at last carried back towards, and resolved into the primary elements from which it was originally derived, almost as completely as if it had been consumed by fire.

All the material of which the earth was composed before the creation of life, belonged to the mineral kingdom. The rocks and other minerals belonging to this kingdom may be worn away by the elements, but they do not rot or putrefy.

The soil that covers the surface of the earth is composed of fine particles of mineral matter. Upon these mineral particles of the soil the various green plants feed and they are able to utilize this material in liquid solutions and organize it into green foliage, wood and other vegetable tissue.

But there are other kinds of plants to be found that have no true green matter in their composition, they are usually white and are known as the fungi. You have seen a mushroom, a puff-ball or a toadstool. Perhaps you have examined with a magnifying glass a little forest of mildew or blue mould growing upon a piece of cheese or a crust of bread that has been left in a damp place in warm weather. You may have examined in this way the smut on growing grain, or the blight on potato leaves known as pota to rot, or the rust on the straw of wheat and oats. These all belong

to the same class of plant life as the mushroom, and they are all known as fungi, but there are sub-divisions of the fungi (in all about 30,000 species) that are so small they can be seen only by the aid of a microscope, and are grouped under such technical names as bacteria, bacillus schizomycetes, etc.—It is not necessary for our purpose to confuse ourselves with this scientific nomenclature so, I will call all these microscopic plants fungi.

It is left to us who have no microscope to get some correct notion of fungi through the larger members of the group that can be examined wtih the naked eye. Although they all belong to the vegetable kingdom some of them would seem to constitute the link that connects animal and vegetable life. They differ from the ordinary plants of our every day observation by being devoid of the green matter known as chlorophyl. They are nearly all white like the mushroom, tooadstool and young puff-ball when growing, but turn brown or black when ripe or in decay.

They breathe like animals.—That is they take from the air oxygen and give off carbonic acid gas, just as we do when we breathe; while the green plants take from the air carbonic acid gas and give off oxygen. If you will examine the "gills" of a mushroom and compare them with the gills of a fish you will find a very striking similarity in their construction, and like the gills of a fish they probably absorb oxygen in much the same way besides producing spores.

The fungi, like animals, feed only on organic matter, while the green plants depend for their main support on mineral matter.

Very many of the fungi have, during some stage of their existence, the innate power of what looks like voluntary motion, and, if you should see them under the microscope, you would find it hard to persuade yourself, that what you saw was not animal life. When they decay they smell like putrid flesh.

This form of plant life under favorable conditions multiplies with great rapidity by simple sub-division, and by what is known as spores. The spore bears the same relation to the fungi that the seed does to green plants or the egg to the animal. Crush a dry puff-ball and you can see thousands of its spores floating away in the air. The spores of the microscopic fungi is as much smaller than these, as these are smaller than the puff-ball.

They require for their growth damp air or a liquid. They thrive well in an atmosphere whose humidity is at or near the point of saturation, and the spores of these plants will not germinate at a humidity of 75 per cent or less. The temperature at which they grow best is from 60 to 80 degrees, but if once germinated, some kinds will continue to grow in a damp air even below the freezing point, but the rapidity of their growth is greatly diminished at a temperature of 50 degrees, and is still further retarded by lower temperatures.

Why does our fruit and all forms of organic matter decay? It is all the work of the fungi.

All the fungus plants seem bent on the destruction of all other forms of life and, if they could have their way, they would kill and devour all the animals and green plants on the globe. The principal thing that pre-

vents them from destroying animals and plants is the skin aided by internal vital forces that seem to exist for that purpose. If there were no fire or fungi the surface of the earth would be hopelessly buried beneath a thick covering of dead animals and plants.

If the skin of a man or a tree or a cranberry is broken the spores or germs of some species of fungus find easy access through the broken skin, and once inside the fungus growth is rapid and the work of destruction is begun. In plants we call it rot or decay, and in animal matter we call it putrefaction, blood poison, gangreen or by some of the other names given to the various forms of contaigous and infectious diseases.

Some varieties of the cranberry have a high keeping quality while others decay very quickly. The reason for this difference is to be found mostly in the relative resistive power of the skin of the fruit. If one could shut out the germs of rot from access to the inner tissues of the fruit or stop its growth, he could preserve his fruit indefinitely.

The common methods of preserving our food from the attack of microscopic fungi is by sealing it in airtight cans or by using on it some antiseptic that will not injure us when used in small quantities but acts as a poison to the fungi. It is for this purpose we use salt to preserve our pork, creososate on our hams and bacon, and a sugar syrup for our fruits; because fungi are killed by salt, creososate or a strong sugar syrup. We dry beef or fruit to preserve it, because the microscopic fungi cannot grow without moisture and we reduce it to a low temperature because these microscopic fungi require a warm temperature. So every successful attempt at the preservation of food or fruit is a successful attack on the growth of microscopic fungi.

We may now consider intelligently the rules for promoting the keeping quality of cranberries without the ues of salt, creososate or any other antiseptic.

