forgiven for having done such a thing along with our other sins.)

Thus far I have been talking of reclaiming a marsh that has seemed to be the quickest way to results, we did scalp about one half acre of vines that have small inferior berries and applied about two inches of sand and planted a better variety. This is a very much cheaper method only we shall have to wait longer for a crop but shall console ourselves with the thought we will have a much more valuable piece of ground in three years then it would have been had we treated it as we had the remainder of our vines.

We are now ready to adopt Mr. Malde's suggestion offered us some years ago to first scalp and sand at least two inches or more (we expect to put on three inches) and plant our vines on this foundation, planting our vines in rows and keeping all grasses and weeds out by hand as the quickest and cheapest and surest road to success. We have a very expensive lesson on our hands now. The past season we planted some acres in the old way spreading the vines on the muck thinking it the quicker way to get a stand of vines. I now think from comparison it will cost us at least six times as much and doubt very much if it will be as far advanced in three years as the piece that was planted in the sand, both pieces having been planted only a few days apart or having nearly an equal start.

Mr. O. G. Malde's report on the experiment station shows I think that no frost damage has occurred for several years although no flooding excepting for early May frosts has been done for frost protection and the berries have been allowed to remain upon the vines most seasons until the last days of September or some seasons until October.

The berry's growth when they can be allowed to remain upon the vines for two weeks later than is usually allowed is another item in favor of clean culture I think. Mr. Malde's records shows a growth of about 20 per cent besides the improved grades.

Our own tests have shown about the same increase in growth.

Yours truly,
A. Sears.

———

POLLINIZATION


"Pollination of Forced Tomatoes."

It is a well known fact that greenhouse tomatoes do not set fruit freely during the mid winter season. The only satisfactory method for correcting this trouble is to fertilize them by hand.

It is here desired to emphasize the importance of pollinating carefully and thoroughly. In house grown tomatoes there is often a considerable percentage of one sided fruit and of small fruit which detracts greatly from the value of the crop.

The general inferiority in size of winter grown tomatoes can un-
doubtedly be attributed to the comparatively short periods of sunshine at that season of the year. On the other hand the results of station investigations along this line show that imperfect pollination is an important cause of one sided and small fruits.

While working at the Cornell station in the state of New York, W. N. Munson found that the amount of pollen used may have an important bearing in determining the size and form of the fruit. In the winter of 1900 and 1901 while crossing tomatoes two stigmas in the same cluster of flowers were given different amounts of pollen. The first was given a very small amount, 10 to 20 grains on one side of the stigma. The other was given an excess of pollen, the stigma being well smeared. The effect on the size and form of the fruit was very marked. The fruit receiving the large amount of pollen was of normal size and nearly symmetrical in form while the other was small and deformed. The larger fruit produced an abundance of seeds and all of the cells were well developed. The smaller developed seeds only on one side, while the other side was nearly solid. These experiments were repeated several times during the following winter and similar results obtained regardless of the position of the flower treated. In no case was there any fruit secured when all pollen was excluded.

The conclusions deduced from this work were that when pollen falls upon one side of the stigma only a one sided tomato always results. The larger the stigma the greater the irregularity. The amount of the pollen applied to the stigma determines to a great extent the size and smoothness of the tomato; but after applying a certain amount of pollen no further increase in size or weight results by applying more.

The small irregular tomatoes grown under glass are caused largely by insufficient pollination. All the experiments, however, do show most conclusively that the setting of a good crop of smooth heavy fruit depends very largely upon the care taken in distributing the pollen, but very little advantage was secured by cross fertilization of the tomato only a small gain in weight. Why expect even this when Burbank of California, the originator of the Burbank potato and the cross between the red and black raspberry, and many others, after many years of experience, declared that in cross fertilization only about one in fifteen thousand proved to be better than the parents that produced them. Yet the United States are paying him ten thousand dollars a year for ten years so that he may continue his investigations more extensively, and no doubt the money will be well invested.

Now having shown clearly the absolute necessity of Pollination let us now ask ourselves, as cranberry growers, the vital question by what means is the cranberry pollinated. Aside from self Pollination I know of only one insect that I am positive aids materially in that work and is producing cross pollination of the cranberry, and that is a bumble bee which I first saw on my marsh at Cameron, Wis., which was certainly gathering pollen from the cranberry blossoms and putting it in little balls on his hind legs exactly as the honey bee does. This they can only do while on the wing. They first enter the blossom and smear themselves all over with the pollen then when on the wing, going from flower to flower, they use their fore
legs like hands gathering the pollen from every part of their body and placing it between their two hind legs on the small pads with which nature has furnished them, then they rub these two hind legs together by a movement almost too rapid for the eye to trace until the pollen becomes waxy, then by crossing the hind legs one over the other, it is quickly transferred to the outside of the hind legs where it is pressed into neat little balls by the use of the bee's fore legs which it uses for hands.

