THESIS

The Pollination of
Apples and Pears

O. L. Ayrs, and others

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The Pollination of Apples and Pears

With Reports of Experiments on Kindred Subjects.

A THESIS

By

O. L. Ayrs.

E. R. Bennett.

B. S. Brown.

M. A. Crosby.

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B. Wermuth.

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Michigan Agricultural College.

Spring Term, 1901.

THESIS

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Description of

Michigan Agricultural College Orchards.

By

E. R. Bennett.

The orchards at the Michigan Agricultural College in which this experiment was made are in three plots. One, a pear orchard, is on the west and north slope of a hill near the west entrance to the College campus. Another, the old apple orchard, is east of the horticultural laboratory and experimental plots. The other, the young orchard, is south and east of the old orchard and is much the largest of the three.

The pear orchard is about forty feet at its greatest elevation above the Red Cedar river which runs along the south side of it. The soil here is a stiff clay loam with a clay subsoil, and has been under good cultivation since the orchard was planted. This was done by Dr. Beal in the early days of the College. Of the original number of trees sixty-seven are now standing the others having been replaced by young trees as individual trees died out. The old trees are in a fair condition of thrift, though badly mutilated from the effects of blight. They are twenty to thirty feet high and bear a fair crop of fruit each year. The chief varieties are Bartlett, Louise Bonne, Flemish Beauty, Winter Nelis Grey and White Doyenne and Lawson.

The old apple orchard was set by President Williams (Pres. of M. A. C.) in 1857--8 and 9. It originally contained three hundred trees nearly 50% of which have died or been removed to make room for other things. The land is nearly level about 35 ft. above the river and is composed of a light sand loam with a quick sandy subsoil.

Trees are set 33 ft. x 33 ft., average height 20 ft. They are in fairly good condition though troubled with apple scab. Northern Spy and Greening are the predominent varieties though many other varieties are represented.

The young orchard has about the same elevation and soil conditions as the old apple orchard. It consists of about 1000 apple trees, 160 pear and 100 plums. This orchard was designed as a variety test and holds first place for having the largest number of varieties of apples of any orchard in the world. Trees are set 16 ft. X 16 ft. and range in size from setting, up to trees of eight inch trunk. Owing to the great number of varieties, there is a great diversity in condition of trees, some are smooth, symetrical and healthy while others are badly effected with sun-scald and apple-scab and others are deformed by the heavy southwest wind.

Among the plums the American and Japanese types are largely represented for the purposes of experiment as are also the Russian and Japanese varieties among the pears.

Weather Conditions Spring of 1901.

By

O. L. Ayrs.

The weather conditions during the flowering season of pears and apples were not such as would favor the best conditions for the setting of fruit. The entire month of May was quite cool with frequent rains. While the government thermometer at no time registered as low as 32° but light frosts were observed several times on the lowlands near the College. The first open pear blossoms were obesrved May 3 and the apples were about a week later. Beginning May 7th there were five days in which it rained during some portion of the twenty-four hours with one day, May 10th, intervening when there was no rain. This came at a time when the flowers most needed bright warm weather. The petals did not all fall until about May 25th so that it will be seen that the flowering period extended over about twice the time it would under favorable conditions.

The following table copied from the official weather records, will show what the prevailing conditions were. It extends over a period of thirty-seven days beginning April 25th and closing May 31st. The table gives the tempetature at three times each day and the mean maximum and minimum temperature. The direction and velocity of the wind in miles per hour at three different times

during the day is given. The last two columns give the percnet of sunshine for each day and the inches of rain fall.

Date	Temperature						Wind									
Apr.	7P M.	2P M.	9P M	Mean	Max	Min	Dir	Force	Dir.	F.	Dir	F.	% of sunshine	In. of rainfall	Date
25	53	65	47	55	68	39	N.	4	N.	5	N.E.	1	100		25
26	56	71	56	61	72	38	N.E.	2	N.E.	3	N.E.	8	100		26
27	54	74	54	60⅔	76	38	N.E.	5	N.E.	5	N.E.	3	100		27
28	54	77	51	60⅓	77	41	S.E.	2	E.	3	E.	0	100		28
29	61	81	55	63⅔	83	48	S.W.	3	S.	3	S.	2	100		29
30	63	8	64	69½	81	53	S.W.	5	S.W.	8	S.W.	5	90		30
May															
1	57	76	64	65½	78	55	S.E.	3	S.	6	S.	7	50		1
2	68	79	52	66½	81	39	S.W.	5	S.W.	12	N.	5	90		2
3	47	64	43	51⅔	64	35	N.E.	6	N.E.	5	N.E.	1	100		3
4	55	73	50	59⅔	73	39	S.E.	4	S.	5	S.E.	2	100		4
5	58	79	59	63⅓	79	52	S.E.	3	S.E.	3	S.E.	2	80		5
6	61	72	61	64⅓	73	51	S.E.	7	E.	7	E.	3	30		6
7	57	70	58	61⅔	74	49	E.	3	S.	7	S.E.	3	40	.01	7
8	58	66	52	58⅓	69	50	S.		S.	1	S.E.		00	.69	8
9	54	63	59	58⅔	63	52	E.		E.		E.		00	.24	9
10	59	68	56	61	70	49	S.E.		S.E.		S.W.		75		10
11	50	54	52	53⅓	62	37	N.W.		W.		W.		80	.16	11
12	39	46	38	40⅓	48	33	W.		W.		W.		60	.14	12
13	43	54	44	47	60	35	W.		W.		W.		80		13
14	42	56	41	46½	58	33	N.W.		N.W.	3	N.W.	1	95	1.	14
15	50	64	47	53⅔	67	37	S.W.	2	S.W.	3	S.W.	2	100		15
16	57	72	57	62	74	47	S.W.	4	S.	4	S..	3	90		16
17	58	77	61	65⅔	77	52	S.	3	S.W.	7	S.W.	1	10	.07	17
18	61	66	52	59⅓	71	44	N.	2	N.E.	4	N.	1	60		18
19	51	53	53	52⅔	58	45	N.	2	N.E.	6	N.E.	12	00	.02	19
20	52	59	50	53⅓	62	47	N.E.	12	N.E.	7	N.E.	7	000		20
21	54	56	60	56⅔	61	52	N.E.	11	N.E.	13	E.	11	00	.29	21
22	57	62	59	59⅔	68	49	S.	12	S.W.	12	S.W	12	40	.	22
23	64	76	62	67⅔	79	55	S.W.	5	S.W.	8	S.W.	8	85	.76	23
24	60	57	44	53⅓	60	42	S.W.	10	N.E.	12	N.E	13	00		24
25	50	55	45	50	56	42	N.	13	N.	11	N.	2	00		25
26	45	55	43	47⅓	58	43	N.	3	N.	4	N.	2	00		26
27	49	66	52	55⅔	67	48	N.	4	N.	10	N.	9	60		27
28	51	57	44	50⅔	59	39	N.	14	N.E.	8	N.E	5	80		28
29	50	54	49	51	63	36	N.E.	9	N.E.	3	N.	1	30	.02	29
30	43	60	45	49⅓	63	40	W.	7	S.W.	7	W.	4	90		30
31	49	61	47	52⅔	62	34	W.	8	W.	6	W.	2	10		31

History of Work done on Self-Sterility of Fruits.

By,

B. Wermuth.

The first impetuous to the importance of cross-pollination in plants was given by Darwin when he published his "Origin of Species" in 1859. But long before this time cross-pollination was known. In 1793 Sprengel, a German, published a book, which showed the essential part played by insects in pollinating flowers. He also observed that in certain plants cross-pollination necessarily took place. Andrew Knight in the early years of the present century remarked that sexual intercourse between neighborning plants of the same species was intended by nature. The same law was hinted at by Kolrenter in 1811 and by a few others later. But it remained for Darwin to show the importance of the observations of Sprengel.

Although Darwin presented this important question to the reading world in 1859 yet no general interest was aroused until 1862 when he gave the public his work on, "Various Contrivances by which British and Foreign Orchids are Fertilized by Insects." He says "Nature thus tells us in the most emphatic manner that she abhors perpetual self-fertilization." In 1876 Darwin had published his book entitled, "Cross and Self-fertilization in the Vegetable Kingdom." Darwin's exhaustive experiments as given in this work show the value of crossing plants.

In his Variation of Plants and Animals under Domestication, he demonstrates some important laws which are now universily accepted by naturalists. They are briefly stated by Waite as follows:-

1. Nature abhors perpetual self-fertilization.

2. Continued self-fertilization is injurious resulting in inferior and less fertile offspring.

3. Cross-fertilization is necessary for the production of healthy seedlings.

4. Plants are endlessly modified to secure this end.

Darwin, thus having opened the door to this great field of labor is followed by a number of investigators. The first among these was Waite of the United States Department of Agriculture. He experimented with pears. Among several conclusions warranted by evidence brought forth in his work, two conclusions have direct bearing on the question with which this thesis has to deal. They are,

1. Many of the common varieties of pears require cross-pollination, being partially or wholly incapable of setting fruit when limited to their own pollen.

2. Some varieties are capable of self-fertilization. This discovery threw rays of light on many incidents where orchards with only one variety often bore but little or no fruit. Other prominent horticulturalists immediately took up the work and extended it to other fruits.

In 1896 Wangh of Vermont experimented with plums. Out of fourteen varieties he found eight that set fruit, but five of these had fruit that was very weak. He concluded, that for all practical purposes plums should be considered self-sterile.

For six years S. A. Beach of Geneva, New York, carried on a series of experiments with grapes. He began in 1892. One hundred and sixty-nine varieties were included in his investigations. He also worked with the same variety in different localities and as above indicated at different seasons. Mr. Beach classified the varieties with which he worked according to self-fertility. Class I. contained thirty-eight varieties. It consisted of those producing clusters varying from perfect to somewhat loose.

Class II. contained sixty-six varieties. It consisted of those having moderately compact or loose clusters.

Class III. contained twenty-eight varieties. This class consisted of those clusters that were unmarketable.

Class IV. contained thirty-six varieties. The grapes in this class are self-sterile.

In 1899 Mr. Beach worked on the fertilization of the self-sterile grapes, and received some good results.

Mr. Chas. S. Crandall of Colorado worked with plums in 1898. Six hundred and twenty-nine flowers representing forty-two varieties were self-pollenated by hand. All foreign pollen was kept away by use of paper bags. These flowers produced six fruits. Six hundred and ninety-nine

flowers of the same varieties, isolated from other pollen by paper bags, produced seven fruits. The conclusion was "that infertility did not lie in the failure of the stigmas to receive pollen, but must be looked for in an inherent antipathy which the plant has for its own pollen , or in some outside influences.

Among other writers and experimenters along the line of self-fertility, are Goff, Craig, Kerr, Heideman and Fletcher on orchard fruits; and Earle, Mumson, Whitten and Greene on grapes.

The field is open and many of our best horticulturalists have been working therein; yet there is much work to be done on this important subject. Apples have received little or no attention and many varieties of all the fruits need to be tested in different localities.

Object of this work.

The object of this work was to determine the degree of fertility of the common varieties of apples and pears in the vicinity of the Michigan Agricultural College.

Methods of Work.

By

M. A. Crosby.

In carrying out this experiment to determine which of the numerous varieties of apples and pears represented in the college orchards are self-fertile also those which are selfsterile, the following plan of work was followed. Before the clusters of flower buds were far enough advanced in growth to demand any special attention the labels, sacks, note books, and in fact all the materials needed in carrying on the work, were put in readiness for immediate use so that no unnecessary time would be consumed when the proper moment arrived to begin the work in the field. The labels used were the common shipping tags, each one marked with a number and fitted with a firm copper wire which served the double purpose of attaching it to the sack and also to close the mouth of the latter when placed over the cluster of fruit buds. The sacks used were the manilla paper bags such as are commonly used by grocers. These were in different sizes to accommodate the different sized clusters of blossoms and ranged from twelve to eighteen inches in length.

Upon an average at least two trees of each variety were selected for the experiment. With some varieties, however, only one tree could be found bearing blossoms while in others three or four trees were worked upon.