First: The berries should be picked when the seeds begin to turn from white to brown,—because at that time the skin has matured and is better fitted to resist te attack on fungi than if picked earlier; and because some of the vigor of growing life still remains in the berry to heal any slight injury to the skin that it may receive in handling: for when the wounds are healed it can better resist the germs of decay that are constantly seeking access to the inner tissue of the fruit.

Second: Any injury to the skin of the fruit however slight, should be carefully avoided. This is especially true of ripe berries,—because their vital power is weak or exhausted and they will not be able to heal over such injuries to the skin of the fruit, and every injury to the skin if not healed opens the door to the germs of decay.

Third: The fruit should be picked dry and kept dry,—because if the skin of the fruit is kept wet or even damp the spores and germs of fungi not only adhere to it more rapidly, but they germinate on the moist or wet surface, and may succeed in sending their hyphae, (a sort of filament or rootlet) through the skin, and once inside, the foundation for the destruction of the fruit is surely laid.

Fourth: The berries should be cooled to a temperature of fifty degrees

as soon as practicable after they are picked. and they should be kept at that temperature,—because the fungi of rot thrive best at a temperature between 60 and 80 degrees. Below sixty their power of growth diminishes very rapidly and at fifty it is quite feeble. Any temperature between thirty and fifty is good, but it should be uniform. Better a uniform temperature of fifty than a variable temperature between thirty-two and forty. The danger to the fruit is caused by raising the temperature not in the lowering of it; because when the temperature of the fruit is raised by contact with air that is warmer than the fruit. moisture is liable to be deposited on the skin of the berry. just as it is sometimes depositied on the sides of a cold pitcher on a warm day, and in that moisture the spores can germinate and penetrate the skin and enter the living tissue of the berry.

Fifth: The air in the cranberry house should be maintained at a humidity of 90 per cent.—because such air will keep the berries dry and will not afford sufficient moisture to germinate the spores. or sustain the growth of fungi. for most of them require for their growth a 90 per cent humidity.

Sixth: The cranberry house should be free from decaying material of all kinds,—because in the presence of decaying organic matter the air is liable to be filled with the spores or germs of decay and a room where decay exists has in it the conditions that promote decay.

No matter how favorable the other conditions may be, you cannot keep berries in a store room with rotting vegetables, even the so called "wet chaff" too often put in with berries under the notion that they will "keep better in the chaff" is a great mistake.

SUMMARY.

The first three rules given above relate to the perfection and protection of the skin of the fruit.

The last three are applicable to all forms of food and might be covered by the three words,—dryness, cleanness and coolness

If you wish to secure for yourselves the reputation that you are good packers and that Wisconsin berries are good keepers, you must handle the berries so as not to injure the skin. and in curing remember the three words,—Dryness, Cleanness and Coolness.

REPORTS OF COMMITTEES, BUSINESS, ETC.

Report of Advertising, J. W. Fitch

The matter of co-operating with the National Council of Horticulture for the purpose of better educating the public to the value of cranberries through their press service, was left to the executive committee, who left the matter to the secretary. The four articles and letters from Mr. H. C. Irish show the plan of the work.

St. Louis, Mo., Jan. 11, 1908.

Mr. J. W. Fitch.

My Dear Sir:—Am very sorry that absence from my desk has prevented a more prompt reply to yours of recent date. I enclose papers which show

pretty well the work which was done last year, and I think it will be continued along much the same lines the coming year. A dozen articles of interest to your people would cost $75.00 if you can prepare them. I should be glad to hear from you further. Very truly,

H. C. Irish, Sec'y.

Press Service of the National Council of Horticulture for 1908

Distribution of the press service of the National Council of Horticulture for 1908 has been attended by increased success. This was the third spring that the newspapers of the country have been supplied with weekly installments of short articles designed to teach elementary horticulture, increasing public interest in plants, flowers and shrubs, and consequently benefitting the business of dealers in these wares. Each year has shown an encouraging growth in interest among the newspapers themselves, and the service has been substantially improved each season.

Beginning March 7, 1908 a service of four articles each woeek was sent out to 3,000 or more newspapers, most of them being reached through syndicates and ready plate bureaus, but the larger daily papers of the country being mailed tthe service direct. The mailing list covered the country from Portland, Me., to Seattle, Ore Houston, Tex., was the southernmost point touched. Prof H. C. Irish, secretary of the National Council, directed the preparation of the articles, and when the first installment was distributed, an advance schedule was prepared, showing the subjects that would be covered during the seventeen installments. It was necessary to depart from this schedule in some instances, but it was followed in the main.

Accompanying this report are letters from a few of the newspapers, eighteen to be exact, that received the service, and 100 or more clippings from some of them showing how the articles were used. These letters are unsolicited acknowledgments of the value of the service, and they are from newspapers of the highest standing, including the Brooklyn Eagle, Philadelphia Bulletin, Spokane Spokesman-Review, Houston, Tex., Post, Louisville Times, Detroit Free Press, Milwaukee, Wis., Evening Wisconsin, Portland, Me. Daily Press, Lynn, Mass. Daily Item, Cleveland Plain Dealer, Minneapoils Tribune, Austin, Tex., Statesman, Cedar Rapids, Ia., Evening Indianapolis, Ind., News, Rock Island, Ill., Argus, Dallas, Tex., News, Racine, Wis., Journal, Nashville, Tenn , American.