About the only motion that the eye catches is the rubbing together of the hind legs. I discovered the entire process by mortally wounding a honey bee that was covered with pollen and holding it by the wings when it went through all these motions slower and slower until it died. When I first saw these bumble bees on the Cameron marsh, I was sure they were a different variety from the common upland bumble bee, and I still think so. They were smaller, very uniform in size, slimmer in body, with yellow bands, no black on their bodies. They often build their nests right on the marsh, utilizing an old marsh mouse's nest or bog or tuft of bunch grass. The past summer at the Grand Rapids marsh, I found on the upland, that apparently the big black bumble bee had mixed with the marsh bumble bee, producing some strange mixtures.

I used to think that the fruit worm miller, in hunting for a place to lay its eggs, might also aid in the distribution of the pollen, but when I came to visit some bogs in New Jersey, where there were no fruit worms, and yet producing good crops year after year, and when I came to learn that in some parts of Oregon and the state of Washington where neither the fruit worm nor the vine worms exist, although repeatedly brought there with vines from the east, they soon perished, yet their yield of cranberries per acre often far exceeds the yield of the same varieties in the east, both in quantity and in uniformity of bearing, so I had to abandon the idea of the fruit worm aiding us in pollinating the cranberry. In the summer of 1907 I noticed that the marsh at Cameron had a good many of these swamp bumble bees on it, one to every square rod on the section that I had examined, and there was a fair crop of berries that year and very little blight. The next year 1908, I do not remember of seeing any, and the crop was very light and the blight heavy. I also observed a very large number of fruit worms in Wood County in 1908, and it was predicted that a still larger crop would be here in 1909, but reports from all parts, east and west and here, showed that there were very few fruit worms.

The question now comes up How can we increase the number of these swamp bumble bees and so protect them, instead of destroying them that we may have our cranberries all pollinated every year? The little sub-tailed swamp mice which take to the water, equal to the muskrat, used to be very numerous all over the wild marshes, their run ways crossing nearly every square foot and destroying many vines in making them, but our winter flooding compelled them to take to the dams. Our burning around our marshes as a protection against fire, has materially reduced their numbers. Skunks and other animals destroy them and their nests, also the nests of the bumble bee. I am satisfied that this bumble bee is not the only insect
that helps to cross pollinate the cranberry.

But when I see a barrel of cranberries picked from vines grown from seed of the Bell and Bugle variety and find them nearly every one differing from the other I have good reason to believe that each blossom, as a rule, does not pollinate itself; if they did, I would expect to see them all uniform as peas or some kinds of beans.

I write this to induce others to watch out for others and to report facts. In order to encourage the bumble bee to locate their nests near my marsh at Cameron, I sowed alsike clover on the hard land near the border of the marsh to which the bumble bee is quickly attracted by its fragrance and the honey it produces. The bumble bee gets its pollen quicker and easier from the cranberry blossoms and uses more of it in building its nests than the honey bee does.

I have given much thought to this subject and believe it is of vital importance in preventing blight and increasing our crops. Certainly without pollination there would not have been a single berry. I have no doubt in my own mind but what the imperfect crop of apples the present season is the result of imperfect pollination. If you cut these small apples open and examine them, you will find them to contain a small amount of seeds if they are not of the normal size of that variety of apples showing a lack of pollen. The object of the pulp of the apple is to feed the seeds until they are prefectly developed. When your cranberries bight next summer cut some of them open, and if no seeds are found you can be sure they have received no pollen and would not mature any fruit.

A. C. Bennett.

Mr. A. U. Chaney of New York gave a short talk on the condition of the market, also of the prospects for the future which he considered good and also gave an interesting description of the new scoop used in the East.

Some Important Points Brought Out in Discussion.

Orchardists consider that one spraying is sufficient to kill the codling moth. With cranberries it is different, as unlike the codling moth the fruit worm hatches at different times but the first spray is most satisfactory. The best time to spray is one or two days after the berry is set. No eggs are laid on berries on which the petals have not fallen. The eggs are laid on the calyx cup, never on the side.

On being asked as to the cause of the lack of fruit worms the past season Mr. Hardenburg replied that the several light rains which came at the time they were emerging from the ground might have been the cause. This brought out considerable discussion as to the advisability of light flowing at this time and it is to be hoped that this cheap method will be thoroughly tried by growers. Mr. Hardenburg predicted that in 1910 and 1911 the fruit worm would be abundant.

Business, Etc.

The committee on pumping reported having purchased almost every-