As soon as the earliest blossoms began to show the white of their petals, the work of putting the paper bags over the clusters of blossoms, to keep them from receiving the pollen from any othervariety, was begun. Upon each tree selected for the experiment several small branches, each bearing several clusters of flower buds, were covered with the paper bags the mouths of which were then closely shut and bound with the wire to which was attached one of the numbered tags. When it was possible each variety had from twenty to twenty-five sacks used upon it and in each case the sacks were distributed over all parts of the tree as well as the distribution of the clusters of fruit buds would permit, and each sack was made to include as many clusters as possible. The name and location of each tree, the number of sacks used, and the number on each tag attached, were all carefully recorded in the worker's note book. Great percautions were taken not to enclose insects of any kind in the sacks and in no case was a cluster of flower buds used when any blossom was so far advanced as to have the stigma exposed.

The counting began three weeks after the dropping of the blossoms. In working the count the sacks were carefully removed and the number of healthy fruits, also the number of blossoms which failed to set fruit, were determined. Next the general fruitfulness of the uncovered blossoms was determined by taking at random several clusters of the same character as those which were covered,

and counting in the same manner as for the covered blossoms. When healthy fruits were found under the sacks the tags were left on the limb so that the development of the fruit might be noted.

Description of Anthers and Pollen.

B. Wermuth.

The anther is one of the essential parts of the flower. Within it walls is found the pollen which fertilizes the ovules, they in turn becoming perfect seeds.

The anther of the apple is attached to a hairy clubshaped filament. This attachment is nearly versatile i. e. the anther is fixed to the very point of the filament and is fastened near its middle. The stamen often has a redish tint before the flower opensup, but is yellow afterward and remains so until the pollen is shed. When young this organ has four cells--two in each lobe. This can be understood perhaps by noticing the right hand lobe of cross-section (A) of the anther in the drawing. Soon the tissue between these two larger cells is reduced to pollen, or otherwise changed and the two cells become one, as seen in the left lobe of cross-section (A). As the walls of the anther begin losing moisture by exposure they break along each lobe at (c) and turn backward. This exposes the inside of the two cells and the pollen they contain is in a position to be transferred of other flowers.

Pollen.

Within the lobes above mentioned is found the pollen of the apple--a fine yellow dust that will adhere to the

finger if touched. This dust is the result of the breaking up of tissue cells within said lobes. Each of these "mother cells", as they are called, divides into two "daughter cells" and these in turn divide into two more; thus making four cells from the one parent cell. These new cells have a cell wall formed about them. It then is called a pollen grain. The cell wall of the parent cell changes into a viscid material which lies between the grains of pollen. It is this material that causes the pollen to adhere to other objects. The bee coming in contact with this yellow dust has his body more or less covered with it, and then, when he visits another flower, some of this pollen is left on its stigma; thus, incidentally cross-pollenizing while he gathers the sweet nectar.

In the drawing the shape of the pollen grains are shown. When looked at under a compound microscope they appear very much like a kernel of wheat, except the ends are more symmetrical. (a) in the drawing of the pollen, is an end view of one of the grains. It shows three lobes which run lengthwise of the pollen cell.

These grains of pollen correspond in the apple to the male parent among animals, and its influence upon the offspring is equally great in both cases.

Field Work.

The following questions regarding pollen were studied in the field.

1. Does cultivation effect the amount of pollen in apple blossoms?

2. Does cultivation effect the time pollen is ready for distribution in apples?

3. Does cultivation effect the length of time apple varieties have available pollen?

4. Do the anthers on a single apple blossom get ready to distribute their pollen simeltaneously or alternately?

5. Does spraying effect the anthers and pollen if the spray is applied when trees are in bloom?

Material used in the study.

Four trees were used in most of the study. They were all of the same variety--Femuse. Two were located in the old college orchard and were about years old. The others were about eight years old and located in an open field north of the college.

A compound microscope to examine the pollen, tags to mark the examined flowers.

A spraying pump, and the spraying mixtures as well as other incidential necessities were at hand to carry out the work.

Difficulties.

The work was done out of doors making the conditions uncontrolable and therefore making possible different results than what might be obtained under more normal conditions. There were two storms and two frosts during the time of observations which to a greater or less extent effected the normal development of the flowers. That the weather may be understood in detail the meteorological report for the month of May will here be inserted.

Day of Mo.	Temperature 7 A.M.	2 P.M.	9 P.M.	Barometer 7 A.M.	2 P.M.	9 P.M.	Wind 7 A.M.	2 P.M.	9 P.M.	2 P.M.	Rain or Snow
1	41	62	51	29.49	29.42	29.34	0%	0%	7%	E.	night
2	52	78	56	29.09	29.02	29.04	80	0	10	W	Rain 7-9
3	54	74	54	29.22	29.09	29.18	45	50	100	S.E.	Rain in night
4	51	75	61	29.01	29.08	29.15	20	30	100	W.	" " "
5	53	66	55	29.03	29.49	29.33	80	10	10	N.	"
6	54	69	59	29.19	28.95	28.94	100	50	50	S.	" " "
7	49	62	48	29.08	29.2	29.29	100	50	0	N.W.	"
8	60	75	65	29.15	29.06	29.25	25	5	0	S.W.	"
9	39	49	42	29.4	29.5	29.48	40	30	0	N.W.	
10	34	38	37	29.47	29.39	29.41	100	100	80	N.E.	Snow
11	44	57	44	29.42	29.43	29.35	0	0	0	N.	Frost
12	52	69	58	29.26	29.29	29.24	0	0	100	S.E.	Rain
13	52	60	47	29.22	29.28	29.39	100	95	0	N.E.	"
14	52	60	44	29.39	29.30	29.37	0	10	0	N.E.	"
15	54	63	50	29.31	29.37	29.34	0	0	0	N.E.	"
16	55	68		29.29	29.27		90	5	0	S.	"
17	65	76	58	29.17	29.14	29.10	5	0	10	S.W.	Rain in night
18	65	77	65		28.9	28.93	90	100	50	S.	"
19	75	87	67	29.0	29.10	29.10	75	50	10	S.	"
20	74	80	66	29.27	29.26	29.41	30	25	50	N.E.	"

A second difficulty was to get trees of the same variety, that were alike in situation, size and age and differing only in cultivation. The trees as described above came the nearest to what was wanted, yet I feel that there is some possibility of errors because of the difference in age.

This work having been carried on only one season causes the writer to remark that the results should not be given the confidence it would command if a series of years were considered. Also that the work regarding the effects of cultivation has been restricted mostly to one variety making it possible that different results might be obtained from other varieties. With these considerations we will take up the questions asked above.

1. Does cultivation effect the amount of pollen in apples? Cultivation is here used in its broadest sense, i. e. including spraying, pruning, etc., as well as the tillage. (From my observations I must answer this question in the affirmative, but there is ground for difference of opinions.) One hundred anthers from each of seven varieties were taken under as nearly equal conditions as possible and weighed on balances, also the average number of stamens and the length of ten stamens. The following is the result of these weights.

Variety	Weight	Length of 10 stamens	No. stamens
Talman Sweet	.0831	399.3	20
Autumn Strawberry	.1040	330.0	20
Talman Sweet	.0680	392.7	20
Wealthy	.0909	396.0	20
Greening	.1172	432.3	20
Dixie	.0721	389.4	20
R. I. Greening	.1090		20
Pyrus Malus	.0670	366.3	20

From this table it will be seen that each of the cultivated varieties surpasses the Pyrus Malus in weight of the anthers. The cultivated varieties averaging over .0920 for the one hundred anthers, or more than one third more than does the Pyrus Malus. One would quickly conclude by simply observing the anthers of the wild and the cultivated flowers that the latter were much the larger, as the above figures indicate. But as we glance at the next column we notice that the increase in the size of the pollen grains corresponds more or less closely with this increase of the anthers in size. There is a single exception to this in the above table. The Autumn Strawberry measuring less than the Wild Pyrus Malus. But taking the average of those examined it seems that cultivation has increased the size of the pollen grains and of the anthers but has not noticeably increased their numbers.

But there is another phase to this question. Cultivation in its broadest sense includes spraying, prunning,

etc. One of the uncultivated Femuse trees had abundant Aphis (Aphis Mali Fabr) before and during the blossoming period. These Aphis were allowed to remain and it was found that the number of perfect anthers were very much decreased on the tree in question. The following figures will give the comparison of the number of perfect anthers on the trees with the Aphis and those with none.

	No. of flowers.	Per.Flowers.	Imperfect anthers.
Tree with Aphis	100	34	244
Tree without Aphis	100	49	150

A great number of these flowers were counted and the above figures are the average amounts of flowers having all the anthers perfect and of the number of defective anthers. The Aphis may not be the cause of these imperfect anthers, but that was the only way the writer could account for their deficiency. Other trees under the same conditions and in the immediate vicinity but have far less Aphis thereon, were not so affected. If then, spraying will destroy the Aphis, or any other insects or fungus that may affect the anthers or pollen, and if spraying is considered a phase of cultivation, then we may say that cultivation may under these local conditions make possible a larger amount of serviceable pollen.

II. Does cultivation effect the time pollen is ready for distribution?

The four trees above mentioned were watched very

closely and the date of the first appearance of pollen on them was noted. Each of the cultivated trees had pollen ready for distribution on May 4th while the uncultivated ones did not show the first pollen until May 7th. This is a result of observations for only one season and should not be given the weight that a series of such observations would command. But it indicates that cultivation has effected the time in which pollen is ready for distribution in the Femuse variety.

III. Does cultivation effect the length of time a variety has available pollen?

Several flowers on the cultivated and uncultivated trees were marked with tags. Upon these tages were placed the dates when each flower had its first pollen ready for distribution. The marked flowers were then carefully watched until all the anthers had shed their pollen. The cultivated flowers had a range from six to nine days; the majority having exhausted their supply by the eighth day. The uncultivated flowers ranged from six to eight days; the majority being without pollen on the seventh day. These observations indicate that with the Femuse apples the time available pollen is present is prolonged by cultivation.

IV. Do anthers on a single flower get ready to distribute pollen simeltaneously or alternately?

Flowers were marked by tags in the same manner, as with the preceeding question. In fact these flowers were used to extend the observations on this question. Also unmarked flowers were examined to find if possible any flowers that had all anthers with pollen ready for distribution at the same time. The results of these observations were as follwos. At the end of the first day from four to six anthers would have pollen ready. Then each following day would add to this number from one to three more anthers with its pollen ready to be carried off by insects. But at the end of the third, often the second day, the first anther would begin to degenerate and thus decrease the possibility of all anthers being ready with their pollen at the same time. The average number of anthers ready at the same time was four.

During my observations I was unable to find a single flower with pollen ready on all its anthers simeltaneously. Pyrus malus, Crab, Femuse, Maidenblush, Talman Sweet, and several other varieties whose names I did not record, were examined in these observations.

V. Does spraying effect the pollen and anthers if the spray is applied when the trees are in bloom?

A number of flowers were marked on each of two trees with tags as in III and IV. To one of these trees was applied a thorough spray of normal Bordeaus mixture by

means of an air pressure knapsack pump. To the other was applied a spray of arsenite (Paris Green); using the proportions of 1# Paris Green to 150 gallons of water. The spraying was very thoroughly done leaving none of the flowers without a film of the mixture thereon. The flowers were then watched and compared with unsprayed flowers on the same tree, and it was found that neither of the sprays affected the pollen, or anthers to which they were applied. I trust that this will not be construed to mean that spraying does no harm to the apple grower when used as the trees are in bloom, for there are other considerations to be taken into account than the effect on pollen. But experiments have shown that spraying during blooming season has little or none of the harmful effects once attributed to it.

Conclusions.

1. Cultivation effects the size of the anthers and pollen grains of apples, but not the number, at least to perceptable extent.

2. Cultivation apparently hastens the blossoming period of the Femuse three days.

3. Cultivation apparently extended the time during which available pollen was present in flowers by about one day.

4. The anthers of a single apple blossom do not get ready for distribution simeltaneously.

5. Spraying with arsenite and Bordeaux during the blooming season does not effect the anthers and pollen of apples.

Is Wind Pollination of Pears and Apples Possible?

By

O. L. Ayrs.

The blossoms of apples and pears are of an entomophiloas character but it has never been determined whether wind pollination was possible or not. M. B. Wait of the Department of Agriculture at Washington states that the nature of the pollen is such that it will not be carried by the wind. Professor L. H. Bailey of Cornell says in Geneva bulletin No. 196 that certain orchards which he work in during the blossoming season of 1900 bore good crops while the weather conditions were such that bees did not work for ten days and the wind is probably a factor in cross pollination.