These letters are the best proof of the satisfactory nature of our service to newspapers of this class, several hundred of which received the service direct. Smaller papers were reached through "ready print" bureaus which were glad to use the articles in their plates.

The success of this horticultural press matter at a time when the newspapers of the country are being flooded with contributions from "publicity bureaus" which seek to advertise various interests, is an excellent proof of the standing which horticulture is gaining in the popular mind. The newspapers have realized public interest in this subject for many years.

The national council service was the first to offer them authoritative gardening information, prepared in the newspaper style, and the result has been that the council's service has lessened materially the amount of inaccurate gardening information printed. There has also been created a demand for more elaborate articles, illustrated, and this demand is being supplied by several syndicates this year. Some of these syndicates used the national council's service formerly and have since found it profitable to prepare articles of their own and illustrate them. The council encourages this, for each purveyor of accurate gardening information is an ally in the cause of horticulture.

Lack of working capital, and the expense of preparing illustrations prevents the elaboration of our service to a point where pay for it could be asked of the newspapers. But it seems ample justification for our free service if we can educate the larger newspapers up to the point where they will purchase a more elaborate illustrated service, and at the same time supply a free service to those papers that would not print gradening articles if they had to pay for them. As compared with our service, a paid service would be greatly limited in scope, owing to the necessity of giving exclusive rights in a large territory to each purchaser.

It would increase materially the efficiency of our work if the members of the seed nursery and florists trades would take enough interest in it to urge upon the newspapers of their respective cities the desirability of printing the council's articles, and inform the council of the names of the papers so solicited. They will at once be put on the mailing list. Many tradesmen have advertised with profit in the papers that print the service. In the future, every effort will be made to furnish advance schedules which will be accurate, in order to facilitate the preparation of timely advertisements.

The articles distributed have been divided among the contributing associations—seedsmen, nurserymen and florists—according to the sums given. Practically no attempt has been made to supply a service except during the spring and early summer. There is room for an extension of the service to the fall, covering the fall planting of shrubs and bulbs, and to the winter, when advice can be given concerning the care of house plants the use of cut flowers, etc.

Cranberries—Mrs. S. N. Whittlesey, Cranmoor, Wis.

The cranberry is the least understood and the most abused of any of our domestic fruits. Comparatively few know their possibilities. Quite as few know how to prepare them in palatable form. The expression is common: "You need a barrel of sugar for a barrel of cranberries." This is not true. They are NOT sugar consumers compared with most fruits.

If users will make the test, they will discover that more sauce with less sugar proportionately can be made from a quart of cranberries than from a quart of any other kind of berry, and if properly made will be tempting and toothsome. A barrel of sugar will sweeten more than three barrels of cranberries. A cranberry shortcake will compare favorably with

a strawberry shortcake. Eaten raw, they are a laxative and liver tonic and, like the olive, one can cultivate a fondness for them. Cranberries are keepers like the apple, and like apples, require a cool, dry place. It is economy to buy good berries. Never stand in tin or iron ware, use porcelain, earthenware, or granite. Do not cover with cold water and allow to simmer, steep and stew over slow fire. This makes tough skins, pale, sickly pink, or dark dull red color, and gives acid flavor. Use boiling water, cook rapidly and not long.

For a good sauce, to one quart of clean cranberries, add one pint granulated sugar; one pint boiling water, place immediately over brisk fire, stirring enough to mix sugar with water and cranberries—cover, as soon as berries begin to swell and "pop," stand by and mash against kettle until every berry is broken, keep them boiling during this operation. By the time berries are all mashed, or having boiled to fifteen minutes, remove from stove and turn into china or earthenware dish. When cold, this should be a beautiful rich red, jellied sauce.

Cranberries in Europe—Andrew Bissig, City Point, Wis.

In 1902 after the cranberries were all disposed of I left Wood County, Wis., for my childhood home in Switzerland where I remained about five months. In Switzerland they have every variety of fruit except cranberries. It was surprising to me to find the people so ignorant of this delicious fruit, as there are thousands of Americans visiting European countrries. It would seem that they would call for this delicious fruit at hotels and restaurants there, but they must forget about them or know that they cannot get them there.

Not only the European people are ignorant of our beautiful cranberry but there are thousands of Americans that are just as ignorant of this fruit especially in the southern states.

It must be admitted by all people who know how to use cranberries, that they are the most healthiful fruit on earth. I have traveled a good deal in this country and very seldom have gotten a good dish of cranberry sauce or pie, and this is evidence enough that the majority of the American people do not know how cranberries should be cooked. On my trip to Europe I took with me some of our best berries to show the people there what cranberries were. In the raw state this fruit was of no use to them, but after they were properly cooked and they had tasted the beautiful sauce, they showed their high appreciation of it, so I have come to the conclusion that when properly cooked everybody here as well as in Europe would eat this fine fruit.

Cooking Cranberries—J. W. Fitch, Cranmoor, Wis.

Through ignorance of its true value, one of our American fruits is practically unknown to millions of our citizens. Many have never eaten them. Many have tried them only to be disappointed in them. Nearly

all other fruits have this great advantage over the cranberry—they can be eaten raw, while the cranbrery must be properly cooked, and that they are very seldom well cooked is very evident to anyone who knows what good cranberries are like.

