

til the injuries are sufficiently reduced to make the pests no more difficult to control than our native forms.

In 1870, when the Mormons were settling in the vicinity of Utah, a plague of grasshoppers appeared and almost completely devastated the country, coming in such swarms that they appeared as clouds, and just when it looked as though every green leaf and grass blade was to be destroyed, a flock of birds appeared in swarms, almost obscuring the sun, and in a single day completely wiped out the outbreak. Here in Wisconsin, we find flocks of birds following an outbreak of such pests which play an important part in checking serious outbreaks before they attain much headway.

As an example of what a heavy rain will do toward checking an outbreak of a serious pest, we might cite an instance that took place several years ago in Marinette County. We were preparing to spread poison bran for the control of grasshoppers, and just as we were ready to issue the word to the farmer that they were about all hatched out of the egg beds and were ready to migrate, a storm was threatening and so it was thought advisable to wait until after the storm, and two days later, after a heavy storm had subsided, there were not enough of these hoppers left to warrant the spreading of the bran. In another county adjoining they decided to apply their bait, and the farmers there still believe that the enormous reduction in numbers of these insects was due to the treatment, whereas, had they waited, they would very likely have found it unnecessary to apply the poison at all.

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## SPRAYING AND WATER RAKING EXPERIMENTS

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Many of you will be interested in the results of our experiments with spraying and water raking cranberries. We were first approached on this question three years ago by a company which had been experiencing considerable difficulty with berries spoiling on the markets. The company proposed to try spraying with a fungicide to overcome the trouble, a remedy of proven value in other cranberry sections, and offered to cooperate with our office in making a study of the value of spraying under Wisconsin conditions. Since the practice of spraying had not to our knowledge been used in connection with water raking, and since the use of this method of harvesting is increasing yearly in the state, we felt that the question was of sufficient importance to justify an extended study.

Bordeaux mixture of the 4-4-50 formula has been used in all spraying experiments, and two and three applications per season have been tried. The first application has invariably been made in the "hook stage", the second immediately after blossom, and a third some two weeks later in certain tests. The results have been measured by determining the amount of rot which developed in berries from the respective plots after holding for about 3½ months.

The results of spraying on two successive crops have not been promising. The percentage of rot in the 12 unsprayed lots held during the two years has averaged exactly the same as in the 12 sprayed lots—21%.

Strikingly different results were obtained when comparing dry raked and water raked berries. The average rot in 12 lots of dry raked berries was 14%, while in 7 water raked lots it was 27%. The discrepancy between numbers of lots held is explained by the fact that time-of-harvesting tests were run also, and it was not feasible to flood an entire section merely to harvest the early and late picked samples.

When it began to appear that water raking was followed by twice as much storage rot as dry raking on this particular marsh, it was decided to see if the condition was general over the state. Accordingly, last year we ran as many water raked-dry tests as time would permit. One sample was raked dry either before or after the section was flooded, and another from near the same spot raked on the flood by the regular harvesting crew. In every case an attempt was made to dry the berries in the manner used by the grower, though frequently the test samples dried in shorter time than the average for the crop. Water raked berries were thoroughly dried before being placed in storage, and all samples were boxed and shipped to Chicago about the middle of October. Counts for rot were made December 15—18. The total number of tests was 13 with the Searls variety, 6 with the McFarlin, and 3 with odd varieties. The results are given in Tables 1 to 3, together with detailed notes on the handling of each lot.

These tests clearly indicate that the keeping quality of the Searls variety is decidedly impaired by water raking, as has been the invariable experience in similar experiments conducted by other workers. On the other varieties used the results were surprising as well as perplexing.

The present tests are in no sense an investigation into the causes of water raking injury. However, records were kept of such contributing factors as degree of ripeness and time and method of drying. These notes apparently do not help in interpreting the results. For example, water raking under exceptionally favorable conditions were not detrimental. The only obvious difference between Searls and McFarlin as a class is that the latter were harvested late in the season, when both water and air temperatures were lower.