It was decided that inconnection with other work on pollination and fertility of the apple and pear, which was being carried on at the College, a careful study of the pollen of these fruits and its behavior would be made.

The structure of the flower of the apple and pear is the same only varying slightly in the form and size of the parts. When the flower opens under normal conditions the pistils are extended from an eighth to a quarter of an inch beyond the stamens which are curved inward, the cluster forming a ring or collar around the pistil. As the stamens develop they straighten out drawing their anthers past the stigmas of the pistils but the anthers are seldom or never ripened until the filiments

have straightened out. When fully grown the stamens vary in length some being longer than the pistils, others approximately the same length and still others somewhat shorter than the pistils. This condition of the flower would make it possible for the anthers to come in contact with the pistils and deposit some of their pollen upon the stigmatic surface of the pistil. In this way the production of fruit without the aid of insects might be accounted for in varieties which are self-fertile. An examination of the pollen with a microscope shows the granuels to have an oily or glucose like covering which makes them adhere to any surface that they touch and prevent their being easily jarred or blown off.

After studying the structure of the flower and the pollen, I began experimenting to see if wind would loosen pollen from the flowers or carry it about after it had separated from the anthers. I placedthree specimens of pear blossoms and seven of apples upon sheets of paper. A careful examination of them after twenty-four hours showed that no pollen had fallen from the stamens but a slight jar caused a quantity of pollen to fall upon the paper. This dry pollen could be blown about upon the surface of the paper but could not be blown into the air as the pollen of anemophilous flowers can. I then selected blossoms from twelve varieties of apples and two varieties of pears. These I placed in bottles partly filled with water and turned upon their sides, the flowers projecting over sheets of paper to catch any pollen that

might fall. Under these conditions the flowers ripened their pollen the same as they would upon the tree. The blossoms were kept in this condition until all of the anthers had ripened their pollen and the petals had begun to fall from the flowers. During this time they were carefully observed from day to day. At no time did any pollen fall from any of the ripened anthers nor could any be blown from them by blowing across them with varying force. By brushing the hand lightly over the ripened anthers pollen could be jarred off onto the paper. After it had fallen on the paper, it could be blown about over the paper but could not be blown into the air.

While these experiments would not be absolute proof that wind pollination is impossible, the results all indicate that the wind has very little or no effect upon the pollination of apples and pears. It is quite probable that wind pollination of these fruits seldom or never takes place.

Are Some Trees More Attractive to Insects than are Others?

By

L. D. Rudolph.

The scientific horticulturist of today is branching out from the trodden paths of his calling and investigating facts and principles which have been neglected in the past.

The ultimate object of every practical horticulturist is to secure the largest and best crops possible and sharp competition has made a thorough knowledge of fundamental processes an essential to the greatest success. From its botanical position no process is more closely or vitally concerned with the harvest than is the process of fertilization. By various devices nature has made self-fertilization for some varieties easy, for some difficult and for many an utter impossibility. To be more accurate a large percent of our apples are self-fertilizing. All the rest depend in the process upon insects. Now, not only as a recompense for this service but in oreder to secure it, these varieties of fruits must furnish themselves with something to attract the little workers. Grant the insect to be a free moral agent with respect to his choice of a base of operation (a concession which can hardly be denied), and it follows that he will devote most of his time to those varieties which offer the greatest attraction to him. Here arise two questions; do self-fertilizing

varieties which need no assistance from the insect, still offer him asgreat attractions as varieties which depend for their very existance upon winning his favor; and, among the latter, do certain varieties offer greater inducements than others, and if so what are those inducements?

In investigating these questions I have made use of the old apple orchard at this college in the belief that there would be less individual variation in blooming among mature trees than among younger ones, hence a better representation of the floral type of each variety.

Whatever power of attraction a variety has, must spring from the possession of one or all of the following qualities, viz., conspicuousness of single blossom, fragrance, and fulness of bloom of tree. The sum of these qualities vested in a variety determine its degree of attractiveness. I have selected well known varieties and have arranged them in two ranks according to their attractiveness. In determining relative conspicuousness several blossoms of each variety were carefully measured and the average width taken. The color of the flower was also considered.

In determining comparative fragrance I depended upon the sense of smell, while fulness of bloom was readily determined by inspection.

After making these determinations satisfactorily there yet remained the equally important matter of finding

the number of insects which visited each variety. This was done by climbing to a point of vantage within the tree and counting all insects seen for a space of five minutes time, upon two different days.

In the following table the varieties are divided into two divisions, rank 1, those receiving most visits from insects, and rank 2, which received fewer visits. The table also shows the degree of attractiveness as determined by measurements and comparisons, of the same varieties. In this last determination it was difficult to secure definite results for while a variety might excel in width and beauty of blossom, it might at the same time lack in fragrance, or not be in full bloom. Great care was taken, however, and in every case the variety in the first rank of attractiveness was in the first rank in number of visiting insects, and in view of this fact, we are justified in concluding that varieties do differ in their attractiveness to insects and that the most attractive varieties receive the most attention from them.

With regard to the question as to whether self-fertilizing varieties are more or less attractive than other varieties, the writer could not find the least distinction. This, however, is not a case of poor logic in nature for in Bulletin No. 5, Div. of Veg. Path Washington, Mr. M. B. Waite, its author, clearly demonstrates that although

the flowers of a variety may be sel-fertile yet unless they receive pollen from another flower the resulting fruit will be of inferior quality.

Rank 1.	May 16	May 17	Aver. No.	Rank	Comparative Attractiveness Rank I.
	No. of insects				
Golden Sweet	126	132	129	16	Golden Sweet.
Crabb	96	115	105	14	Crabb
Hawley	84	93	88	11	Hawley
Femeuse	96	103	100	13	Femeuse
Wealthy	112	141	126	15	Wealthy
Sweet Greening	88	91	89	12	Sweet Greening
Peter Swar	59	81	70	9	Peter Swar
R. I. Greening	67	79	73	10	R. I. Greening
2.					
Northern Spy	51	60	55	7	Northern Spy.
Summer Rose	24	37	31	1	Summer Rose
Shiawassee	43	51	47	3	Shiawassee
Warfield	48	61	54	6	Warfield
Oldenberg	31	38	34	2	Oldenberg
Talman Sweet	44	58	51	5	Talman Sweet
Flora Bell-flower	52	62	57	8	Flora Bellflower
Early Harvest	43	56	49	4	Early Harvest
	Temp 2 P.M. 68° F	Temp. 2 P.M. 76° F			

The Description of Varieties of Apples and Pears by the Aid of Their Flowers.

By

W. K. Wonders.

The number of varieties of apples and pears which today are offered for sale by the nursery men has assumed large proportions. It has been estimated that the nursery men have for sale over eight hundred varieties of apples and almost as many pears.

With the steady increase of varieties it becomes obvious that if we wish to be able to name a variety with certianty we must use all the facilities we have in the making of our systematic descriptions. Owing to this great multiplicity of varieties and also to the close similarity of the varieties of the individual types it has become necessary in descriptions to give the closest attention to all the distinct characteristics that are associated with the two above mentioned fruits.

Contrary to the early teachings of the nursery men we have learned by experience that the characteristics of plants differ whenever the plants are grown in unlike conditions. Therefore in making our descriptions we must keep in mind the fact, especially when we are dealing with plants under cultivation, that a variety which is grown in one locality is not likely to correspond in all particulars to the same originated variety which has been transplanted to another locality. In more concise

terms, we can never hope to find characteristics which will exactly fit the same variety when it is grown under differing conditions.

We must see, therefore, that exact descriptions only can be fitted tp those varieties whose environments exactly correspond. The apples and pears which I have studied are located in Michigan in the central part of the lower peninsula. It is not likely that the description which I will give will fit the varieties which are grown in other states.

At present the form of growth, the color of shoots, the leaf buds, the leaf and the fruit characteristics are the only attributes which the describer of fruits takes into consideration.

It is often the case that during a course of years a variety in a certain locality will lose many of its individual characteristics. Because of this fact any new factors which can reasonably be used in describing a variety will be of substantial value.

At the present time the flowers of neither the apple nor the flowers of the pear are considered in the description of a variety. If the flowers of the two fruits are considered in connection with the description of the fruit and tree characteristics, the likelihood of error in naming will be materially lessened. It is for this reason that I advocate the flower as an aid in the distinguishing of the fruits under consideration.

To describe the fruit by the flower alone would be an impossibility. Especially would this be so in the case of the pears. The apple has a few strong characteristics in its varieties while the points in the pear flower are weak. The pear flower varies preceptibly only in size. It is by combining the methods now commonly used with the characteristics which the flower has that the describing of a variety will be made much easier.

To show how the present method of description is likely to mislead the describer of varieties it will be well to point out a few of its weaknesses. In considering the growth of a tree, shoots may be errect as in the Early Strawberry, spreading as in the Rhode Island Greening, drooping as when branches fall below horizontal, ascending as in Gravenstein or irregular as in the Black Gilliflower. Again shoots may be straight or flexible, stout or slender. Although many times the above individual characteristics may be of value and certainly are of great value in descriptions, it is not always the case that they can be depended upon.

This is not because varieties under uniform conditions do not have permanent characteristics but it is because a variety will vary when it is given better cultural treatment or when its cultural treatment is neglected. For instance a fast growing tree is quite likely to grow much slimmer in proportion to its height than a slow growing one. The manner of growth is affected

by the amount of food available for use of plant. A slow growing tree is likely to be stout. If a naturally slow growing tree is placed in the best growing conditions it is very probable that the woody portion will be more slender and pliable than it would have been had its conditions for growth been less favorable. Again the manner of growth of a young tree is not like the manner of growth of an old tree. A young tree that is errect in growth, in all probabilities will be ascending when old or if it is diverging when young it will be spreading when old.

The leaf buds do not vary as much as the leaves. Since they vary appreciably only in size and very little in shape their value in connection with a description is not very perceptible.

Examination of the foliage is generally next in order. Foliage is the source of much individual variation. The nitrogen, phosphorus and calcium in the soil are all factors which influence the leaf, color and texture and some times size. The season also exerts its influence on the size of leaf. In a dry season the leaves will be much smaller than they would have been in a moist season. In distinct types the leaves are generally characteristic.

The color of a shoot is hardly ever taken into consideration because of the great variation in individuals of the same variety. The color of a shoot changes greatly during the progress of a season and it is also influenced

by unusual drouths and wet spells. A healthy tree in the prime of life is likely to be much brighter than is a tree of the same variety that is not as healthy. The color can be relied upon in a few instances but the instances are so few that they are of value only to the most expert.

Of all the factors which are taken into consideration in determining the variety to which a fruit individual belongs, the form, the color, the texture, the flavor and the quality of the fruit are probably relied on to the greatest degree. If it were not for the fact that each variety of fruit is true to its primary description only in exceptional cases, it would be an easy matter to determine the variety by an examination of a fruit in regard to form, color, texture, flavor and quality. Correlations in color of fruit, especially flavor, texture and form are not to be expected in every instance.

The difference which are likely to arise in a moderatly extended fruit region are many and varied. The differenceswhich do occur when varieties grown in widely separated districts are compared are generally quite striking. The Northern Spy apple for instance is an excellent apple in the North and in the West apple region. In the South, however, it grows small, loses the rich flavor, the handsome color, and mellowness of flesh which it possesses in the north. The Esopus Spitzenburgh is found to nearly always correspond to its description when it is grown in its native location, but when grown in

Michigan and in other states it seldom reaches its best. It becomes small and loses much of its high rich flavor. The fruit of the Yellow Bellflower in the southwest is hardy, excellent, tender, crisp and juicy while in the north it drops prematurely and becomes tart and less rich.

Let me repeat again, that because of the like small varieties which are likely to take place in a variety that is grown in moderately extended fruit districts, the greater the number of factors we have to deal with the easier will it be to make a determination.