Indeed, one who relishes the beautiful and palatable dishes that can be made from them, cares nothing for them as they are generally prepared. Most people's idea of them is that they are very sour and take too much sugar. True, it takes lots of sugar to sweeten the sour dishes generally brought to the table but when they are properly cooked they are more economical than other fruits, are very healthy, can be preserved or kept fresh longer than any other fruit and used the year round.

Many people eat cranberry sauce with turkey more because they are considered the proper condiment, than because they especially like them, but they are a very fine condiment for all meats.

One of the most important points in cooking them is to use only porcelain or earthern dishes, never use tin or metal and they are better the day after they are cooked, but should be kept in glass or earthernware dishes.

The following recipe will be found very toothsome: One quart cranberries, one pound of sugar, one pint of water, boil the water and sugar together for five minutes, skim, add berries and cook slowly without stirring or burning until the berries are thoroughly cooked and tender. They can also be made into marmalade that can be sliced with a knife. Candied, they can hardly be told from candied cherries.

It pays to buy the best berries and growers are beginning to realize that their best asset is to educate the public as to their true value and then get the fruit to the consumer in the best possible condition.

Cranberries should be kept in a cool dry place, and when so kept will keep longer and better than any other fruit, but for keeping, one should always purchase the late varieties.

Cranberries as a Daily Food Relish

Charles Schlosser, Chicago, Ill.

While cranberries are favorably known throughout most of the United States as a national dish in connection with our Thanksgiving turkey, for a daily food relish their many superior qualities are overlooked by the masses.

Properly cooked cranberry sauce makes all meats palatable and is delicious served with roast beef, pork, mutton and all fowls as with turkey. The chemical analysis of cranberries shows that they contain mild acid combinations which are by nature converted into alkaline carbonates in the blood and help to purify it and have a tendency to ward off bilious and rheumatic tendencies. They also aid digestion, clear the complexion and are perfectly harmless to the most delicate stomach. Most condiments used as meat relishes are highly spiced and irritate the stomach, but cranberries are a natural, healthful food, as well as a delicious relish.

They should be properly cooked. For the lack of proper cooking they have been abused and condemned. Containing certain acids and very little

sugar properties, they should never be cooked in metal dishes. Only earthenware, porcelain lined or enameled dishes should be used and after cooking do not let the food stand in anything but glass or earthenware dishes. If you are prejudiced by reason of having eaten unpalatable or improperly cooked cranberry sauce try the following recipe and be convinced: 1 qt. cranberries; 1 qt. sugar; 1 pt. water. Boil sugar and water together for five minutes, skim, add berries and cook slowly without stirring or burning until berries are thoroughly cooked and tender.

They can be made into preserves and jellies with less work and time than any other material known and their splendid keeping quality will enable the consumer in remote places to buy them in liberal quantities, as the surplus may be kept perfectly uncooked by cleaning and storing in glass or earthen jars under cold water, air tight, until needed. The water should be previously boiled during cold weather; freezing does not injure them for sauces, jellies or preserves.

The report of the committee on The Nomenclature of the Cranberry read by Mr. Malde, caused so much discoussion that it was deemed advisable to increase the committee by adding, M. O. Potter, A. C. Bennett, Clarence Searls, G. W. Paulus to the old committee (O. G. Malde, C. B. Hardenburg and J. A. Gaynor), and have it report at the August meeting.

In regard to the further advertising Hon. J. A. Gaynor thought that prices were too high now and it was not good policy to do anything that might increase them. Mr. S. N. Whittlesey said that he felt that it was poor policy to raise them to have them poorly cooked, etc., thus wasting them. It was moved and seconded that the Secretary attend to putting in four articled at a cost of $25 00 out of funds other than the state aid which was not available for this purpose.

Mr. Andrew Searles said that as a number of our growers were suffering from lack of water he felt that any money on hand could be best spent in testing the possibilities of getting water from beneath the first layer of clay that he felt quite sure there was a supply there a three or four horse engine could pump from to supply sufficient water for flooding purposes. It was moved, seconded and carried that a committee of four be appointed to confer with the officers of the station for the purpose of making a test of the possibilities of this means of obtaining water. The President appointed the following: A. Searles, M. O. Potter, J. A. Gaynor and C. R. Treat.

There being no further business the meeting adjourned.

J. W. Fitch, Sec'y.

MEETING AUGUST 18th, 1908.

The twenty-first annual summer meeting was held at the Gaynor Bros. bog, Cranmoor, Wis., Tuesday, August the eighteenth, 1908. The day was very fine and many of the growers from Mather and other points

were present. As usual the morning was spent in looking over the experimental station where Mr. Malde explained the results of the different methods employed. The station had suffered quite severely from winter killing hence the crop was light. A bountiful dinner was served at noon under the supervision of Mrs. A. E. Bennett and Mrs. S. N. Whittlesey assisted by the resident ladies. That it was thoroughly appreciated, was evident from the many complimentary remarks made by those present.