While so far it appears that water raking nullifies the effect of spraying, we are continuing the experiments for at least one more season before feeling fully convinced of it. The water raking tests emphasize how little is really known about this common Wisconsin practice, but it is clear that certain disadvantages are associated with it. Realizing this, it is important to take all possible precautions in the handling of water raked berries.

TABLE 1. WATER RAKING TESTS IN 1930 SEARLS VARIETY

Lot No.	Locality	Date Raked		Notes	% Rot Dec. 15	
		Dry	Water		Dry Raked	Water Raked
1	Phillips	September 3		Sprayed lot. Raked early in season.	5	
2	Phillips	September 3		Unsprayed lot. Raked early in season.	5	
3	Beaver Brook	September 4	September 6	Young bog. Berries immature. Wet berries through grass-picking machine dried in open shed. Wet by rain at night, and dried in a day or two.	14	42
4	Biton	September 11	September 11	Fairly colored. Considerable leaves and trash. Boxes halved and dried in open. Dry in 24 hours.	13	33
5	Phillips	September 12	September 13	Sprayed lot. Mid-season. Wet berries dried in 3 hours.	5	22
6	Phillips	September 12	September 13	Unsprayed lot. Mid-season. Wet berries dried in 3 hours.	5	16
7	Phillips		September 12	Crop run sample from a section under water over one day. Dried in 24 hours.		17
8	Beaver Brook		September 12	From low bed partly under water at each frost flood. Some drowned berries. Taken from warehouse, drying period not known.		32
9	Beaver Brook		September 17	Mid-season. Check for lot 13. Commercially raked and dried, drying period not known.		14
10	Beaver Brook	September 20	September 20	Water raised Sept. 19 for frost, section raked in A. M. Dry Sample raked 4 hours after water was drawn. Wet berries dried in 6 hours.	9	19
11	Phillips	September 21		Sprayed lot. Late season. Berries very dark.	7	
12	Phillips	September 21		Unsprayed lot. Late season.	9	
13	Beaver Brook	October 11	October 13	Late season. See Lot 9 for mid-season check. Few frozen berries Water not high enough for proper water raking, but berries came out wet. The boxes were further wet down with tap water at night. Dried 48 hrs. after raking.	17	17

AVERAGE OF ALL LOTS..... 8.9

23.5

TABLE 2. WATER RAKING TESTS IN 1930 MCFARLIN VARIETY

Lot No.	Locality	Date Raked		Notes	% Rot Dec. 15	
		Dry	Water		Dry Raked	Water Raked
1	Cranmoor	September 22	September 25	Berries well colored. Water very shallow. Dried in place in warehouse, spread thinly in large crates. Time of drying not known.	11	7
2	Warrens	September 30	September 30	Berries well colored. Frost flood night of Sept. 29. Dry sample raked after wet sample. Dried in stacked crates in 6 hours.	10	11
3	Warrens	September 30	October 1	Wet berries dried in stacked crates near warehouse. Took 4 days or more to dry.	4	8
5	Tomah	September 11	September 9	Berries green. Wet berries dried in open in hot sun, drying period not known.	22	21
6	Warrens	September 25	September 25	Commercially water raked sample taken because of slow drying. Dried in 3 days.		
				AVERAGE OF ALL LOTS	11.7	11.0

TABLE 3. WATER RAKING TESTS IN 1930 ODD VARIETIES

Lot No.	Locality	Date Raked		Notes	% Rot Dec. 15	
		Dry	Water		Dry Raked	Water Raked
1	Beaver Brook	September 4		Howes variety, immature. Young vines.	19	
2	Wyeville	September 8	September 9	Metallic Bell variety. Light colored. Wet berries dried in 24 hours in crates stacked on dam.	25	28
3	Warrens	September 10	September 10	Native Wisconsin vines. Rather light colored. Wet berries dried in crates outside of warehouse. Dry in 18 or 20 hours. Berries badly hail-scarred.	43	50