In the past the flower has seldom been used as a factor in description. In the future flowers of some species of fruit can reasonably take a place of prominence. In the case of the apple the flowers have marked characteristics. The pear flower seems more inclined to double than does the apple flower. In the apple flower there are seldom more than five petals. As a rule the flowers seem to be much larger in the apple than in the pear. The apple has a variety of differently shaped petals. Nearly every variety has its characteristic shape. The different varieties of pears have more nearly the same shaped petals and the claws are more uniform in shape and length also.

One of the most striking features of the apple flower was the characteristic hair covering that was on the stype. In some cases the hair bunched at its top and in other cases the hair was bunched at the base. The hair was

variously located but the position was characteristic in each variety. The drawings accompanying the variety descriptions will better illustrate the point, than I can describe it in words. Speaking generally the variety characteristics are not as striking in the pear as they are in the apple, but it is not improbable that they will be of value in descriptions.

The idea of using the blossom of the apples and the blossoms of the pears in their classification is not a new one. In 1879 Professor W. J. Beal read an article before the American Pomological Society entitled,"Describing Varieties of Apples by Their Flowers" and in 1881 the professor read a paper before the American Pomological Society entitled, "Distinguishing Varieties of Pears by their Blossoms."

In my examination of the flowers of the apple and the flowers of the pear, I endeavored to take those flowers which were in good condition and normal development. Specimens to be examined were taken from different parts of individual trees and also from different trees of the same variety. Only those varieties which grow at the College Experiment Station were examined. From six to eight inflorescence from each variety were examined, both from the apple varieties and from the pear varieties.

In making observations the apple flowers were noted for color at three stages of their development, 1st when the buds were the size of a pea; second just before

the stamens burst through the petals and third, just as the stamens are about to shed pollen. All three stages are readily found in one inflorescense. The pear flowers were not examined for color as they are invariably white when developed and a yellowish white when in the bud.

The points noted in the apple flower and in apple inflorescense besides color of flower at different developments, were the shape of petals, their average length and width, the average length of claw, the average dia of receptacle, the average length and width of sepels, the average length of styles and stypes, the average dia of an open flower, the average length of the outer pedical, the average length of the middle pedical and the average length of the terminal pedical, the number of flowers in an inflorescense, the number of stamens in a flower and the texture of the petals.

Drawings from each variety were made showing the shape of the apple, petals, the shape of the sepels and the form of the styles and stypes. The location of the hairs on the pistals and stypes in the case of the apple was very singular in that no two varieties had the hairs correspondingly located. The styles of the pear flowers have for each variety no individual characteristics.

The parts studied in the pear flower were the same with a few exceptions as were examined in the apple flower. The points noted in connection with the pear flower were the shape of the petals, the average length and width of pistals, the average length and width of the sepels,

the average length of claw, the average dia. of the receptacle,the average dia. of pistil, the length of pedical and the average length of the first, the middle and the terminal pedical, the number of flowers in an inflorescence. The measurements were taken for the purpose of determining whether the parts were large, small, or medium. The different varieties are quite likely to have different combinations of parts. For instance, in the flower of one variety we will find an organ (a pistil or stamen for example) that is small and another organ that is large while in the flower of another variety we will find the size of the same two organs reversed.

The flowers of twenty-three varieties of pears were examined. The petals either elliptical,oval, rotund, broadly elliptical or broadly oblong. The following numbers used to give dimentions will be the average in the variety named in connection with them. The narrowest petals were in the Lawrence (10/32 in.) and the widest petal was in the Keifer (20/32 in.) The largest claw was in the Peffers (4/32 in.) long and the shortest claw was in the Garber, 1/32 in. long. The widest sepel was in the Bonesack (7/32 in) and the narrowest sepels were in the Lawrence (3/32 in.). The receptacle with the greatest dia. was the Early Margo (8/32 in.) and the smallest dia. was the Lawrence (7/64 in.). The longest style was the Dana's Hovey (25/64 in.) and the shortest style was in the Keiffer (17/64). The dia. of styles

vary very little, being almost uniformly 1/96 in. The pedicals are almost uniformly 3/64 in. in diameter. The largest of the terminal pedicals was in the Swiss (1 12/16 in.) and the shortest was the Sheldon (14/16 in.) The largest of the middle pedicals was in the Swiss (2 2/16 in) and the shortest was the Sheldon (14/16 in.) The largest outer or lower pedical was 2 7/16 in. in the Swiss and the shortest was in the Sheldon (12/16 in.) The inflorescense that contained the largest number of flowers was in Old Ky. Home (13-11) and the inflorescence containing the smallest number of flowers was in the Souvenerda (5--6). The greatest diameter of a flower was on the Souse Bonie (1 20/32 in.) and the smallest diameter was in Lawrence (1 1/16 in.)

The average measurements of the different parts may be classified into either medium, large or small in size, broad, medium or narrow in size, or long medium length or short.

Following are the descriptions of the flowers.

Old Ky Home.

Petals elliptical, medium size, medium width, long. Claws, medium. Sepels, very long, width medium. Receptacle, medium size. Style, long. First pedical, medium length, middle pedical, medium length, terminal pedical, medium length. Number of flowers in inflorescence 11--13.

Early Berganot.

Petals, broadly elliptical,large, broad, long; claw, meduim length; first pedical, medium, middle pedical, long; terminal pedical, medium; inflorescence, number of flowers 9--12. Size, medium. Flowers partly double. Sepels, medium length, wide. Style, medium length.

Swiss.

Petals, broadly elliptical,large, broad, long. Claw, medium. Sepel, medium length, narrow. Receptacle, small. Style, medium length, narrow. Receptacle, small. Style, medium length. First pedical, long; middle pedical, long, and terminal pedical long. Number of flowers, 8--5. Flowers medium size. Base of sepels is narrow Pedunela 12/32--13/32.

Early Mago.

Petals broadly elliptical,large, Flower large. Claw short. Caylx, large. Sepels, long, broad. Receptacle, medium, Style, long. First pedicel, medium, middle pedicel, medium; terminal pedicel, medium length. Number of flowers in inflorescence 7--8. Length of pedunela 11/32--14/32.

Lawrence.

Flower small. Petal small, broadly elliptical, short, narrow. Claw, short. Sepels, narrow, short. Receptacle, small. Style, short. Pedicels, first short,

middle, medium length, terminal short. Number of flowers in inflorescence, 6--9. Flowers sometimes double.

Ines Seedling.

Flowers medium in size. Petals oval, medium length, and width. Style short, sepels, medium in length and width. Receptacle, medium size. First pedical medium pedicel, medium length, and terminal pedicel medium in length. Length of pedunels 11/16--14/16. No. of flowers in inflorescence, 7--8.

Dubramelder Moncran.

Flower medium size. Petals oval, medium size, medium length, medium width. Claw, medium length. Sepels, short, medium width. Recepticale, medium size. First pedicel, medium; middle pedicel, medium length, and termina pedicel medium length. Style, short. Pedunels, 9/16-12/16 in. Number of flowers in inflorescence, 3--7.

Garber.

Flower medium in size. Petals oval, medium length and width. Style, short, sepels, medium in length and width. Receptacle, medium size. First pedicel, medium length; middle pedicel, medium length; terminal pedicel, medium in length. Length of pedunels, 11/16--14/16. Number of flowers in inflorescence, 7--8.

Sause Bonie.

Flower large in size. Petals, large, medium.width and long. Sepels, medium length, narrow. Length of pedunels, 7/16--9/16. Number of flowers in influencence 5--6. Receptacle, small. First pedicel, medium length, terminal, medium length.

Keeffr.

Flowers medium size. Petals oval , width, medium length. Sepels, long, medium width. Length of pedicels 9/16 to 13/16. Number of flowers 5 to 8. Receptacle, small. Style, short. Pedicels medium length.

Howell.

Flower, medium in size. Petals, oval, medium size length and width medium. Claw, medium length. Sepel, short, narrow. Receptacle, small. Style, short. Pedicel, medium. Pedunels 14/16--1 7/16. Number of flowers on influescence, 8--10.

Beurre Angou.

Flower large. Petals, large, medium width. Claw, long. Sepels, short. Receptacle, small. Style, short. Pedicel, short. Pedunels, 9/16--20/16. Number of flowers in inflorescence, 8--11.

Boussack.

Flower medium size, petal braodly elliptical, medium length and width. Claw medium length. Sepels medium length and width. Receptacle small. Style, short. Outside pedicel, short, middle, short, terminal, medium length. Number of flowers in inflorescence 7--8. Length of peduncle, 11/32--14/32.

Clapps Favorite.

Flower, large, double. Petals, wide, length medium. Claw short. Sepels, long, wide. Receptacle, medium. Styles, long. First pedicel, short; middle, short, and terminal medium. Number of flowers in inflorescence 6--8. Length of peduncle 10/16--13/16.

In dealing with the apples the flowers of fourteen varieties were described.

The petals of the apple flower were ovate or elliptical The narrowest petal was on a crab (13/32) and the widest was on a Canadian Baldwin (23/32). The largest petal was in the Rambo (29/32 in. long) and the shortest was in the unknown (19/32). The shortest Claw was in Talman Sweet (1/32) and the longest was in unknown (4/32). The narrowest sepel was in the Talman Sweet (4/32) and the widest was in the Cellein (6/32). The shortest sepel was in the Alexander and the longest was in the Mann Blk (13/32. The largest receptacle was in the Northern Syp (4/32 in. dia.) and the smallest was

in the Early Red Crab (2/32 in. dia.). The longest style was in the Mann Blk (16/32) and the shortest was in a Crab (10/32). The largest stype or stalk was on the Early Red Crab and the shortest was in the Northern Spy (8/32). The diameter of style varied from 2/96" to 3/96" and were either stout or slender. The longest terminal pedicel was in the Alexander and the shortest was in the Blk Main (6/15). The flower with the greatest diameter was the Rambo (1 14/16) and the shortest was in the Talman Sweet (1 3/16). The texture of the petals was either from coarse to medium.

Following will be the descriptions of ten varieties.

Mam Blk.

Young buds, bright scarlet. Buds when ready to show stamens have bright shaded scarlet. Open flower petals are shaded evenly from margin with crimson on upper side. On under side of petals the surface is blotched with crimson. Petals large. Flowers very large. Petals oval and elliptical. Sepels long. Receptacle large. Terminal pedicels short. Number of stamens 18--20. Texture of petals is coarse.

Talman Sweet.

Young buds scarlet but not strongly. Buds ready to show stamens, delicately scarlet. In open flower there was trace of scarlet on both sides of petals. Flowers small. Petals ovate, small. Claws short. Sepels short and narrow. Style short. Stype short, hairs few

at base. Much hair at upper part of style. Terminal pedicel medium. Number of stamens 17--20. Receptacle small. Texture of petals, delicate.

Cellin.

Young buds scarlet, not deep. Buds about to open pale crimson, noticeable but not very strong. Flowers when have practically no upper side of petals but on under side there is slight trace of crimson. Flowers large. Petals thick and large. Sepels wide and short. Claw long. Diameter of receptacle large. Style medium length. Stype completely covered with hair. Terminal pedicel stout, medium length. Stamens 17--19.

Rhode Island Greening.

Young buds crimson. Buds ready to open, crimson, rather evenly distributed. Open flowers have faint crimson tinge on upper and lower sides of petals. Flowers large. Petals ovate or elliptical, large. Claw, short. Sepels wide, short. Recepticale, medium size. Style, short. Stype, medium length. Hairs bunched at top of stype. Terminal pedicel short. Stamens 18--20. Petals coarse texture.

Crab.

Young buds scarlet, not very intense. Faint scarlet tinge on buds about to be opened by stamens. In open flower there is a noticeable tinge on under side of petals and a faint tinge on upper side of petals. Flower small. Petals, elliptical, medium length, narrow. Sepels

short, narrow. Receptacle small. Style, short, medium length. Hair on upper part of style is thickly placed. Terminal pedicel medium length. Stamens 16--20. Texture of petals delicate.

Early Red Crab.

Young buds weak scarlet. Buds just ready to open are faint scarlet. Flowers opened are almost white, but have faint trace of scarlet on under side of petals. Petals ovate, large. Claw long. Sepels medium length, narrow. Style short. Receptacle small. Pedicel long. Number of stamens, 10--12. Texture of petals coarse. Stype short and covered with hair from base to top.

Northern Spy.