After dinner all gathered at the grove to listen to the speaking. In a few well chosen words President A. E. Bennett welcomed the guests and said that in order to have more time for the speakers the ordinary business would be omitted. Prof. Franklin, formerly of Amherst University but at present with the University of Minnesota, who had made quite a study of the insects injurious to cranberries in the east, gave a very instructive and interesting account of his observations of these pests under eastern conditions and spoke hopefully of our being able to control them in the same way viz., with water.

Mr. C. B. Hardenburg of the experiment station said that we could not control them so easily, that our conditions made spraying a necessity. He also gave some statistics showing the great gain in crop resulting from spraying.

Mr. Malde, with diagrams, showed the range of temperatures comparing sanded and unsanded bogs which showed very plainly the frost resisting superiority of the sanded bogs.

Mr. Chas. Schlosser of Chicago spoke on the prospect of the market and thought that in spite of the business depression, prices would be good.

On behalf of the Mather district, Mr. E. K. Tuttle invited the association to hold their next summer meeting at their bog at Mather. Mr. Fred R. Barber, on behalf of the Warrens district, seconded the invitation which it was voted to accept.

The report of the committee on nomenclature was postponed until the January meeting.

After considerable debate a resolution from the Citrus Protective Union of California, asking an endorsement of their efforts to secure adequate protection for fruit, was voted down.

The Cranberry Situation in Wisconsin as Regards Insect Attack.
By Henry J. Franklin, Ph. D.

Ladies and Gentlemen of the Wisconsin Cranberry Growers' Association:

Since first I became interested in the cranberry as a cultivated fruit I have desired with a great desire to see the Wisconsin cranberry marshes, and the Wisconsin cranberry experiment station, of which we have heard so much in the East. At last my wishes have been gratified, and in the short time which has been allowed me I have been looking around and seeing all that I could see, and I have been greatly interested in everything which I have seen. It is almost presumptuous on my part to come here to address

your association, when you have other workers and growers here who have been acquainted with the business much longer than I have. My only excuse must be that I have had the privilege of being situated in the heart of the great cranberry growing region of the country, and of making a rather careful study of the cranberry and its enemies there for two seasons, and that apparently for that reason your secretary, or some other member of your association thought I might have something of interest which I could say to you. If I manage to leave with you a helpful idea or two I shall feel that I have at least done my duty, and repaid you in some measure for the honor of being invited to your meeting and for the courtesy of those who have entertained me here.

Your conditions here are so remarkably different from eastern conditions that it would not be at all surprising if my conclusions in regard to the best methods of treating the insect pests, were in some points at variance with those who have worked so faithfully for you at the experiment station here. Your peculiar conditions also puzzle me somewhat as to just what course I had better take in my discussion, but I presume that you want to know particularly what my views are with regard to the best means of combating cranberry insect pests.

I am told that you have only two insects which are generally troublesome in the marshes of Wisconsin—the fruit worm and the fire worm. In this you are much more fortunate than your eastern brethren.

Fruitworm

I will first discuss treatment for the fruit worm on Wisconsin marshes, as viewed from the standpoint of one who has studied the subject mainly on Cape Cod marshes.

If the winter flowage is held till about the 20th of May on a Cape Cod bog, no serious trouble is ever experienced from the fruit worm. I am told that it is the custom to hold flowage late here in Wisconsin, and still you have fruit worms. I am told, however, that this is considered a very bad fruit worm year here. But the injury which I have observed would be considered only average on Cape Cod. I think I may assume from this that as a rule the loss caused by this insect, is much greater on the bogs of Cape Cod than on those of Wisconsin. But the question naturally arises, why should there be any appreciable injury at all on the Wisconsin bog where late holding of water is the custom, while Cape Cod bogs are so free from injury when the winter flowage is held late on them? To my mind there can be but one answer to this question. The Cape Cod bogs are not cut up by dykes into small areas to any degree comparable with the way your bogs are divided up here. Cranberry vines are growing on these dykes and bearing fruit there, where your flooding does not reach them. Certain experiments which have been tried bear out my belief that the late holding of the winter flowage (on Cape Cod until toward the 20th of May) destroys practically all the fruit worms which have been passing the winter under water on the bog itself. If this be true, then practically all the infestation on a bog during the summer following the late holding of winter flowage must come from the upland surrounding a bog and from the dykes.

As the eastern bogs are not divided up by dykes into small areas, those outside infestation is much less in proportion to the bog area, than in Wisconsin, and in that way becomes insignificant. I need not go into more details in this comparison of eastern and western conditions, to bring you to see the reason for the troubles from fruit worm injury which you experience in spite of the fact that you constantly practice the late holding of winter flowage. You will see at once that I favor depending upon the proper use of water and right methods of cultivation rather than spraying for controlling this insect. My recommendations may briefly be summarized as follows:—

First, reduce your unnecessarily large number of dykes, and by so doing permanently reduce the source of your fruit worm infestation as much as practicable, and at the same time gain considerable ground which is at present occupied by dykes to add to the area of your bogs. I have been told by some of your growers that you have, as a rule, more dykes than are necessary for the control of the water in flooding.

Second, keep your necessary dykes and the upland immediately surrounding your bogs, cleared of cranberry vines.

