PRUNING EXPERIMENTS ON THE HIGHBUSH BLUEBERRY VACCINIUM CORYMBOSUM

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PRUNING EXPERIMENTS ON THE HIGHBUSH BLUEBERRY VACCINIUM CORYMBOSUM

by

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THESIS

Introduction

With the rapid increase in acreage of blueberry plantings and a relatively good market for the berries, there has been much experimental work done with this fruit. This, however, has been limited principally to studies of varieties and cultural practices and few data are available concerning the yield of plants pruned by different methods or systems.

The competition of wild berries and the increasing production of cultivated berries makes necessary practices which will produce large, high quality fruits in order to maintain a high price level. Pruning is claimed by most investigators to be one of the chief practices in production of berries of large size.

This experiment was planned to investigate the effects of pruning on size of fruit, yield, season of maturity, fruit production from fruiting laterals of different diameters, effects of fruit thinning, foliage thinning, blossom thinning, and lateral thinning.

Review of Literature

The importance of proper pruning was mentioned as early as 1916 by Coville (7). He stated that with suitable pruning a blueberry plant will live as long as a man or longer.

There were some differences of opinion among early workers concerning the pruning of the swamp or highbush blueberry. Coville (8), in 1921, stated that a yearly pruning of the swamp blueberry is not necessary, but he does say that "the unproductive stems should be removed, and, if a whole plant is unproductive, all of the stems should be cut to the ground." White (16), in 1921, maintained that although little is definitely known about pruning, the practice is desirable. Mowry and Camp (14) observed that a severe heading back of old plants will give an increased yield the second or third year after the heading back.

Bailey (1); Bailey, Franklin, and Kelley; Beckwith, Coville, and Doehlert (3); Crowley (9); Johnston (11); and Latimer and Smith (12) agree that pruning is one of the most important operations in the culture of the highbush blueberry. Beckwith, Coville, and Doehlert (3) place pruning above all other cultural practices in saying that "pruning is the largest single factor in producing fancy fruits." They also state that with otherwise perfect care the unpruned plant will make no profit as compared to a properly pruned plant which will return a profit over and above the added expense of proper pruning.

To prune a blueberry plant properly, it must be studied from the standpoint of vigor and fruit bud distribution. Fruit buds on the dormant blueberry plant are found on mature wood of the previous season's growth. They were produced in the axils of leaves on the terminal portion both of laterals and shoots. (14)

The blueberry bush under normal conditions, barring loss of blossoms from frost, will produce far more fruits than it can mature to proper size. The primary object of most pruning, therefore, is to help establish a proper balance between size of crop and size of berry by reducing the number of fruits. Some varieties as Pioneer, Sam, Harding, Katherine, (9) and Cabot (3) produce so many fruit buds that in pruning a tipping back of fruiting laterals is advisable. Beckwith, Coville, and Doehlert (3) found that some varieties as Rubel and Rancocas require little if any tipping back of fruiting laterals as they do not tend so strongly to overproduction. Also they found by experiment that the largest fruits are borne on vigorous vegetative growth which matured well the previous season. Beckwith, Coville, and Doehlert maintain that a severe annual pruning from the first year in the field will result in larger crops and better berries. Pruning should be done before growth starts (2) as pruning after blossoming was found to retard the season's growth (3).

The pruning recommendations of some of the more recent investigators are very similar. Bailey, Franklin, and Kelley (2); Crowley (9); and Beckwith, Coville, and Doehlert (3) recommended the removal of about one-third of the oldest

stems each year after the plant is in full production and reducing the number of fruit buds in the overbalanced varieties, mentioned above, by a tipping back of the fruiting laterals.

Johnston (11), working with the Rubel variety, used four plots of ten plants each in a series of pruning studies. Fine wood was removed from the first plot; fine wood and about one-third of the old shoots were removed from the second plot; from the third plot the fine wood was removed and about one-third of the old shoots headed back severely; the fourth plot was used as a check. The first year the check plot yield was largest and the berries were the smallest. The second plot gave the smallest yield of the largest berries. The second year of the experiment the check plot gave the smallest yield of the largest berries and the second plot gave the largest yield of the smallest berries.

Byrd (6), working with several varieties of blueberries found little or no correlation between leaf area and average weight per berry and total weight of berries produced on laterals.

Materials

These experiments were carried out during the spring and summer of 1939 at the South Haven Experiment Station plantation. A fairly uniform plot of about 160 plants was selected on a uniform Saugatuck sandy loam soil. The plants were of the Rubel and Pioneer varieties.

The plants had been set in the field in 1929 and have received a moderate pruning each year. A complete fertilizer consisting of one part of sulfate of ammonia, two parts of superphosphate, and one part of sulfate of potash has been applied to the plants each year, except the last two, since the plants were two years old. One ounce per plant was first applied and the amount increased one ounce per year until a maximum of about seven ounces per plant were applied. During the past two seasons nitrate of soda was used instead of sulfate of ammonia and the mixture consisted of two parts of nitrate of soda, two parts of superphosphate and one part of sulfate of potash. The plants have been cultivated thoroughly each year until harvesting time. These rather large plants have made moderate growth and have produced large crops of berries with the foregoing treatment.

Two very heavy frosts occurred in the spring of 1938 which killed many blueberry blossoms. These frosts occurred May 12 and 13. This reduction in crop resulted in a moderate vegetative growth the season of 1938. The season of 1939 was almost ideal for growth as there were frequent rains. During the month of June there was some precipitation

on 14 days giving a total of 5.93 inches. This was 2.12 inches above the normal (17). In July there was precipitation on 8 days with a total of 1.94 inches. This was .68 inch below normal (18). There was some precipitation on 9 days during August giving a total of 2.95 inches. This was .23 inch above normal (19). Too much rain in August is undesirable as it interferes with harvesting operations.

A five foot poultry wire fence was put around the plot to prevent picking and many strands of three-ply grocery twine were run around the sides and over the plot to protect the berries from birds.

Methods

To facilitate a more definite understanding of the different terms used in this paper and to designate different parts of the plant, the following terms are defined:

Shoot - New growth originating at or near the base of the plant the previous season.

Stem - Shoot growth more than one year old.

Lateral - Fruiting side branch of the past season's growth.

Bushy thin wood - Small bushy growth in the plant which becomes more prevalent as the plant becomes older, especially if it has not been regularily pruned (Fig. 1).

Nine groups of plants were selected for a comparison of effects of different degrees of pruning on total yield, size of fruit, and season of maturity. Five groups were slected of the Rubel variety and four groups were selected of the Pioneer variety. Each group contained ten plants except one Rubel group which contained only nine. One group of plants of each variety received the following treatments:

Check - no pruning.