Flower small. Petals oval. Young buds brown with slight crimson. Buds just about to open and show stamens are comparatively colorless with slight crimson tinge. Flower when open is almost pure white but have faint tinge of crimson on both sides. Claw short. Sepel short. Style medium. Stype short with but little hair on it. Much hair on lower half of separate styles. Receptacle large. Terminal pedicel, long. Stamens 19--20. Petals coarse in texture.

Porter.

Young bud pale crimson. Buds ready to open have slight trace of crimson. Flowers when open have practically no color. Flower small. Petals medium or small in size. Claw short. Sepels narrow and medium in length.

Style, short. Stype, short. Half way between tips of stigmas and base the hair is bunched. Receptacle, large. Terminal pedicels medium in length. Stamens 14--18. Petals coarse in texture.

Canadian Baldwin.

Young buds deep scarlet. Buds about to show stamens are quite stongly marked with scarlet. Flower when open has noticeable traces of scarlet on inside and on outside of petals. Petals ovate and oval, large. Flowers large. Claw long. Sepels, medium length. Diameter of receptacle, large. Style, long. Stype, medium length. Stype covered with hair most densely at upper part of stype. Pedicel,(terminal) medium in length. Number of stamens, 16--13. Texture of petals coarse.

Rambo.

Young bud yellowish white with faint tinge of scarlet. Buds just ready to show stamens have faint tinge of yellow mixed with scarlet. Flower opened is pure white. Receptacle medium size. Style, medium length. Stype, short. Hair bunched at top of stype. Pedicels, large. Number of stamens, 20. Texture of petals, coarse.

Nectar in Apples.

By

Wm. Kreiger and B. S. Brown.

It was not our intention, while experimenting with nectar, to work out any results that might be of value to the horticulturist; but rather to obtain some facts, as far as we were able, by investigation. All the experiments were performed on apple blossoms and with two exceptions on old trees.

Nectar, according to the various plant physiologists, is a form of sugar secreted by glands at the base of the stamens or pistil for the purpose of assisting cross fertilization. The medium of cross fertilization in all plants is by means of wind or insects and as one of the other students has proved that the pollen of apple blossoms can not be carried by the wind, it leaves us dependent largely upon insects for our apple crop. As the nectar of the apple blossom is located in the cup shaped receptacle, the insects are compelled to run their proboscis down among the anthers in order to get the nectar. They thus get pollen on their legs, proboscis and other parts of their body, and as they fly from one flower to another they get it off on other stigmas thus fertilizing the flowers. According to Sachs the insects effect the transformation of pollen involuntarily and without their knowledge of it.

On May 13th we examined a large number of blossoms in view of determining whether any nectar was secreted before the stamens discharged their pollen. We found in nearly every case that some nectar was excreted about one day before the flowers were open and in most cases two or three days before the pollen was ripe. We also experimented to determine the number of times nectar would be excreted when removed by insects. To do this we enclosed several clusters of flowers with paper sacks to keep out the insects, then each day removed the nectar from the flowers with small pieces of blotting paper. It was found that no nectar was excreted after it had been removed four times. This would seem to indicate that if the insects removed all the nectar four times that no more honey would be excreted ; but this result is to be questioned for two reasons: first, in order to remove the nectar from the flowers it was necessary to remove some of the stamens, thus interfering with the natural conditions of the plant: and second, in some cases the stamens were removed but the nectar allowed to remain, in which case the nectar remained but very little longer than those from which it was removed.

On May 14th, we began examining the flowers to see if there was any appreciable difference in the sweetness of the nectar or if the bees liked the nectar from one tree better than another. We first tasted the nectar from several trees and could tell the difference in the

varieties but were unable to determine anything as a basis for results. We next selected eight varieties and attempted to count the insects working upon the flowers. For four successive days we climbed to the top of the trees counting all the insects seen for a period of five minutes. As the number of blossoms varied on each tree, we independently placed the trees in ranks according to the number of blossoms. We agreed on five trees, placing the other three by arbitration. The results are found in the following table.

Variety	Bl's'm rank	No. of insects seen. May 15	16	17	18	Total	Ave.	Insect rank
Yellow Bell Flower	*1	70	68	62	21	221	55	7
Strawberry	2	157	98	124	15	394	98	1
Fall Pippin(a)	3	41	68	80	35	224	56	6
" " (b)	3	91	99	51	36	247	69	4
Prious Red	3	85	104	104	71	364	91	2
R.I.Greening	4	51	95	59	60	265	66	5
Porter	5	57	88	83	64	292	73	3
Maiden Blush	6	65	42	39	28	174	44	8

*Rank 1 having most blossoms, 2 next, etc.

The above results are open to error in that the ripening period of the blossoms vary in the different varieties. This is most noticeable in the Strawberry which varied a great deal in the number of insects seen. We think in that the trees stood somewhat close together and from the wide variation in the number of insects, that we have sufficient evidence to prove that there is something in the odor of the flower or the sweetness of the nectar that makes the insects like one kind better than another.

In order to determine whether the nectar is excreted in the dark or not, on May 14th we enclosed several clusters in paper sacks after first covering them with black cloth. When the sacks were put on no nectar had been excreted and we found by observing these that, although the nectar was delayed about one day more than the blossoms that were not covered, darkness does not interfere materially with the excretion of honey. We also determined later that the quantity of nectar excreted by any flower in the dark was not as large as from those in the light.

On May 13th we enclosed several clusters to determine how long the nectar would remain if it were unmolested by the insects. This was tried on three different trees, two young trees (Chenango and Babuschinäe) and one old tree(Tälman Sweet). It was found that the Babuschinäe retained its nectar for about eight days,

the Chenango nine and the Talman Sweet ten or eleven. In every case it remained from three to four days longer than those that were not covered.

On May 17th we took some of the flowers that had been covered with the black cloth and weighed them on an analytical balance, then removing the nectar and weighing again we were able to obtain the quantity of nectar excreted. The results are as follows.

No. of flower.	Amt. of nectar
1	.0018 grms.
2	.00160 "
3	.00175 "
4	.00168 "
5	.00100 "

On the 20th we again weighed some blossoms that had been covered with cloth, also some from the same trees that were bagged but not covered with cloth. We obtained the following results.

No. grown in dark.	Amt. of nectar	No. grown in light.	Amt. of nectar
1	.003315 grms.	1	.003812 grms
2	.002875 "	2	.004680 "
3	.00375 "	3	.00300 "
4	.002625 "		
Average	.003047 "	Average	.003831 "

At the same time we also weighed some blossoms from the Northern Spy.

No.	Amt. of nectar.
1	.00112 grms.
2	.00175 "
3	.00168 "
Average	.00151 "

All weights were taken from blossoms that we kept free from insects and after, except in case of the Spy, the nectar ceased to be excreted by the flower. If we could say that all blossoms excrete the same amount of nectar and make no allowance for evaporation, we would have pretty accurately the quantity of nectar excreted by each flower. From these results we conclude that the amount of nectar excreted under similar conditions are comparatively constant.

Table Showing Self-Fertility of forty-nine Varieties

of Apples and forty-four varieties of Pears.

Andre Disportes.

Row 9, Orchard, New.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
316	7	0	100	26	Bags put on May 6.
317	14	0	100	39	
318	12	0			Count made May 28.
319	4	0			
320	21	0			Uncovered counted
321	32	0			
322					May 23.
323					
324	8	0			
325	16	0			
326	7	0			
327	42	0			
328	5	0			
	00%		32.5%		

Anjon

West Orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
700	23	0	100	31	Covered May 4.
701	46	3	100	40	Covered May 27
702	48	0			
703	41	0			
704	29	0			
705	14	0			
706	46	0			
707	21	0			
708	35	0			
709	Acci.				
710	27	0			
711	53	0			
712	25	0			
713	45	0			
714	63	0			
715	24	2			
	.9%		35½%		

Bartlett.

Pres. Orchard, Row II.

	Covered		Uncovered.		
Record No.	Blossom	Fruit	Blossom	Fruit	Covered May 6.
749	24	0	100	40	Counted May 27.
750	10	0	235	150	
751			100	58	
752	6	0			
753	8	0			
754	11	0			
Row Tree I:					
760	6	1			
761	20	0			
762	16	0			
763	12	0			
768	17	0			
651	23	0			Covered May 4
652	16	0			Counted May 27
654	45	0			
656	19	0			
657	22	0			
658	18	0			
655	Acci.				

Bartlett.
Row 8, Orchard, New.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
266	12	0	100	72	
267			100	75	Bags put on May 6.
268	12	0			
269	6	0			Count made May 28.
270	6	0			
271	13	0			Uncovered counted
272	6	0			
273	7	0			May 23.
	.3%		62.8%		

Besseimianke.

Row III.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
159	50	36	100	31	
157	16	12	100	32	Covered May 4.
158	65	27			
160	32	7			Counted May 28.
162	48	24			
169	18	13			
163	28	20			
164	16	6			
165	41	4			
166	48	30			
161	25	0			
170	30	21			
	48%		31.5%		

Beurre Gris de Hiver.

West Orchard.

	Covered		Uncovered.		
Record No.	Blossom	Fruit	Blossom	Fruit	
636	52	0	100	66	Covered May 4.
637	43	0	100	64	
638	78	0			Counted May 27.
639	64	0			
640	16	0			
641	29	0			
642	23	0			
643	39	0			
644	15	0			
645	27	0			
646	30	0			
647	36	0			
648	51	1			
	.2%		65%		

Beurre Hardy.

West Orchard.

	Covered		Uncovered.		
Record No.	Blossom	Fruit	Blossom	Fruit	
659	21	8	12	7	Covered May 4.
660	35	0	30	15	
661	17	1	61	42	Counted May 27.
662	27	11	34	24	
663	18	0			
664	25	7			
666	25	13			
	23.8%		64.2%		

Beurre Superfine.

West Orchard.

	Covered		Uncovered.		
Record No.	Blossom	Fruit	Blossom	Fruit	
624	51	0	89	46	Covered May 4.
625	37	0	105	36	
626	Acci.		74	25	Counted May 27.
627	29	2	100	24	
628	26	0			
629	43	3			
630	20	0			
631	14	1			
632	21	0			
633	29	4			
634	24	0			
635	20	2			
	3.8%		35.6%		

Blood Good.

West Orchard.

Record No.	Covered Blossom	Covered Fruit	Uncovered Blossom	Uncovered Fruit	
681	15	0	100	49	Covered May 4.
682	33	0	100	30	
683	45	0	100	24	Counted May 27.
684	43	0	100	68	
685	22	0	100	42	
686	31	0			
687	36	0			
688	29	0			
689	43	0			
690	12	0			
691	39	0			
692	30	0			
693	34	0			
694	43	0			
695	20	0			
696	38	0			
697	22	0			
	00%		42.6%		

Bosc.

Row 7 New orchard.

Record No.	Covered Blossom	Covered Fruit	Uncovered Blossom	Uncovered Fruit	
241	22	0	100	41	Covered May 6.
242	17	4	100	43	
243	10	5	100	39	Counted May 28.
244	14	6	100	47	
245	30	14			Count of uncovered
246	7	5			
247	12	9			May 23.
248	18	6			
249	12	1			
250	20	7			
	35.2%		42.5%		

Boussock.

West Orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
716	20	0	100	76	
717	23	0	100	72	Covered May 4.
718	Acci.				
719	24	0			Counted May 27.
720	20	0			
721	34	0			
722	24	0			
723	37	4			
724	12	1			
725	23	0			
726	31	0			
727	34	0			
191	12	2			Boussock Row II
192	17	1			May 6, 1901
193	10	1			May 28, 1901.
194	24	4			
195	16	7			
196	8	4			
197	7	0			
	6.4%		74%		

Clapps Favorite.

Row II 11th and 12th trees.

	Covered		Uncovered.		
Record No.	Blossom	Fruit	Blossom	Fruit	
198	6	0			Covered May 6.
199	23	5			
200	7	0			Counted May 28.
201	11	0			
202	6	0			
203	7	0			
204	14	0			
205	6	0			
206					
207	6	0			
208					
209	7	0			
210	24	8			
	11.1%				

Clairgeau.

Row 7 Orchard New.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
284	28	0	100	12	Covered May 6.
285	27	0	100	41	
286	21	0			Counted May 28.
287	16	0			
288	7	0			Count of uncovered
289	12	0			
290	12	0			May 23.
291	12	0			
292	22	0			
293	11	0			
294	12	3			
295					
296	12	0			
297					
298	11	0			
	1.4%		26.5%		

Coles.