It is my belief that if you will follow these directions carefully you will have very little trouble from the fruit worm. As your season seems to be a little later here than in Massachusetts you may find it advisable to hold your winter flowage as late as the first of June. You must, however, bear in mind the fact that if the late holding of water is practiced every year, and the water is held up so as to cover the vines, it is almost certain to reduce the cropping of your bogs. But under the conditions which you have here there would seem to be no necessity for holding the water up over the vines. Your bogs are so level that you can completely cover the bottom and have the water stand up among the vines without covering them, and it seems probable that such a flowage, during the month of May, would be even more effective against the fruit worm than a deeper one would be. So much for the control of the frruit worm by means of water and improved cultivation. You may object that it would be considerable trouble to keep the dykes and surrounding upland cleared of vines. If so, the only alternative which so far seems to offer the ghost of a chance of success is spraying with some insecticide. We have tried spraying experiments with a considerable number of different insecticides and combinations of insecticides and adhesives and insecticide and fungicides on eastern bogs, and I am not yet convinced that spraying can be counted as a ssuccessful or even an advisable remedy for the fruit worm, even on the strictly dry bogs of Cape Cod where the average yield and the fruit worm injury are both considerably greater than on your bogs. I am sure that I could not recommend spraying for eastern bogs with water for flowage, and those bogs have on the average, fully tiwce the yield, and probably nearly twice the fruit worm injury that your bogs have. After saying this about Massachusetts bogs, I can hardly recommned spraying for the fruit worm on your marshes and be consistent. You must consider the matter from the standpoint of averages, rather than from that of any special case. Sometimes when your crop is very large and your fruit worm injury comparatively very great,

it might possibly pay you somewhat to spray. On the other hand, if your crop is light, and your fruit worm injury also light, it seems pretty certain that your spraying would yield you a loss rather than a profit. But I want to ask the veterans among you cranberry men whether you can always, during the month of June, when the spraying must be done, if it is to stand any chance of being effective, tell with absolute certainty what sort of a crop you are going to have, unless it be already evident at that time that it will tbe distinctly poor. Furthermore, we have not yet discovered the weather and other conditions which are responsible for bad fruit worm years, and without this knowledge no one can give you sufficiently early information as to whether it will pay or whether it will be unprofitable to spray on any given year. If, therefore, you adopt the policy of spraying for the fruit worm you must, as a rule, spray every year in order to strike anywhere near an average mark of profit. So, in considering the whole question you must consider what your average annual loss from fruit worm injury is in dollars and cents. Then remember that you cannot, at best, hope to save more than three-fourths of this loss by any reasonable amount of spraying on account of the fact that both the setting of the fruit and the laying of the fruit worm's eggs stretch over a considerable period of time instead of conveniently coming all at once Consider also that spraying three times a season, (which is to be recommended if you hope to succeed at it at all) will cost you about $16 per acre for materials and labor, and that in the process of spraying those three times you are bound to crush a considerable amount of fruit besides injuring the vines somewhat. So, to sum up this matter of spraying, I repeat that you must consider the question from the standpoint of averages rather than from that of any special case, and you must count the costs. Do not understand me to say that spraying will not, in any case, pay. In fact, in some bad cases of fruit worm injury I believe it would pay to spray, but how can you tell that your fruit worm injury is going to be severe until it is too late to even hope to meet it effectively by spraying? I will say that if you wish to try the matter out for your own satisfaction, the combination of arsenate of lead (five or six pounds to 50 gallons of water), Bordeaux mixture and resin fish oil soap (five or six pounds to 50 gallons of water) gives the best promise of success of any spray which I have tried. In my experience, however, this preparation tends to cling to the fruit more or less at picking time and is in that way objectionable.

So you see that on the whole, I strongly favor the proper holding of water as the best means of fighting the fruit worm. I cannot believe that there is any reason why spraying should be more effective in Wisconsin than in Massachusetts. In fact, the condition of most of the bogs, which I have seen here, argues strongly that the opposite would be the case Reasoning from a Cape Coder's standpoint it would be necessary to, at least partially, clear your bogs of grass before you could hope to spray effectively.

The Fire Worm

In Massachusetts the fireworm is seldom, if ever, seriously injurious on dry bogs, its greatest destruction being as a rule on those bogs with deep winter flowage and scanty water supply for spring reflowage It seems

probable that two distinct factors are responsible for this state of affairs, namely; the severity of winter weather and parasites.

In the case of the dry bogs the eggs of the fireworm, clinging as they do, through the winter, to the lower sides of the cranberry leaves, are subjected to severe freezing and to thawing, and many of them are doubtless killed by this exposure. Then, again, if a bog is never flooded, parasites (small insects which are beneficial in that they are very potent factors in keeping down our insect pests) can develop and multiply normally, and so aid in keeping down injurious forms much more effectively than they can if destroyed in large numbers by an occasional flooding. These parasites are, doubtless, an important factor in keeping down the fireworm on dry bogs in Massachusetts.