Light method - Mostly removal of bushy thin wood and light heading back of new shoots (Figs. 2, 3, 4, and 5)

Intermediate method - The removal of bushy thin wood, removal of about one-third of the oldest stems,

Figure 1. Bushy thin wood of Rubel (left) and Pioneer (right).

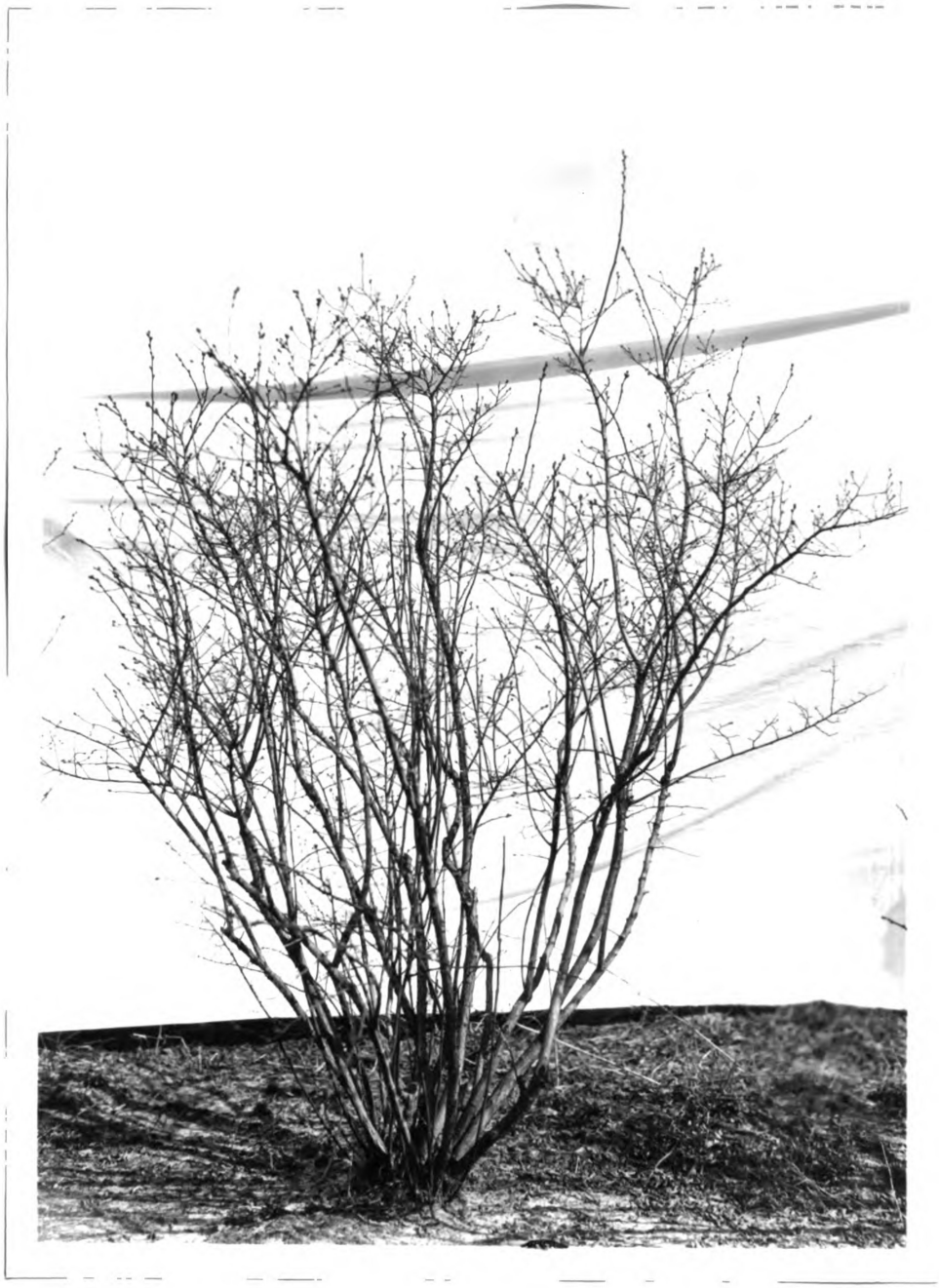

Figure 2. Rubel plant before light pruning.