Row I.

	Covered		Uncovered.		
Record No.	Blossom	Fruit	Blossom	Fruit	
134	25	2	100	55	Covered May 4.
135	36	0			
136	12	0			Counted May 28.
137	20	0			
138	15	0			
139	16	0			
140	18	0			
	1.4%		55%		

Conklin.

Row III Young Orchard.

	Covered		Uncovered.		
Record No.	Blossom	Fruit	Blossom	Fruit	
36	19	0	100	65	Covered May 3.
37	Accident				
38	23	0			Counted May 28.
39	25	0			
40	18	0			
41	12	0			
42	13	0			
43	12	0			
44	32	0			
45	32	0			
	00%		65%		

Dana's Hovey.

West Orchard Row II.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
747	24	0	100	29	Covered May 6
748	20	0			
211					Uncovered May 27
213	12	0			Row IV. May 6
212	24	0			May 28
214	18	0			
215	30	0			
216	21	0			
217	6	0			
218	6	0			
	00%		29%		

Double Beurre.

Row V Vegetable Orchard.

	Covered		Uncovered		
Record No.	Blossoms	Fruit	Blossoms	Fruit	
1	6	0			Covered May 3
2	54	0	100	33	
3	17	0	100	30	Uncovered May 28.
4	36	0			
5	--	--			
6	24	0			
7	--	--			
8	25	0			
9	27	0			
10	54	0			
11	36	2			
12	--	--			
13	23	0			
14	36	0			
	.6%		31.5%		

Duchess Precose

West Orchard Row I Tree 4 (s).

	Covered		Uncovered.		
Record No.	Blossom	Fruit	Blossom	Fruit	
745	14	0	100	27	Covered May 6
746	19	0			Uncovered May 27.
Row 2 tree 1 (s)					
755	60	0			
756	18	0			
757	70	0			
758	80	0			
759	50	0			
	0%		27%		

Duhamel de Morceau.

Row 8 Orchard New.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
274	42	1	100	40	Covered May 6
275	54	0	100	45	
276	22	8			Counted May 28
277	12	0			
278	25	0			Uncovered May 23
279	30	1			
280	25	2			
281	22	11			
282	43	3			
283	13	0			
	8.7%		42½%		

Early Margeret.

Row 7 Orchard New.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
231	13	13	100	86	Covered May 6.
232	6	6	100	60	
233	7	7	100	89	Counted May 28.
234	16	6			
235					Count of uncovered
236	6	3			
237	18	15			May 23.
238	24	16			
239	12	5			
240	10	7			
308	25	20			
309	5	5			
310	8	8			
311	15	4			
312	9	9			
313	19	19			
314	12	9			
315	8	8			
	75.1%		78.3%		

Flemish Beauty.

Row II Tree 2.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
171	12	0	63	36	Covered May 6.
172	6	0	50	20	
173	16	0	100	65	Uncovered May 28.
174	60	0			
175	48	0			
176	6	0			
177	6	0			
178	12	0			
179	20	0			
180	29	0			
168	7	0			
	00%			57.8%	

Golosky.

Row 5 Tree 3, Young Orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
81	10	3	100	18	Covered May 4.
82	9	1			
83	13	0			Counted May 28.
84	7	1			
85	7	0			
	10.9%			18%	

Garber.

Row III Tree 5-6, Young Orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
26	12	0	100	49	Covered May 3.
27	24	0	100	51	
28	6	0			Uncovered May 28.
29					
30					
31	14	0			
32	12	0			
33	32	0			
34	28	0			
35	14	0			
46					Rows II and III.
47	12	1			
48	25	0			
49	16	0			
50	6	0			
51	24	0			
52	30	0			
53	18	0			
54	18	0			
55	6	0			
56	12	0			
57	12	0			
58	24	0			
59	18	0			
60	24	0			
	.3%		50%		

Gray Doyenné.

West Orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
612	41	8	113	63	Covered May 4.
613	Acc.		102	69	
614	31	2	100	73	Counted May 27.
615	22	0			
616	20	0			
617	24	0			
618	31	0			
619	30	2			
620	16	5			
621	12	6			
622	Acc.				
623	34	8			
	11.9%		65.1%		

Howell.

West Orchard.

Covered			Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
728	34	0	100	34	Covered May 4.
729	42	0	100	29	
730	24	0			Counted May 27.
731	36	0			
732	101	0			
733	47	0			
734	48	0			
735	43	0			
736	39	0			
737	41	1			
738	27	0			
	.2%		31.5%		

Idaho.

West Orchard Row 17--3.

Covered			Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
795	37	0	50	21	Covered May 6.
796	36	2	100	42	
797	37	4			Counted May 27.
	5.5%		42%		

Jones Seedling.

Row II.

Covered			Uncovered.		
Record No.	Blossom	Fruit	Blossom	Fruit	
141	15	7	100	51	Covered May 4.
142	31	14	100	62	
143	14	6			Counted May 28.
144	29	14			
145	19	3			
146	34	2			
147	23	6			
148	18	0			
152	21	2			
	26.4%		56.5%		

Kieffer.

Row X Last two trees, Young orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
89	7	0	100	60	Covered May 4.
90	12	0	100	60	
91	9	0			Counted May 28.
92	5	0			
93	6	0			
149	32	0			Row III. South end.
150	45	0			Veg. Orchard.
151	48	0			Covered May 4.
153	12	0			Counted May 28.
154	52	0			
155	50	0			
156	100	0			
	00%		60%		

Lawrence.

West Orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
600	17	0	80	31	Covered May 4
601	19	0	85	30	
602	51	0			Counted May 27.
603	37	0			
604	19	0			
605	38	0			
606	40	0			
607	38	0			
608	29	0			
609	22	0			
610	33	0			
611	11	0			
	00%			36.9%	

Lawrence.

Row 11, tree 7 Young Orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
71	26	0			Covered May 4.
72	20	1			
73	18	0			Counted May 28.
74	18	0			
75	7	0			
76	12	0			
77	Acci.				
78	6	0			
79	7	0			
80	20	0			
	.7%				

Louise Bonne.

West Orchard, Row 16 Tree 9.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
776	12	1	100	74	Covered May 6.
777	13	0	100	85	
778	12	2			Counted May 27.
779	36	0			
780	12	0			
781	12	0			
782	24	1			
783	10	0			
784	14	3			
785	11	0			
786	7	0			
787	12	1			
788	6	0			
	4.4%			79.5%	

Louise Bonne.

Row 10 Orchard New.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
329	6	0	100	59	Covered May 6
330	6	0	100	62	
331	18	0	100	56	Counted May 28
332	24	0			
333	18	0			Uncovered counted
334	23	0			
335	18	0			May 23.
336	18	0			
337	18	0			
	0%			59%	

Magnate.

Row 6-3 West Orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
764	9	0	18	6	
765	21	0	48	20	
766	6	0	15	4	
767	22	0	105	52	
769	28	0	15	10	
770	18	0			
771	24	0			
772	12	0			
773	18	0			
Row 7 tree 5					
774	6	0			
775	6	0			
	0%			45.8%	

Mount Vernon.

New Orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
299	43	0	100	54	Covered May 6.
300	26	0	100	59	
301	15	0	100	49	Counted May 28.
302	41	0			
303	9	0			Uncovered counted
304	39	3			
305	21	1			May 23.
306	8	0			
307	17	0			
	21.2%	.	.	54%	.

P. Barry.

Pres. Orchard Row I Tree 2.

	Covered		Uncovered	
Record No.	Blossom	Fruit	Blossom	Fruit
739	12	4		
740	41			
741	3			
742	11			
743	5			
744	5			
	5.1%			

Pres. Drouard.

Row X Tree 13-17 Young Orchard.

	Covered		Uncovered	
Record No.	Blossom	Fruit	Blossom	Fruit
94	6	0	100	18
95	48	20		
96				
97	22	0		
98	12	1		
99	18	9		
100	24	0		
101	6	2		
102	18	0		
	21.6%		18%	

Rutter

Row 6 New Orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
219	12	0	100	30	Covered May 6.
220	16	2	100	20	
221	7	0			Counted May 28.
222	12	0			
223	8	0			Count of uncovered
224	12	0			
225					May 23.
226	6	0			
227	13	0			
228	24	0			
229	12	0			
230	7	0			
	1.5%			25%	

Seckel.

West Orchard Row 16--7

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
789	9	2	100	76	Covered May 6
790	6	3	100	87	
791	8	2			Counted May 27.
792	6	2			
793	7	3			
794	5	1			
	31.7%			81.5%	

Sheldon.

West Orchard Row 15-1 & 16 -1.

	Covered		Uncovered.		
Record No.	Blossom	Fruit	Blossom	Fruit	
798	16	6	100	28	Covered May 6.
799	16	4	100	20	
800	7	2	100	36	Counted May 27.
802	20	6	100	40	
806	24	9			
807	48	14			
Row 16-1					
801	5	2			
804	11	4			
803	10	0			
805	13	3			
808	18	9			
184	12	1			Row II 30 4th
181	19	3			
182	13	0			Covered May 4
183	23	0			
185	18	17			Counted May 28.
186	12	1			
187	10	1			
188	6	2			
189	24	4			
190	32	3			
	25.1%		31%		

Souvenir du Congress.

Row 7, New Orchard,

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
251			100	54	
252	37	0	100	59	Covered May 6
253	12	0			
254	12	0			Counted May 28.
255	42	0			
256	11	0			Count of covered
257	6	0			
258	29	0			May 23.
259	6	0			
260	21	0			Covered 1.2%
261	18	0			
262	20	0			Uncovered 56½%
263	17	3			
264	15	0			
265					

Souvenir de Esperen.

Young Orchard Row IX Tree I--2.

	Covered		Uncovered		
Record NO.	Blossom	Fruit	Blossom	Fruit	
103	35	0	100	58	Covered May 4.
104			100	60	
105	31	0			Uncovered May 28.
106	22	0			
107	22	0			
108	15	0			
109	6	0			
110	25	0			
111					
112					
113	24	0			
114					
115	21	0			
116	24	0			
117	14	0			
	00%			59%	

Swiss

Vegetable Orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
15	15	6	100	85	Covered May 3.
16	19	3			
17	32	4			Counted May 28.
18	26	12			
19	25	7			
20	26	11			
61	24	0			Row IV Tree 1--2
62	19	5			Young Orchard .
63	12	2			Covered May 4.
64	14	0			Counted May 28.
65	15	1			
66	36	16			
67	18	0			
68	25	0			
69	12	2			
70	14	0			
	Second tree				
86	7	0			
87	6	0			
88	7	0			
	19.6%			85%	

Vermont Beauty.

Vegetable Garden, Row I.

	Covered		Uncovered.		
Record No.	Blossom	Fruit	Blossom	Fruit	
122	14	0	100	31	
123	27	0	100	25	Covered May 4.
124	17	0			
127	30	0			Counted May 28.
128	45	0			
129	42	0			
130	32	0			
131	43	0			
132	10	0			
133	23	0			
	00%			28%	

White Doyenne.

West Orchard.

	Covered		Uncovered		
Record No.	Blossom	Fruit	Blossom	Fruit	
667	36	8	100	64	Covered May 4.
668	32	1	100	62	
669	40	0			Counted May 27.
670	43	0			
671	42	0			
672	18	0			
673	Acci.				
674	30	6			
675	46	2			
676	27	0			
677	17	0			
678	41	4			
679	42	0			
680	33	2			
	5.2%			63%	

Alexander.

20-5-6; 21-5.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
548			108	44	Covered May 7.
549			96	37	
550	18	0	42	18	Covered counted
551	12	0	96	26	
552	38	0	108	39	June 5.
553	31	0	108	28	
554					Uncoverdd counted
555	24	0			
556	12	0			June 5.
557	24	0			
558	12	0			
559	18	0			
560	24	0			
561	24	0			
562	18	0			
1402	24	0			
1403	13	0			
1404	12	0			
	00%			34.4%	

Autumn Strawberry.