I have suggested that many Massachusetts bogs might be cleared of this pest by sanding heavily in the fall, and allowing the bogs to remain without flowage for two or three winters, and by helping out these natural factors by spraying once or twice at the proper time during the summer with arsenical poisons. But your winters here are more severe than on Cape Cod, and I presume that such a suggestion could not be considered for appciation to your marshes here. On Cape Cod, the fireworm seldom becomes troublesome on bogs which are reflowed freely in the spring, and when it does become injurious on such bogs it is usually easily gotten rid of. Here again there is an apparent difference of results from the same treatment applied in Massachusetts and Wisconsin You have to flow your bogs again and again in the spring to protect them from frosts, and judging from Cape Cod experience, one would naturally expect from this that you would never be seriously troubled with the fireworm. There are one or two important differences, however, between reflows on Massachusetts and reflows on Wisconsin bogs. When we speak of a reflow on Cape Cod we think of bogs being practically entirely covered with water, there being few or no vines to which insects could cling, sticking up out of the water. Here, however, if I understand conditions aright, it is practically impossible for you to completely cover the bogs, grasses and all. Of course, if the grasses as well as the vines, on your bogs are not covered, the fireworms, driven up by the water, will cling to them more or less, and thus escape drowning in large numbers. Furthermore, I am told that you seldom even cover your vines in your ordinary reflows to prevent frost, the water as a rule being raised merely enough to partially cover them, the portion of the vines which are not covered being protected by radiation from the water. With this difference between a Cape Cod and a Wisconsin reflow explained, it is easy to see why the fire worm sometimes makes considerable headway in Wisconsin in spite of the use of the water. Furthermore, the fact that it is difficult to get water enough to cover the grasses as well as the vines on your bogs makes it seem probable that you will always experience difficulty in getting rid of this pest by reflowing while the worms are active among the vines.

The insects of the order to which the fireworm belongs agree in having four very distinct and different stages in their life histories, namely, the egg, the caterpillar, the quiescent or pupal stage, and the moth. We have

in a general way considered the matter of treatment in the caterpillar stage. Can we hope to apply treatment successfully in any other stage? It is obvious that treatment cannot be applied satisfactorily in the moth stage, as the moths appear at a time when it would be destructive to the crop to reflow. It has been attempted many times to treat the eggs by the use of water in various ways, especially by holding the winter flowage very late in the spring, with a view to either exhausting the vitality of the eggs, or to have them hatch in the water, the young caterpillars being immediately drowned thereby. This treatment has been given so many trials in both Massachusetts and New Jersey that I think I can safely say that, while in some cases it has met with some success, it must at least be considered unsatisfactory.

There remains then, only the quiescent or pupa stage to be considered further. On Cape Cod the caterpillars of both broods all come down out of the vines when they reach maturity and pass into the pupa stage among the fallen leaves on the sand on the surface of the bog, it being only occasionally that one is found pupating among the spun up tips. Experiments have shown that a flooding of two or three days will kill these pupae. For this reason I am recommending for Massachusetts bogs that, wherever bogs or portions of bogs are level enough, or can be made so by dyking to perimt it, the water be raised up among the vines without covering them, as soon as the worms of either brood have come down out of the vines and reached the point of general pupation, for about two days and a half. Of course, if the worms are very irregular in their development, and the time of pupation is extended over a considerable period of time, it may often be found advisable to raise the water in this way more than once for each brood.

I am told, however, that the fireworm in Wisconsin has a strong tendency to pupate in the vines. It is, of course, possible that this fact is sufficient to throw this method of treatment entirely out of consideration, but I am led to ask why this insect should differ so markedly in its habits as regards pupation between Massachusetts and Wisconsin. After having studied this question carefully I have been able to arrive at only one conclusion. At the time of the pupation of the fireworm, the surface of the cranberry bogs under the vines is dry in Massachusetts, but quite wet in Wisconsin. It is a natural conclusion, that the moisture of your bog surfaces here compels the fire worm to remain in the vines as a safer and more satisfactory place to pupate. Judging from Cape Cod bogs and from general agricultural principles, your bogs would give you far better returns than they do at present if provision were made for good drainage. Good drainage, besides benefitting the vines in general, would aid you greatly in approaching nearer to the ideal of clean cultivation by helping rid your bogs of many of your troublesome grasses and sedges. It could also, I believe, be made a factor in helping to control the fireworm by allowing the surface of an infested bog to become dry at the time of the insect's pupation, and thus allowing it to take its natural course and come down out of the vines to pupate on the bog surface. Of course, if the worms are allowed to work along to the pupa stage before anything is done, they will often

cause serious injury. Therefore, when the worms appear to be numerous enough to warrant it, I would recommend that you precede the treatment which I have suggested for the pupa stage, with treatment for the young worms, either by flooding (perhaps repeated if the hatching of the eggs is very uneven), or by spraying with arsenate of lead.

As I know of no other insect problem which presents features of striking interest to you I will cease tiring you with a disscussion of these matters. I am aware that there may be minor questions of particular interest to various growers here, which I have neglected to discuss. I shall be happy to answer as best I can any questions which you may desire to ask.

I thank you for your kind attention.

Comment Upon Mr. Franklin's Address by C. B. Hardenburg.