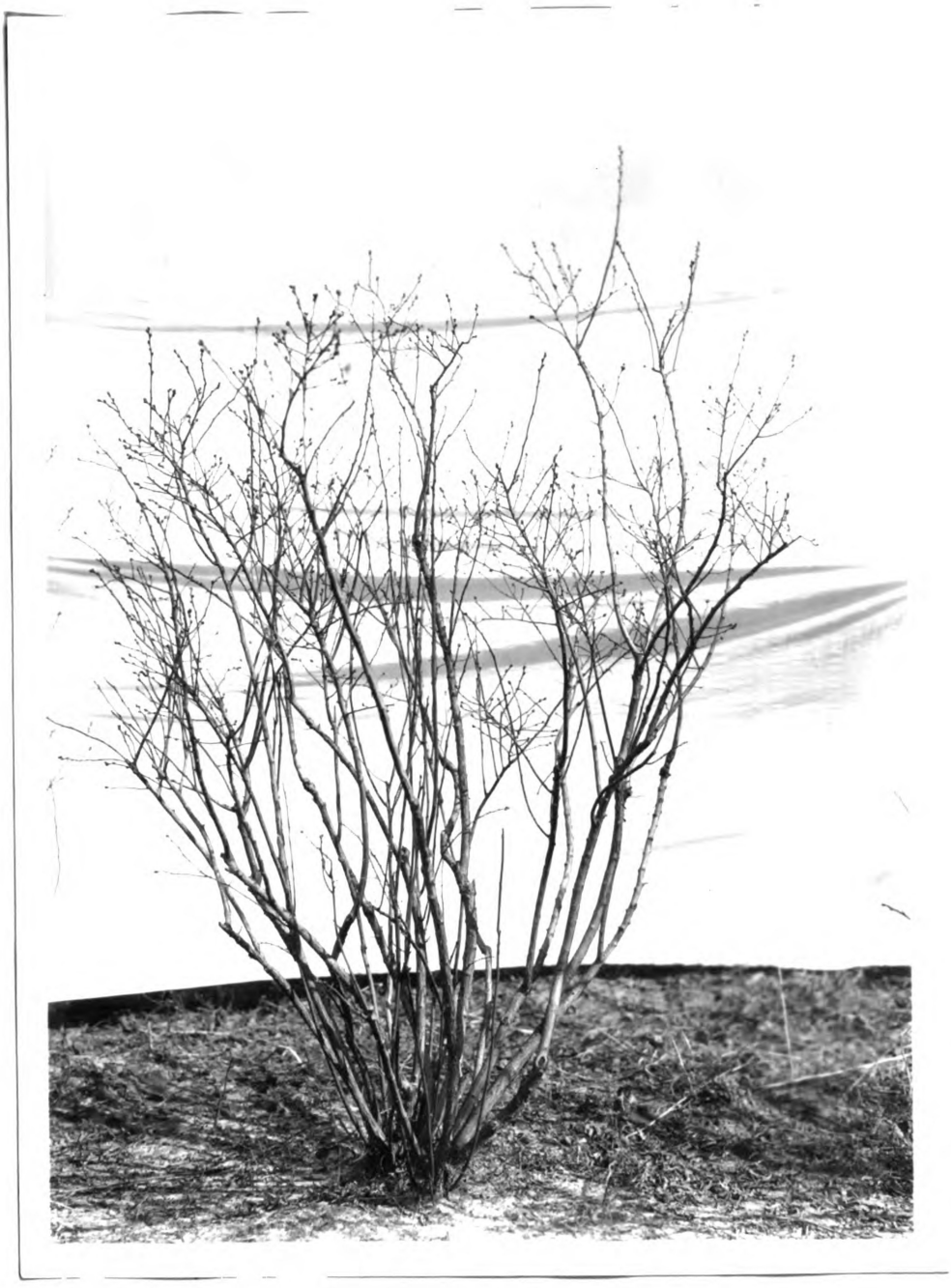

Figure 3. Rubel plant after light pruning.

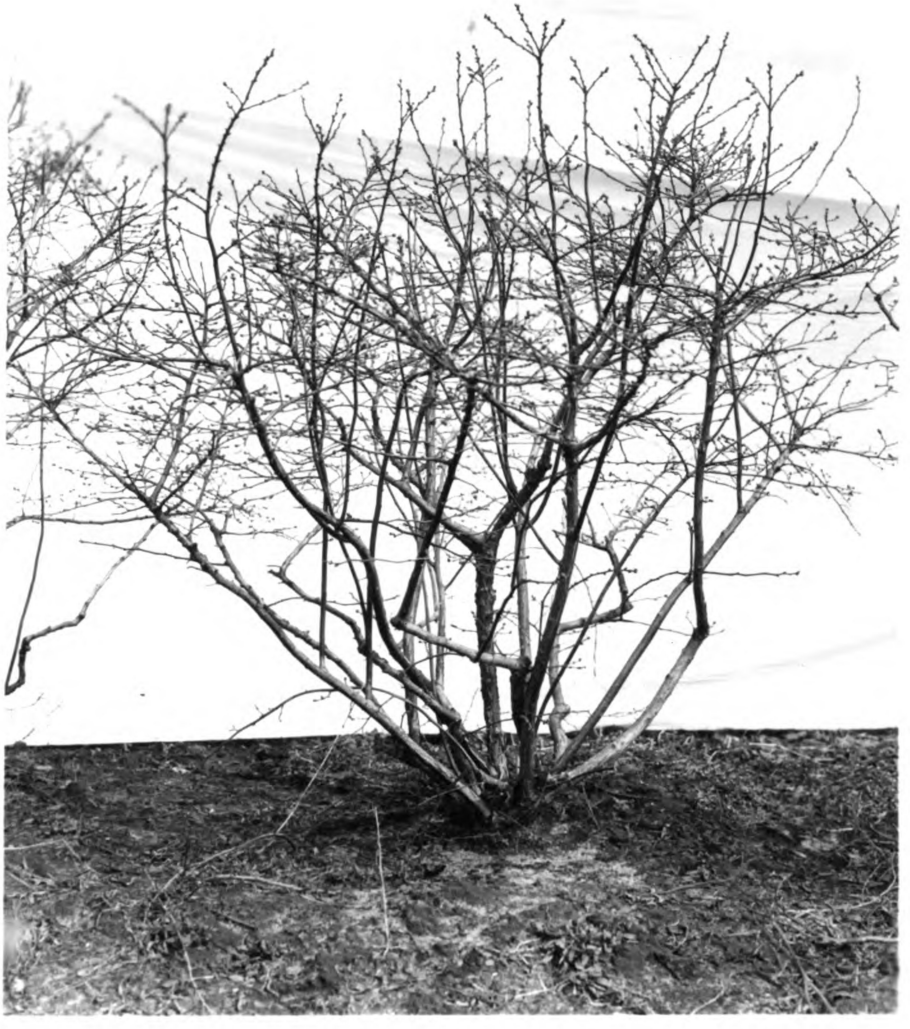

Figure 4, Pioneer plant before light pruning.