Row 24.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1329					
1330	35	0	100	56	Covered May 10
1331	36	0	100	71	
1332	33	0	100	76	Covered counted
1333	31	0	100	67	
1334	15	0			June 5.
1335	25	0			
1336	24	0			Uncovered " June 4.
1337	21	0			
1338	20	0			Covered 0%
1339	21	0			
1340	20	0			Uncovered 67.5%
1341	15	0			
1342	26	0			
1343	14	0			
1344	21	0			
1345	20	0			
1346	26	0			
1347	20	0			
1348	21	0			

Baldwin.

Row 14 and 15.

	Covered		Uncovered.		
Record NO.	Cluster	Fruit	Cluster	Fruit	
353					
354	12	0	89	24	Covered May 7.
355	6	0			
356	12	0			Counted May 31
357	18	0			
358	6	0			
359					
364	6	0			
365	6	0			
	0%			27%	

Bottle Greening.

Row 18 trees 13 and 14.
" 19 " 13.

	Covered		Uncovered.		
Record NO.	Cluster	Fruit	Cluster	Fruit	
482	18	0	60	25	Covered May 7.
483	24	1			
484					Counted May 31.
485	18	0			
486					
487	18	0			
488	24	0			
489	30	0			
490	13	0			
491	12	0			
492	18	0			
493	12	0			
494					
495					
	.5%			41.6%	

Canada Baldwin.

Extension Old Orchard Row 2.

	Covered		Uncovered		
Record NO.	Cluster	Fruit	Cluster	Fruit	
951	26	4	100	84	Covered May 8.
952	18	3	100	72	
953	36	10	100	76	Covered counted
954	12	3			
955	30	3			June 10.
956	36	1			
957	27	0			Uncovered " June 7.
958	30	8			
959	48	4			
960	36	2			
961					
962	18	0			
963					
964	24	1			
965	12	1			
966	36	2			
967	11	0			
968					
969	36	3			
970					
	10.3%			77.3%	

Cellein.

Old Orchard Row 8 (3 trees).

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1115	24	0	24	4	Covered May 9.
1116	36	2	42	5	
1117	18	0	24	5	Covered counted
1118	24	0	64	14	
1119	18	0	60	12	Uncovered " June 4
1120			42	6	
1121	18	0	60	6	
1122	20	0	30	4	
1123	42	1	60	9	
1124	18	0	42	4	
1125	24	0	48	7	
1126	26	0	42	4	
1127	24	0			
1128	12	0			
1129	12	1			
1130	24	0			
1131	25	0			
1132	6	0			
1134	16	0			
1135	32	0			
1136	15	0			
1137	11	0			
1138					
1139	17	0			
	.9%		14.8%		

Chenango.

Row 18 tree 3 & 4.
" 19 " 3.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
445	18	0	18	14	Covered May 7.
446	12	2	48	23	
447	12	1	36	19	Counted May 31.
448	24	1			
449	36	0			
450	12	2			
451	24	0			
452	6	3			
453	18	4			
454	12	1			
455	6	0			
	7.2%		54.9%		

Crab.

Old Orchard Row 13 two trees.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1140			61	32	Covered May 9.
1141			60	13	
1142	30	0	60	26	Covered counted
1143	18	0	60	28	
1144	24	0	12	60	June 7.
1145	36	0	60	28	
1146	36	0	42	12	Uncovered "
1147	26	0	60	21	
1148	60	0	36	7	June 4.
1149	32	0	60	17	
1150	36	0	60	12	
1151			36	8	
1152	24	0	26	4	
1153	36	0	36	8	
1154			60	13	
1155	36	0	30	4	
1156	36	0	48	8	
1157	30	0	18	2	
1158	42	0			
1159	26	0			
	0%		36.7%		

Doyleston.

21-15, 20-15.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
511			51	24	Covered May 7
512	6	0	54	20	
513			108	36	Counted covered
514			104	47	
515			48	13	June 5.
516	8	0	54	19	
516	12	0	102	28	Uncovered counted
517	36	0	55	15	
518	18	0	75	21	June 5.
519	12	0			
521	24	0			Covered 00%
521	24	0			
522	24	0			Uncovered 34.9%
523	18	0			
524					
525	Hole in sack.				

Early Harvest.

Row 14 Tree 13 and 14.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
391	54	0	100	43	Covered May 7.
392	24	0	37	11	
393	36	0	73	25	Counted May 31.
394					
395	30	0			
396	24	0			
397	42	0			
398					
	0%		37.6%		

Early Red Crop.

Old Orchard Row 4.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1056			63	28	Covered May 9.
1057	36	4	60	36	
1058	24	3	60	38	Covered counted
1059			42	28	
1060			32	26	Uncovered counted
1061	48	3	65	30	
1062	10	3	16	10	June 4.
1063	56	8	42	16	
1064					
1065					
1066	55	16			
1067	48	0			
1068	42	16			
1069 (?)	30	1			
1070	24	0			
1071	31	0			
1072 (?)	42	1			
1073	84	4			
1074	110	11			
1075	24	2			
	10.8%		55.9%		

Fall Pippin.

Row 12 Tree 2.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1242	21	0	100	41	Covered May 10.
1243	15	0	100	48	Counted June 4.
1244	11	0	100	50	
1245	24	0	100	51	
1246	24	0			
1247	25	0			
1248	20	0			
1249	30	0			
1250	34	0			
1250	34	0			
1251	21	0			
1252	11	0			
1253	19	3			
1254	15	0			
1255	20	0			
1256	16	0			
1257	20	0			
1258	26	0			
1259	26	0			
1260					
	.8%		47.5%		
Row 22 Tree 3.					Covered May 11.
1309	25	0	100	45	
1310	20	0	100	50	Covered counted
1311	14	0	100	43	
1312	16	0	100	36	June 5.
1313	11	0			
1314	16	0			Uncovered "
1315	20	0			
1316	--	--			June 4.
1317	15	0			
1318	15	0			
1319	16	0			
1320	15	0			
1321	20	0			
1322	21	0			
1323	20	0			
1324	15	0			
1325	25	0			
1326	11	0			
1327	20	3			
1328	22	0			
	.9%		43.5%		

Gano.

Extension Old Orchard Row 3.

Row 18 tree 19.

" 19 " 19.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
			100	56	
671	6	0	100	55	Covered May 8.
672	12	0	66	39	
673	9	0	56	18	Covered counted
674	15	0			
675	12	0			June 7th.
676	20	0			
677	15	0			Uncovered "
678	18	0			
679	17	0			June 10.
680	36	0			
496	24	0			
497	24	0			
498	42	0			
499	12	0			
500	12	0			
501	24	0			
502	24	0			
503	12	0			
504	12	0			
505	36	0			
506	18	0			
507	18	0			
508	18	0			
509	36	0			
510	18	0			
	0%		53.8%		

Gideon.

Extension of Old Orchard Row 3, also Row 8.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
985	25	1	50	22	Covered May 9.
986	12	0	50	26	
987	12	0			Covered counted
988	12	0			
989	12	0			June 7.
1000	21	1	100	44	
1001	13	0	50	23	Uncovered counted
1002	13	0	100	51	
1003	Acci.		25	13	June 10.
1004	18	0			
1005	18	0			
1006	8	0			
	Location 22--11; 23--11				
563	18	0	36	17	
565	6	0	96	70	
566	18	0	108	45	
568	12	0	54	21	
569	18	0			
570	6	0			
571	6	0			

.8% 39.1%

Golden Stuart.

Row 16 trees 11 & 12. Row 17 tree 10.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
411	24	0	48	19	
412	42	0	100	20	Covered May 7.
413	18	0	90	22	
414	48	0			Counted May 31.
415	18	0			
416	24	0			
417					
418					
419	12	0			
420	24	0			
421	36	0			
422	6	0			
423	42	0			
1380	6	0			
1381	24	0			
1390	36	0			
1391	6	0			
1392	36	0			
1393	18	0			Covered 0%
1394	6	0			Uncovered 25.6%

Grimes Golden.

Row 15--14--8.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
360	18	0	35	22	Covered May 7.
361	12	0	100	48	
362	6	0	67	21	Counted May 31.
363	6	0	31	10	
366	6	0			
367	12	0			
368	33	0			
369	30	0			
370	24	0			
371	36	0			
372	12	0			
373	42	0			
374	6	0			
375	12	0			
376					
1375	36	0			
1376	24	0			
1377					
1378					
	0%		70.6%		

Haas.

Row 6 --1-2; 8--2.

	Covered		Uncovered		
Record NO.	Cluster	Fruit	Cluster	Fruit	
881	37	0	60	2	
882	36	0	72	13	Covered May 8.
883	32	0	12	1	
884	5	0	108	10	Covered counted
885	47	0	54	8	
886	26	0			June 8.
887	18	0			
888	16	0			Uncovered "
889	13	0			
8(o					June 8.
891	19	0			
892	30	0			
	0%		11%		

Hawley.

Old Orchard Row 4, tree 5.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1091			54	21	Covered May 9.
1092			30	12	
1093			24	7	Uncovered counted
1094	18	0	60	31	
1095	18	0	60	15	July 4
1096	24	0	64	19	
1101	36	0	34	14	
1102			18	6	
1103	60	0	54	21	
1104	20	0			
1105	24	0			
1106	12	0			
1107	18	0			
1108	19	0			
1109					
1110	24	0			
1111	18	0			
1112	20	2			
1113	24	0			
1114	24	0			
	.6%		41.2%		

Jacob Sweet.

Row 10; tree 7.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
926	6	0	84	33	Covered May 8.
927	7	0			
928	12	0			Covered counted
929	9	0			
930	15	0			June 5.
931	7	0			
932	14	0			Uncovered "
933	4	0			
934	9	0			June 5.
935	10	0			
936	7	0			
937	8	0			
	0%		39.3%		

Johnathon.

Row 18, trees 11 and 12; Row 19 tree 11.

	Covered		Uncovered		
Record NO.	Cluster	Fruit	Cluster	Fruit	
466	24	0	60	41	Covered May 7.
467	18	0	82	35	
468	12	0	96	45	Counted May 31
469	6	0			
470	36	0			
471	30	0			
472	18	0			
473	24	0			
474	24	0			
475	24	0			
476	24	0			
477	18	0			
478	18	0			
479	42	0			
480	18	0			
481	24	0			
	0%			50.8%	

Keswick Codling.

Row 14.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
346	18	1	41	12	Covered May 7.
347	48	0	36	10	
348	12	0	18	5	Counted May 31
349	18	1			
350	30	1			
351	18	2			
352	18	0			
	3%			28.4%	

Longfield.

Extension Old Orchard Row 4.

From 599--823 on (26 - 12--13; 27 - 12--13)

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
990	18	0	100	50	Covered May 9.
991			50	20	
992	6	0	200	101	Covered counted
993	36	0			
994	18	0			June 7.
995	12	0			
996	15	1			Uncovered Counted
997	6	0			
998	30	1			June 10.
999	40	0			
599	27	1	54	21	
809	24	0	107	54	
810	18	0	96	41	
812	24	2	72	30	
813	24	3	120	69	
816	18	3	102	41	
817	18	0	96	36	
818	24	3			
819	6	1			
820	6	0			
821	36	4			
822	24	3			
823	18	0			
	46.5%		5%		

Lyscom.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
824	24	0	24	2	
825	12	0	84	15	Covered May 8.
826	6	0	30	2	
827	30	0			Covered counted
828	18	0			
829	12	0			June 5.
830	12	0			
831	18	0			Uncovered "
832	18	0			
833	18	0			June 5.
834	6	0			
835	18	0			
836	12	0			Covered 0%
837	12	0			Uncovered 13.8%
838	24	0			

Maiden Blush.

Row 21.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1261	31	0	100	65	Covered May 10.
1262	14	0	100	52	
1263	30	0	100	52	Covered counted
1264	29	0	100	56	
1265	25	0			June 5.
1266	30	0			
1267	15	0			Uncovered counted
1268	19	0			
1269	20	0			June 4.
1270	26	0			
1271	25	0			
1272	24	5			
1273	16	0			
1275					
1276	16	0			
	1.6%		56.3%		

Mamoth Black Twig.