A careful perusal of Mr. Franklin's article, in which he gives us such an able description of the conditions, prevailing upon the Wisconsin marshes and those in the Cape Cod region, shows us, that at the present there is little hope for combatting our troublesome insect pests successfully. For the FRUITWORM, late holding of the water, the only successful method in the East, is apparently of no avail in our region, and spraying, judging from the results obtained in the Cape Cod district, is not sufficiently beneficial to warrant its application here, where the conditions are so much less favorable for a thorough spraying. Mr. Franklin also states, that altho this season was one of unusual severe fruitworm injury, the damage was such that it would be considered only average in Cape Cod.

The fruitworm injury this year amounted to 30 per cent of the entire Wisconsin crop, as stated by a reliable authority. This includes marshes where the fruitworm was not present at all. On bogs where the fruitworms were present in injurious numbers, the damage has amounted to from 50 per cent to 60 per cent; and on some sections as high as 75 per cent and more. Such a percentage may be truly said to be considerable, and we are anxious that it should not become "average" here

Late holding of the water is apparently not of any benefit in checking the appearance of the fruitworm. One of the reasons for this is probably the one Mr. Franklin suggests, namely the presence of too many dams, which form favorable hibernating and hatching places. The injury is almost invariably greatest near the dams, but, as the millers are good flyers, and have been seen to fly across two sections, even when not followed by the observer, it could be supposed that fruitworms found in the middle of the section, have come from eggs laid by millers which had hatched on the dams.

However, we find that, even in the center of the section, a spot, slightly higher than the area, immediately surrounding it, shows invariably a greater degree of infestation. The difference in level may be only a few inches, and such as to be hardly noticeable. To explain this on the grounds just mentioned, would presuppose that the millers, in flying across, select such spots for depositing their eggs, in preference to other. But another reason may be, that such spots, when the water is drawn off, dry

quicker than the surrounding parts, having slightly the advantages in drainage, and the heat of the sun start the pupae in their development, while comparatively dry: while those in surrounding parts are stimulated to development, while still moist. That cold water does not injure the pupae is amply proven by the fact that they will withstand a submersion of several months during the winter, but the effect of comparatively warm water upon the pupa during their development may be injurious. This may also be the reason why sanded sections are generally more infested with fruitworm than not sanded ones; the sand being dry while peat is still moist. We have therefore reason to believe, that, even with our late holding of the water, fruitworm millers hatch all over the section, and not on the dams alone. The danger of the dams is not so much in their presence as such, and the inability to flood them, as in the presence of cranberry vines with fruit on those dams. If these vines were removed, the danger would be to a great extent, eliminated, as the fruitworms, as a rule, do not travel, to hunt a favorable spot, before going underground.

As flooding during the time of greatest fruitworm activity, is found with too many dangers, we could not advise a treatment of this kind, and our only resort is spraying. Our experience with spraying on the experimental station plots, indicates, that the method may prove to be successful; if the marshes are in a condition approaching clean culture In our experiments we have been able, by three sprayings to reduce the fruitworm injury from 60 per cent to 14 per cent; the mixture being the same as that advocated by Mr. Franklin in his article. The greatest effect of spraying results when the spray is applied before the egg hatches; the poison gathering around the place of attachment of the berry to the hook, which is the place where the fruitworm generally enters. Later sprayings may poison the worm while eating its way into a fresh berry, but the chances are that it will find a spot, where there is no poison adhering to the fruit.

The presence of many dams, dividing the marsh in narrow sections, gives us the advantage in the application of the spray, over our eastern growers, as the spray can be put on with less tramping down of vines and less dragging of long leads of hose.

For the fireworm, the remedy mentioned by Mr. Franklin, as being successful in the East, namely, covering the surafce with water during the period of pupation, is of no avail here, because the fireworm, in Wisconsin, does not go underground to pupate, as a rule. But a thorough reflowage, soon after the first brood eggs hatch, repeated about a week later, so as to drown those worms which have hatched later, can be depended upon as being an efficient check: as was shown by this last spring's experience. If, for some reason, flooding is not used as a means of combating the first brood, and a second brood develops, or, if a second brood starts from eggs laid by millers, invading the bog from surrounding areas, the spraying for the fruitworm, will, at the same time, be a check for the fierworm.

Spraying is to be preferred to flooding, as a sprayed area will be protected against infestation from the surrounding upland, or neighboring bogs which have not been treated. Also spraying will check the progress of many other vine eating insects.

But, whether spraying, or flooding or a combination of both is resorted to, an essential factor toward success is an eradication of the weeds, grasses and sedges on the bogs. Only when we approach more nearly a condition of clean culture, can we hope to successfully combat the different insect pests, which at present levy such a heavy tax from the cranberry growers in Wisconsin.

Through the courtesy of the National Fruit Exchange we submit the following as the nearest estimate of tne 1908 crop at present obtainable.

Cape Cod	225,000 bbls.
New Jersey	65,000 bbls.
Wis.	12,000 bbls.
Total	302,000 bbls.

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January 1907 report now ready for distribution and will be sent to all entitled to same on application to J. W. Fitch, Sec'y. W. S. C. G. A., Cranmoor, Wood County, Wisconsin.