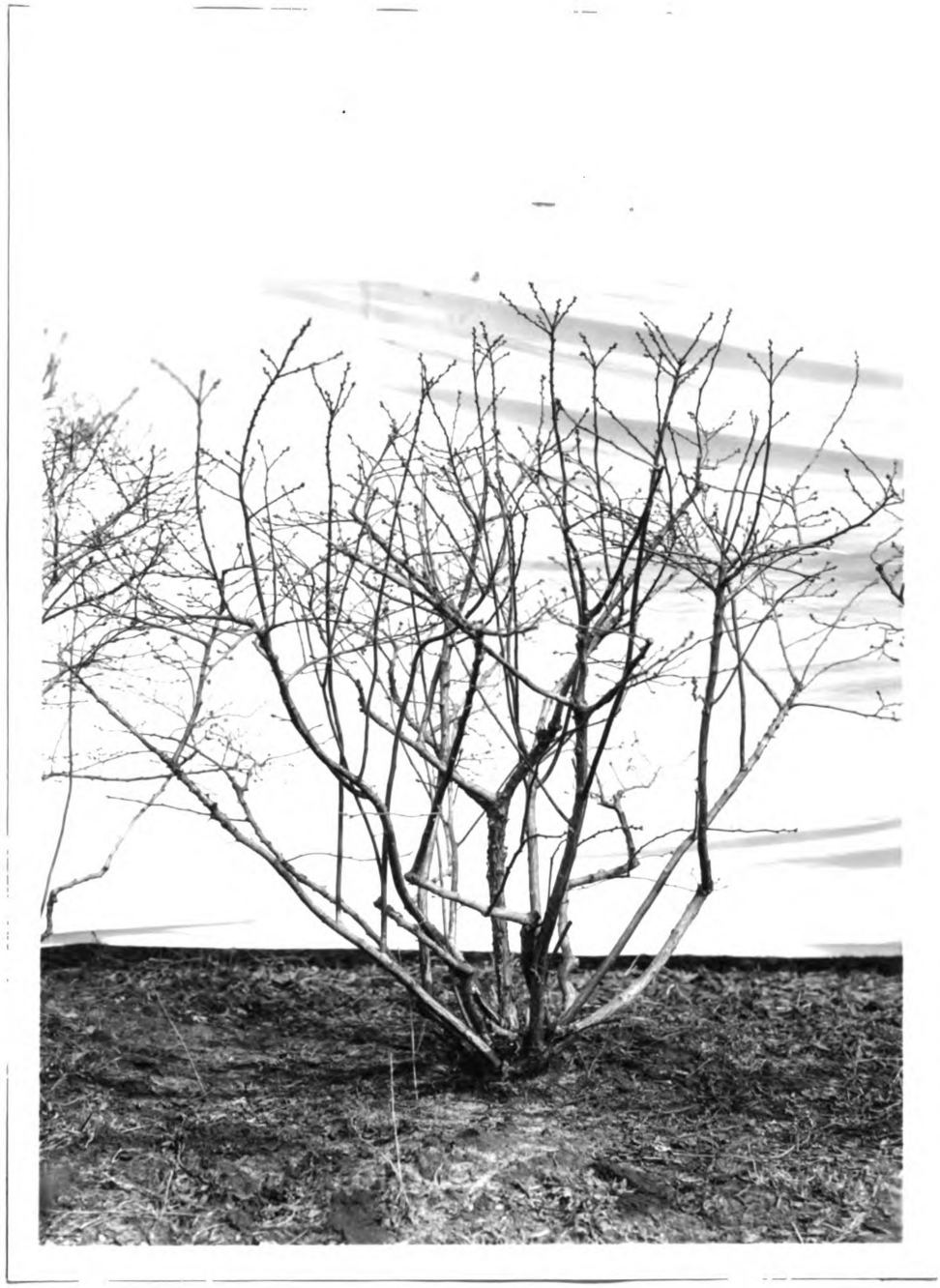

Figure 5. Pioneer plant after light pruning.

and a moderate heading back of new shoots (figs. 6, 7, 8, and 9).

Heavy method - The removal of bushy thin wood and at least one-third of the oldest stems, heading back of all new shoots, and reducing the number of fruit buds on fruiting laterals about sixty per cent by heading back each lateral (figs. 10 and 11).

A group of rubel plants was pruned moderately-heavy by pruning like the heavy method except the number of fruit buds on laterals was not reduced by tipping back (figs. 12 and 13).

The fruits were picked at intervals of varying length as they reached maturity. These pickings were more frequent than were commercial pickings. The fruits were harvested and weighed to the nearest sixteenth ounce and the berries required to fill a one-half liquid pint measuring cup were counted to determine comparative size and grade of the berries. This size of cup has been adopted by the Michigan Blueberry Growers' Association as their standard measuring cup to determine the grades as follows:

90 berries per cup and under - Superior
91-140 " " " - Golden Moon
141-190 berries per cup - Columbia
191 " " cup and over - Lake State

The total yield and number of berries per grading cup are shown in tables 1 to 3. Individual plant records are given in appendix tables A, B, C, and D.

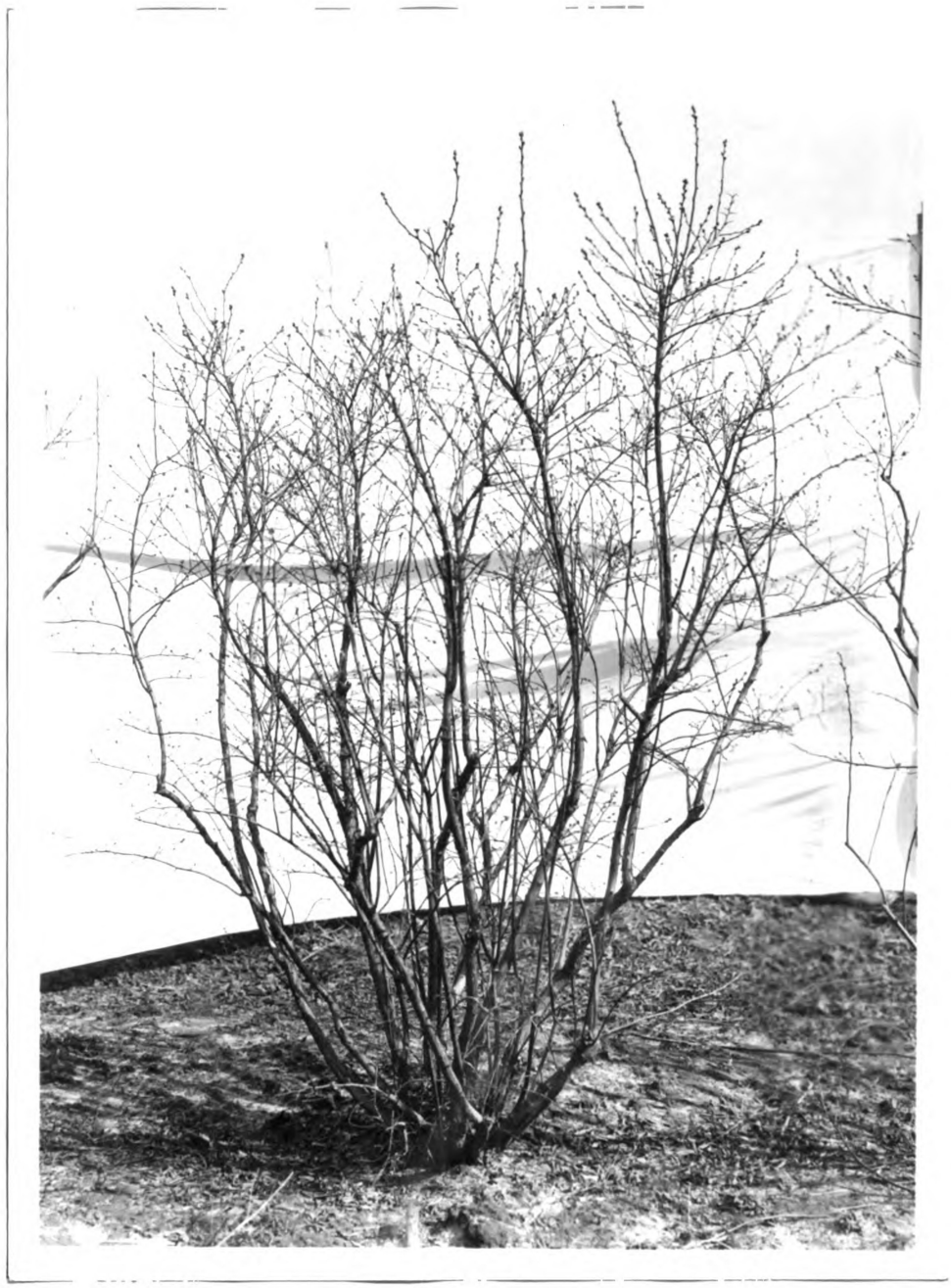

Figure 6. Rubel plant before intermediate pruning.