Row 6 trees 15--16; Row 8 tree 15--16.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
903	15	0	114	14	Covered May 8.
904	18	0	72	11	
905	22	0	108	10	Covered counted
906	30	0	108	16	
907	21	0	66	13	June 5.
908	17	0	96	6	
909	26	0	36	9	Uncovered "
910					
911	16	0			June 5.
912	11	0			
913					
914	13	0			
915	11	0			
916	26	0			
917	26	0			
918	17	0			
919	31	0			
920	20	0			
921	25	0			
	0%		13.1%		

McIntosh Red.

Row 14, Tree 9 and Row 15, Tree 9.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
377	6	0	30	17	Covered May 7.
378			31	9	
379	18	0			Counted May 31.
380					
381	36	0			
382	6	0			
383	12	0			
384	18	0			
385	18	0			
386	24	0			
387	12	0			
388	18	0			
389					
390					
1379	18	0			
	0%		42.6%		

Nero.

20--7- 8; 21--7.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
534	12	0	66	22	Covered May 7.
535	12	0	120	43	
536	6	0	96	37	Uncovered June 5
537	36	0	96	20	
538	18	0	48	16	
539	12	0	102	30	
540	12	0	100	26	
541	12	0			
542	18	0			
543	6	0			
544	18	0			
545	12	0			
546					
547	18	0			
	0%		30.9%		

Northern Spy.

Row 14, Trees 5, 6, 7 and 8.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1405	12	0	36	6	Covered May 13.
1406	24	0	60	18	
1407	12	0	18	3	Counted June 4.
1408	24	0	24	2	
1409			60	12	
1410			60	13	
1411	24	0	60	15	
1412	12	0	54	18	
1413	23	0	18	12	
1414	13	0	60	8	
1415	18	0	12	6	
1416	18	0	18	3	
1417	6	0	60	25	
1418	11	0	12	6	
1419	17	0	60	13	
1420	12	0			
1421	18	0			
1422	24	0			
1423	24	0			
1424	24	0			
1425	24	0			
1426	12	0			
1427	19	0			
1428	18	0			
1429	16	0			
1430	12	0			
1431	18	0			
1432	12	0			
1433	13	0			
1434	21	0			
1435	24	0			
1436	20	0			
1437	28	0			
1438	24	0			
1439	24	0			
1440	12	0			
1441	18	0			
1442	13	0			
1443	12	0			
1444	12	0			
	0%		26.1%		

Oldenburg.

Row 18 Trees 1 & 2, Row 19 Tree 1.

Record No.	Cluster	Fruit	Cluster	Fruit	
432			72	14	Covered May 7.
433	12	1			
434	54	8			Counted May 31.
435	12	1			
436	18	0			
437	12	1			
438	12	6			
439	6	2			
440	18	1			
441	12	1			
442	18	0			
443	12	3			
	12.9%		19.4%		

Peter.

Extension Old Orchard Row 9.

Covered			Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1007	18	0	108	70	Covered May 9.
1008	25	3	100	62	
1009	42	0	100	72	Counted covered
1010	24	0			
1011					June 7
1012	48	0			
1013	18	0			Uncovered counted
1014	31	0			
1015	14	0			June 10.
1016	Accident.				
1017	Accident				
	1.4%		68%		

Pennock.

Old Orchard Row 4.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1076	24	0	12	3	Covered May 9.
1077			54	11	
1078			72	16	Covered counted
1079			24	16	
1080	No fruit		42	10	June 10.
1081			18	3	
1082	set.		24	4	Uncovered counted
1083			42	11	
1084			12	4	June 9.
1085	25	0			
1086	15	0			
1087					
1088					
1089					
1090					
	0%		21.2%		

Porter.

Row 21. Tree 1.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1226	16	0			Covered May 10.
1227	32	0	100	35	
1228	11	0	100	42	Covered counted
1229	41	0	100	44	
1230	20	0	100	45	June 5.
1231	15	0			
1232					Uncovered counted
1233	36	0			
1234	31	0			May 4.
1235	28	0			
1236					
1237	29	0			
1238	18	0			
1239	20	0			
1240	15	0			
1241	22	0			
	0%		41½%		

Priors Red.

Row 20.

Covered			Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1275	75	3	100	67	Covered May 10.
1278	36	0	100	44	Covered counted
1279			100	44	
1280	50	1	100	42	June 5.
1281	22	0	100	59	
1282	23	0			Uncovered counted
1283	40	0			
1284	20	0			June 4.
1285	22	0			
1286	42	0			
1287	31	0			
1288	16	0			
	1%		51.2%		

Pyrus malus, Spectable.

Row 37--18.

Covered			Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
840	60	0	100	90	Covered May 8.
841	42	0	100	87	
842	42	0			Covered countwd
843	66	2			
844	36	0			June 5.
845	54	0			
846	24	0			
847					
848	60	0			
849	66	0			
850	36	0			
853	42	0			
	.4%		88.5%		

Rambo.

Covered			Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
338	30	0	100	44	Covered May 7.
339	30	0			
340	24	0			Covered counted
341	18	0			
342	24	0			May 31
343	12	0			
344					Uncovered counted
345	12	0			
					May 31.
	0%			44%	

Rhode Island Greening.

Row 22.

Covered			Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1289	15	0			Covered May 10.
1290	11	0	100	54	
1291	22	0	100	63	Covered counted
1292	31	0	100	53	
1293	46	0			Uncovered counted
1294	46	0			
1295	26	0			June 4.
1296	25	0			
1297	15	0			
1298	21	0			
1299	30	0			
1300	19	0			
1301	15	0			
1302	16	0			
1303	26	0			
1304	19	0			
1305	26	0			
1306	25	0			
1307	25	0			
1308	19	0			
	0%			56.7%	

Rhode Island Greening.

Old Orchard Row 15--Tree 12.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1160	16	0	18	4	Covered May 9.
1161			60	11	
1162	24	0	90	19	Covered counted
1163	26	1	12	2	
1164	15	0	60	13	Uncovered counted
1165	18	0	60	9	
1166			54	15	June 4.
1167			66	17	
1168			60	14	
1169	18	3	42	7	
1170			60	14	
1171	30	0	90	13	
1172			66	8	
1173	18	0	48	8	
1174			12	4	
1175	30	1	18	3	
1176	24	0	24	4	
1178	24	0			
1179	18	0			
1180	24	0			
1181	24	1			
1182	16	0			
	1.9%			19.7%	

Russet.

21--12.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
526	24	0	48	7	Covered May 7.
527	30	0	78	17	
528	18	0			Covered counted
529	18	0			
530	18	0			June 5.
531	36	0			
532	24	0			Uncovered counted
533					June 5.
	0%			19%	

Seek-no-further.

Old Orchard. Row 2. 5th Tree.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1018	18	0			Covered May 9.
1019	24	0	12	5	
1020	18	0	12	4	Covered counted
1021	30	0	42	12	
1022	18	0	18	8	June 10.
1023	11	0	24	10	
1024	12	0			Uncovered counted
1025	36	0			
1026	18	0			June 4.
1027	30	0			
1028	30	0			
1029	20	0			
1030	18	0			
1031	40	0			
1032	36	0			
1033	24	0			
1034	15	0			
1035	66	0			
	0%		36.1%		

Shackleford.

20--1-2, 21 --1.

	Covered		Uncovered.		
Record No.	Cluster	Fruit	Cluster	Fruit	
855	12	0	84	32	Covered May 8.
856	12	0	60	24	
857	12	0	54	11	Uncovered June 5.
858	6	0			
859	12	0			Covered counted
860					
861	6	0			June 5.
862	12	0			
863					
864	12	0			
865	24	0			
1397	18	0			
1398	17	0			
1399	6	0			
1400	12	0			
1401	18	0			
	0%		28.7%		

Shannon.

Row 8--13-14. Row 6--14.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
893	9	0	12	0	Covered May 8.
894	21	0			
895	24	0			Covered counted
896	17	0			
897	22	0			June 5.
898	16	0			
899	12	0			Uncovered "
900	9	0			
901					June 5.
912	10	0			
	0%		0%		

Stark.

Row 14--15 and 16.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
400	12	0	24	19	Covered May 7.
401	12	0			
402					Counted May 31
403	24	0			
404					
405					
406					
407	24	0			
408					
409	30	0			
410	18	0			
	0%		79.2%		

Talman Sweet.

Old Orchard Row 3.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1036	60	0	18	12	Covered May 9.
1037	32	0	30	19	
1038	36	0	42	12	Covered counted
1039	36	0	24	7	
1040			60	20	June 10.
1041	36	0	48	17	
1042	18	0	30	10	Uncovered "
1043	26	0	63	17	
1044	66	0	48	29	June 4.
1045	52	0	24	6	
1046	32	0	60	19	
1047	37	0	60	9	
1048	54	0	18	10	
1049					
1050	60	0			
1051	54	0			
1052	24	0			
1053	24	0			
1054	30	0			
1055	48	0			
	0%		35.6%		

Talman Sweet.

Old orchard Row 16. Tree 13.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1183	26	0			Covered May 9 (?)
1184	18	0	54	19	
1185	30	0	48	21	Covered counted
1186	50	0	90	35	
1187			35	11	Uncovered counted
1188	14	0	60	15	
1189	24	0	60	28	June 4.
1190	30	0	39	9	Covered 0%
1191			60	16	
1192			60	13	Uncovered 33.2%
1193			60	18	
1194	54	0	36	21	
1195	18	0			
1196(?)	54	0			
1197	24	0			
1198	24	0			
1199	21	0			
1200	42	0			
1177	11	0			

Titus.

Row 27--5.

Covered			Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
581	30	2	100	65	Covered May 8.
582	6	1	108	75	
583	12	6	102	70	Uncovered June 5.
585	12	1	72	58	
586	18	3	57	40	Covered counted
587	48	4			
588	30	6			June 5.
589	24	2			
590	6	3			
591	18	1			
593	30	3			
594	6	4			
595	18	2			
597	36	4			
	24.4%		71.8%		

Wagener.

Row 16, trees 7 & 8; row 17, tree 7.

Covered			Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
424	18	0	100	29	Covered May 7.
425	24	0			
426					Counted May 31.
427					
428	30	0			
429	18	0			
430	18	0			
431	18	0			
1395	18	0			
1396	24	0			
	0%		29%		

Washington Strawberry.
Row 19.--Tree 10.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
456	18	0	66	27	Covered May 7.
457	6	0	30	9	
458	24	0	60	25	Counted May 31.
459	12	0			
460	12	0			
461	6	0			
462	18	0			
463	18	0			
464	18	0			
465	6	0			
	0%		39.1%		

Western Baldwin.

24--13; 25--13.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
573	18	3	78	21	Covered May 7.
574	12	1	72	31	
575	8	0			Covered counted
576	18	0			
577	18	2			June 5.
578					Uncovered " June 5
580	6	0			
	7%		34.7%		

Yellow Bellflower.

Row 24.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
1349	24	0	100	41	Covered May 10.
1350	14	0	100	46	
1351	20	0	100	48	Covered counted
1352	15	0	100	44	
1353	26	0			Uncovered counted
1354	26	0			
1355	11	0			June 4.
1356	24	0			
1357	22	0			
1358	16	0			
1359	32	0			
1360	40	0			
1361	11	0			
1362	15	0			
1363	31	0			
1364	25	0			
1365	32	0			
1366	21	0			
1367	16	0			
1368	16	0			
1369	12	0			
1370	15	0			
1371	23	0			
1372	29	0			
1373	21	0			
1374	32	0			
	0%		44.7%		

Yellow Transparent.

Row 2; 1--2.

	Covered		Uncovered		
Record NO.	Cluster	Fruit	Cluster	Fruit	
866	6	0	42	27	Covered May 8.
867	6	1	66	29	
868	7	2	96	50	Covered counted
869	6	0			
870	6	0			June 5
871	5	0			
872	6	0			Uncovered counted
873	6	3			
874	6	0			June 5.
875	10	0			
876	6	1			
877	6	3			
878	6	0			
879	6	1			
880	35	4			
	12.2%		51.9%		

York Imperial.

Row 12; tree 8.

	Covered		Uncovered		
Record No.	Cluster	Fruit	Cluster	Fruit	
938	42	0	120	2.	Covered May 8.
939	36	0			
940	18	0			Uncovered counted
941	30	0			
942	30	0			June 5.
943	36	0			
944	24	0			Covered counted
945	30	0			
946	30	0			June 5.
947	24	0			
948	30	0			
949	30	0			
950	30	0			
	0%		1.7%		

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