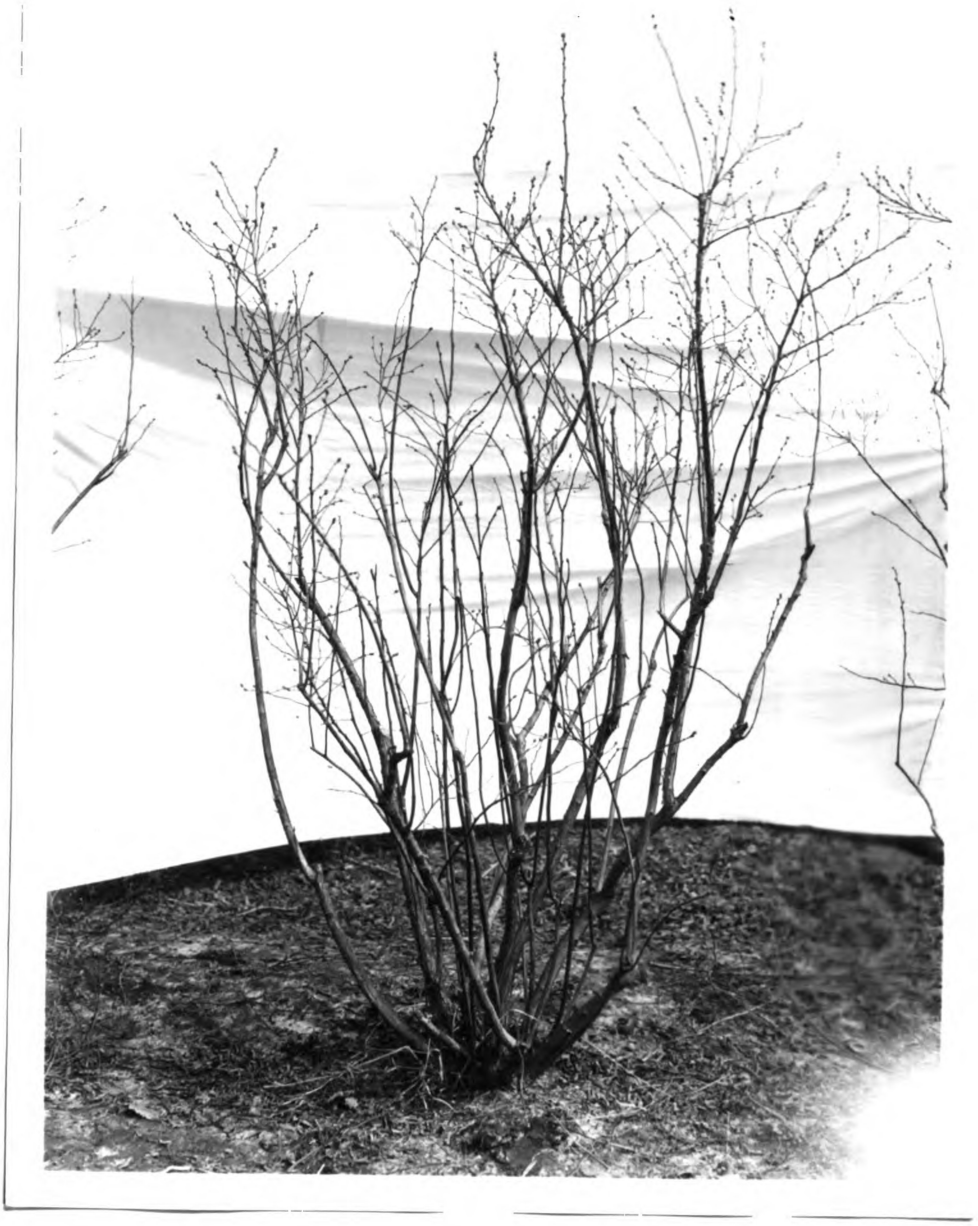

Figure 7. Rubel Plant after intermediate pruning.

Figure 8. Pioneer plant before intermediate pruning.

Figure 9. Pioneer plant after intermediate pruning.

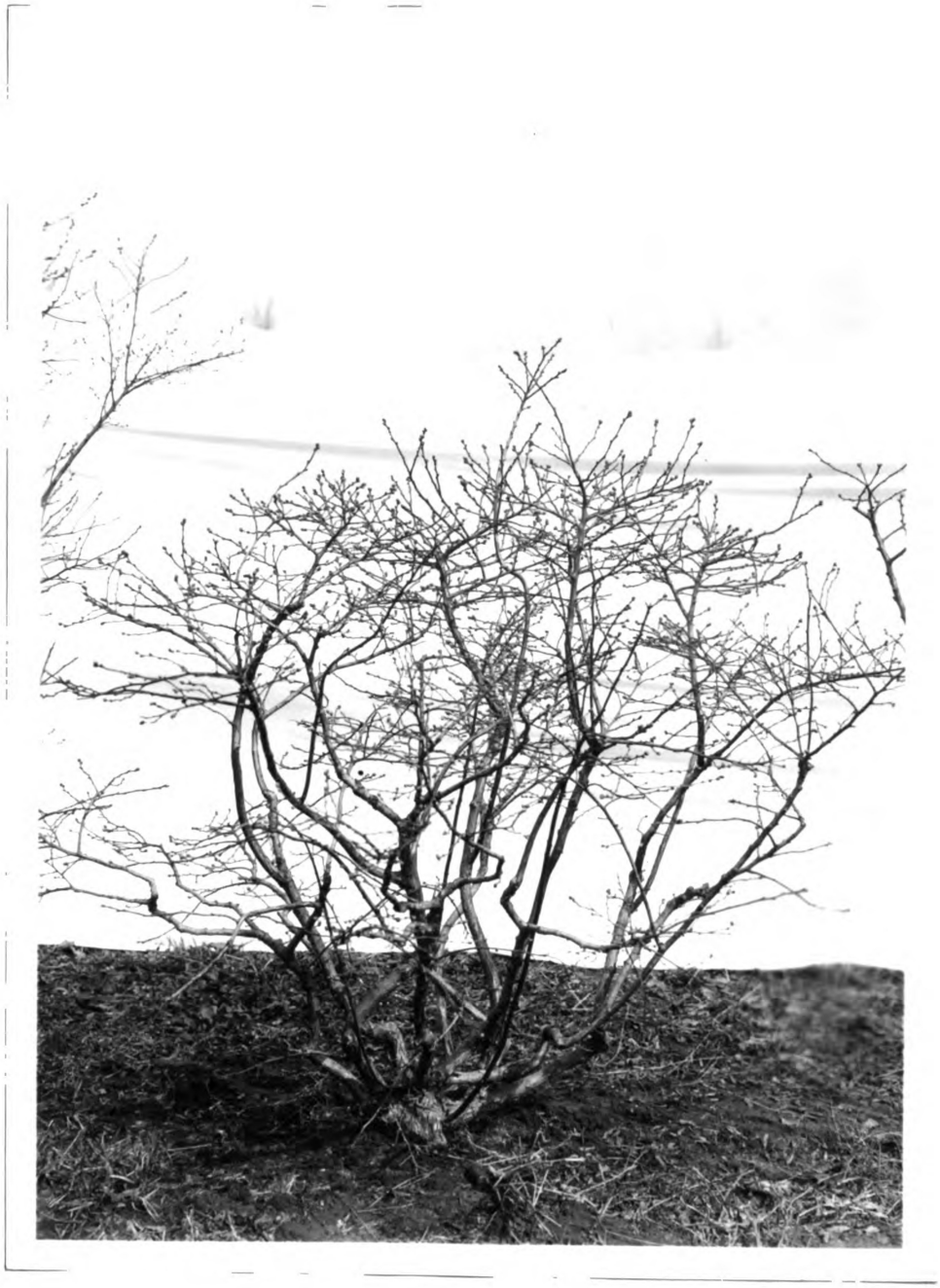

Figure 10. Pioneer Plant before heavy pruning.

Figure 11. Pioneer plant after heavy pruning.

Figure 12. Rubel plant before moderately-heavy pruning.

Figure 13. Rubel plant after moderately-heavy pruning.

Table 1. Effects of Pruning Methods on Average Yield of Plants, Size of Berries and Season of Maturity - Rubel

Method of Pruning	Date of Picking	Av. wt. of berries per plant-oz.	Av. no. of berries per measuring cup	Grade
Check-No Pruning	July 28-30	122.91	157.4	Columbia
	Aug. 9	132.52	208.7	Lake State
	Aug. 18-21	80.26	214.9	Lake State
	Aug. 28	31.57	255.6	Lake State
	Sept. 4	9.32	273.6	Lake State
	Total	376.58	222.0	Lake State
Light Method	July 28-30	172.93	141.5	Columbia
	Aug. 9	76.15	176.0	Columbia
	Aug. 18-21	23.82	201.4	Lake State
	Aug. 28	5.08	243.2	Lake State
	Sept. 4	1.63	301.0	Lake State
	Total	276.62	189.0	Columbia
Inter-mediate Method	July 28-31	152.21	129.4	Golden Moon
	Aug. 9	61.85	174.0	Columbia
	Aug. 18-21	17.67	184.6	Columbia
	Aug. 28	4.61	230.5	Lake State
	Sept. 4	1.23	228.0	Lake State
	Total	237.58	173.8	Columbia
Moder-ately Heavy Method	July 28-30	100.95	118.0	Golden Moon
	Aug. 9	18.44	156.3	Columbia
	Aug. 18-21	1.71	219.0	Lake State
	Aug. 28	.27		
	Sept. 4	.12		
	Total	121.51	147.0	Columbia
Heavy Method	July 28-30	58.29	100.2	Golden Moon
	Aug. 9	3.43	144.8	Columbia
	Aug. 18-21	.37	190.0	Columbia
	Aug. 28	.17		
	Sept. 4	.05		
	Total	62.31	121.0	Golden Moon

Table 2. Effects of Pruning Methods on Average Yield, Size, and Date of Maturity - Pioneer

Method of Pruning	Date of Picking	Av. wt. of berries per plant-oz.	Av. no. of berries per measuring cup	Grade
	July 10-11	15.55	121.7	Golden Moon
Check-	19-21	51.28	143.7	Columbia
No	24-25	91.89	160.4	Columbia
Pruning	Aug. 7-9	121.46	178.1	Columbia
	15	69.98	217.4	Lake State
	28	44.54	227.7	Lake State
	Sept. 4	10.86	283.5	Lake State
Total		404.81	190.3	
	July 10-11	13.41	113.4	Golden Moon
	19-21	50.71	125.8	Golden Moon
	24-25	93.45	133.8	Golden Moon
Light	Aug. 7-9	81.06	156.5	Columbia
Method	15	37.86	170.3	Columbia
	28	14.95	244.2	Lake State
	Sept. 4	2.60	270.0	Lake State
Total		294.07	173.4	
	July 10-11	13.54	115.6	Golden Moon
	19-21	60.88	122.1	Golden Moon
Inter-	24-25	109.93	127.8	Golden Moon
mediate	Aug. 7-9	65.95	146.1	Columbia
Method	15	23.40	173.7	Columbia
	28	5.03	227.8	Lake State
	Sept. 4	0.25		
Total		279.00	151.1	
	July 10-11	5.71	81.7	Superior
	19-21	45.96	81.6	Superior
Heavy	24-25	33.84	84.4	Superior
Method	Aug. 7-9	7.44	93.8	Golden Moon
	15	0.41		
	28	0.04		
	Sept. 4			
Total		93.42	85.3	

Table 3. Summary of Results of Pruning Methods on Size and Yield of Berries from Rubel and Pioneer Plants.

Variety	Pruning Method	No Berries per Grading Cup	Wt. of Berries per plant-oz.	Grade
Rubel	None-check	222.0	376.58	Lake State
	Light	189.0	279.62	Columbia
	Intermediate	173.8	237.58	Columbia
	Moderately-heavy	147.0	121.51	Columbia
	Heavy	121.0	62.30	Golden Moon
Pioneer	None-check	190.3	404.81	Lake State
	Light	173.4	294.07	Columbia
	Intermediate	152.1	279.00	Columbia
	Heavy	85.3	93.42	Superior

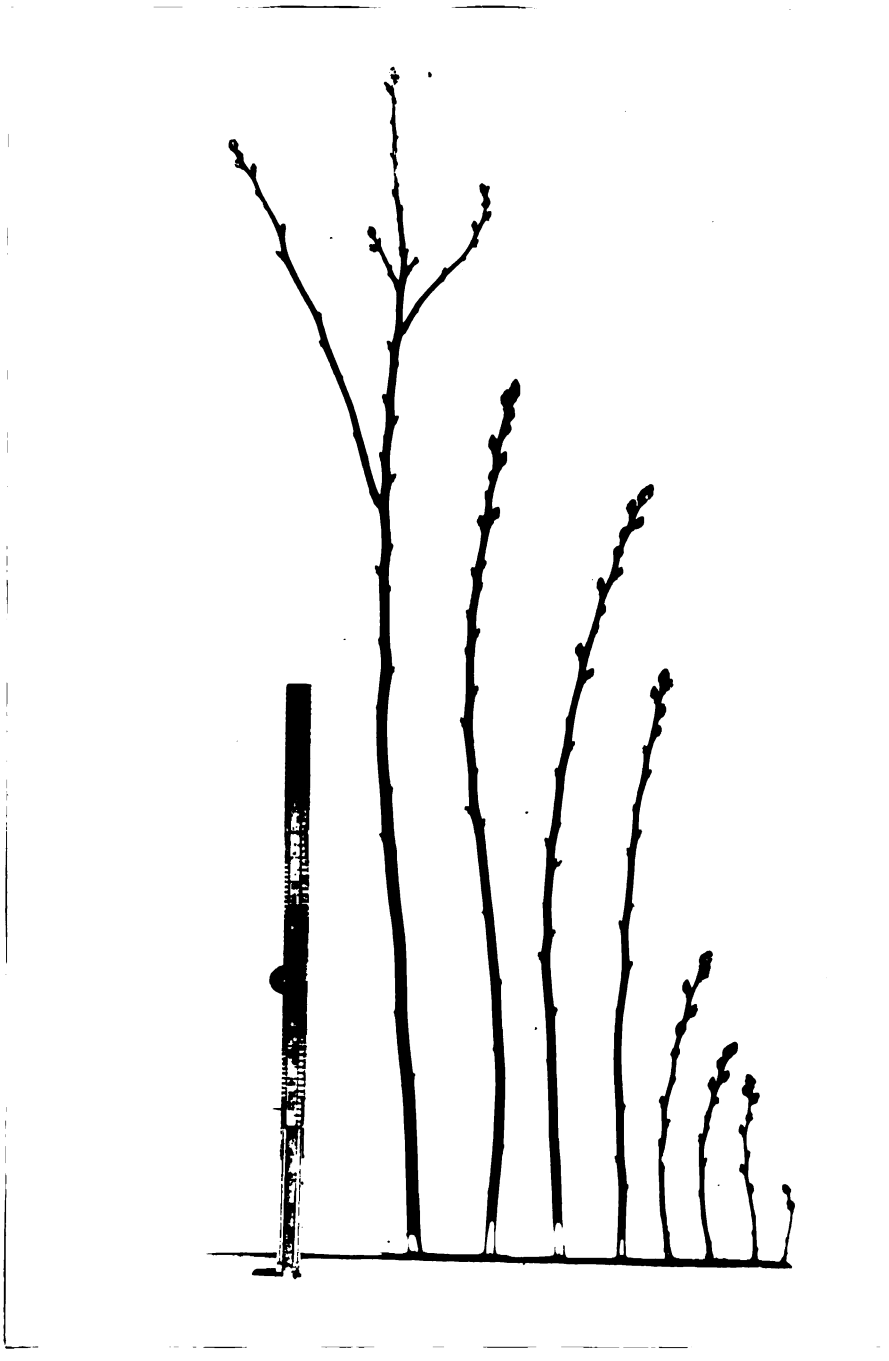

Figure 14. Laterals one thirty-second to eight thirty-seconds inch in diameter (right to left)

Figure 15. Laterals one thirty-second inch to nine thirty-second inch in diameter. (Top row one to three thirty-seconds inch. Lower row four to nine thirty-seconds inch)

Table 4. Average Date of Ripening and Weight per Berry of Berries from Laterals one to nine thirty-seconds Inch Diameter

Date		July 31		August 14		August 24		August 28		September 2	
No. of laterals averaged	Diameter in inches	No. Berries	Av. wt. per berry in oz.	No. Berries	Av. wt. per berry in oz.	No. Berries	Av. wt. per berry in oz.	No. Berries	Av. wt. per berry in oz.	No. Berries	Av. wt. per berry in oz.
12	1/32	2.83	.0305	2.41	.0227	1.33	.0256	0.83	.0200	0.33	.0175
20	2/32	5.35	.0279	5.80	.0229	3.55	.0223	1.05	.0180	0.65	.0123
20	3/32	11.25	.0326	9.90	.0221	4.90	.0233	1.70	.0179	0.50	.0120
18	4/32	17.83	.0315	8.55	.0327	2.83	.0241	1.33	.0195	0.05	.0100
16	5/32	15.50	.0326	16.25	.0256	4.31	.0231	1.37	.0186	0.25	.0100
18	6/32	26.38	.0347	17.33	.0258	5.16	.0236	1.16	.0138	0.27	.0140
17	7/32	28.05	.0369	14.29	.0285	3.17	.0266	0.76	.0169	0.23	.0125
10	8/32	41.50	.0347	20.00	.0272	4.20	.0204	0.90	.0122	0.30	.0166
11	9/32	44.63	.0341	38.00	.0280	4.00	.0234	1.00	.0190	0.45	.0120

Table 5. Percent of Total Number of Berries Harvested Each Picking from Laterals of Different Size and Average of Results from Laterals 1/32 - 3/32, 4/32 - 6/32, and 7/32 - 9/32 in. inclusive

Date		July 31		August 14		August 24		August 28		September 2	
No of laterals averaged	Diameter in inches	Percent of Berries	Av. of three groups	Percent of Berries	Av. of three groups	Percent of Berries	Av. of three groups	Percent of Berries	Av. of three groups	Percent of Berries	Av. of three groups
12	1/32	36.6		31.2		17.2		10.7		4.3	
20	2/32	32.6	36.3	35.4	33.9	21.6	18.7	6.4	7.7	4.0	3.4
20	3/32	39.8		35.0		17.3		6.0		1.8	
18	4/32	58.3		28.0		9.2		4.3		.2	
16	5/32	41.1	50.6	43.1	35.2	11.4	10.3	3.6	3.4	.7	.5
18	6/32	52.4		34.5		10.3		2.3		.5	
17	7/32	60.3		30.7		6.8		1.6		.5	
10	8/32	62.0	57.7	29.9	34.6	6.3	5.9	1.3	1.3	.4	.45
11	9/32	50.7		43.1		4.5		1.1		.5	

Table 6. Summary of Results from Laterals of Different Diameter

No. of laterals used	Diameter (inches)	Length (inches)	No. Fruit buds	No. Blossoms	Fruits Harvested	Percent Fruit set	Av. yield per lateral in oz.	Av. wt. per berry in oz.	Grade
12	1/32	1.50	2.0	11.0	7.6	69.1	.196	.0256	Lake State
20	2/32	3.34	3.6	23.6	15.9	67.4	.378	.0247	Lake State
20	3/32	5.95	4.7	37.8	28.0	74.1	.758	.0272	Columbia
18	4/32	7.55	5.0	41.1	30.0	73.1	.860	.0281	Columbia
16	5/32	11.68	6.4	58.3	37.8	63.8	1.051	.0278	Columbia
18	6/32	16.54	7.9	75.7	50.2	66.3	1.514	.0301	Columbia
17	7/32	19.34	7.1	59.2	46.9	79.1	1.544	.0336	Columbia
10	8/32	23.98	8.8	81.7	66.9	80.6	2.089	.0312	Columbia
11	9/32	27.26	11.9	108.7	85.9	79.0	2.537	.0308	Columbia

To study the influence of diameter of laterals on total yield, size of fruits, and date of maturity, 150 laterals on Rubel plants were measured. These laterals were calipered with a sliding caliper to the nearest thirty-second of an inch. They ranged from one thirty-second to nine thirty-seconds inch in diameter. The length was measured to the nearest sixteenth inch and these measurements converted to tenths of inches. The length ranged from 0.81 to 36.19 inches. Figures 14 and 15 show the diameter range of the laterals. The number of blossoms were counted and the percentages maturing fruit were calculated, as shown in tables 4, 5, and 6. Individual lateral records are given in appendix table E. The harvested berries were weighed to the nearest tenth of a gram and these weighed converted to ounces.

The influence of heading of shoots on subsequent lateral growth was studied on Rubel plants. Thirty vigorous shoots on several plants were selected for this experiment. Ten of these shoots were pruned so as to leave one-half of the total number of buds; ten shoots were pruned so as to leave three-fourths of the original number of buds; and ten shoots were not pruned, these serving as checks. The total lateral growth is shown in table 7 and individual shoot lateral growth is shown in appendix table F.

A study was made to compare fruit production from blossoms on the basal half and from those on the terminal half of laterals. For this experiment, ten laterals on each of three plants were selected. The laterals were five thirty-seconds inch in diameter and of comparable length. The

Table 7. Effect of Heading Back of Shoots One-fourth and One-half the Number of Buds on Lateral Growth

Shoot No.	Treatment	Shoot Dia. (in.)	Length before pruning (in)	Length after pruning (in)	No. laterals produced	Buds remaining		Average size of laterals produced on shoots in inches			
								Basal	Half	Terminal	Half
						Leaf	Fruit	Dia.	Length	Dia.	Length
1	½ of buds	.28	28.31	21.50	4	32	0	0	0	.187	21.0
2	pruned off	.25	30.31	21.19	5	26	0	0	0	.096	6.6
3		.22	13.19	12.94	3	18	0	0	0	.120	8.6
4		.28	32.00	24.12	4	29	0	0	0	.187	19.5
5		.38	41.75	30.19	4	36	0	0	0	.185	25.5
6		.38	55.44	28.00	7	40	1	0	0	.122	9.5
7		.25	41.19	30.19	11	28	0	0	0	.127	9.1
8		.31	39.50	31.56	12	63	0	0	0	.142	12.3
9		.22	32.87	23.19	5	26	0	0	0	.096	8.2
10		.25	33.94	23.31	6	28	0	0	0	.131	12.3
Total		2.82	348.50	246.19	61	326	1	0	0	1.393	132.6
Average		.282	34.85	24.61	6.1	32.6	.1	0	0	.139	13.2
11	¼ of buds	.28	31.00	19.81	3	43	0	0	0	.210	20.6
12	pruned off	.28	27.50	20.44	6	39	1	0	0	.100	5.8
13		.25	35.25	28.00	4	58	0	0	0	.107	8.0
14		.25	27.25	12.75	2	32	0	0	0	.120	13.0
15		.31	48.06	39.00	9	50	0	0	0	.123	10.5
16		.34	55.50	29.25	6	68	0	0	0	.133	15.0
17		.31	47.12	37.00	6	56	0	0	0	.133	14.6
18		.28	35.38	23.62	11	45	0	0	0	.129	10.7
19		.28	37.31	32.25	11	50	0	0	0	.140	11.6
20		.25	30.12	26.81	15	49	0	0	0	.096	6.0
Total		2.83	374.49	268.93	73	490	1	0	0	1.291	115.8
Average		.283	37.44	26.89	7.3	49.0	.1	0	0	.129	11.5

Table 7. Effect of Heading Back of Shoots on Lateral Growth

Shoot No.	Treatment	Shoot Dia. (in.)	Length before pruning (in)	Length after pruning (in)	No. laterals produced	Buds remaining		Average size of laterals produced on shoots in inches			
								Basal	Half	Terminal	Half
						Leaf	Fruit	Dia.	Length	Dia.	Length
21	Check -	.34	37.50	37.50	4	53	1	0	0	.187	20.5
22	No Heading	.25	24.19	24.19	14	48	0	0	0	.107	7.0
23		.25	34.00	34.00	5	67	1	0	0	.134	10.0
24		.34	37.38	37.38	10	74	1	0	0	.135	11.9
25		.25	32.00	32.00	3	58	0	0	0	.206	18.6
26		.25	30.56	30.56	18	40	1	.25	21	.081	4.7
27		.28	27.81	27.81	10	57	5	0	0	.115	8.1
28		.31	41.44	41.44	6	73	2	0	0	.143	14.6
29		.28	26.87	26.87	5	41	0	0	0	.146	12.2
30		.28	32.50	32.50	9	52	1	0	0	.110	7.5
Total		2.83	324.25	324.25	84	563	12	.25	21	1.364	115.1
Average		.283	32.42	32.42	8.4	56.3	1.2	.025	2.1	.136	11.5

terminal half of the blossoms were removed from ten laterals, the basal half of the blossoms were removed from ten laterals, and ten laterals were used as checks. The berries were counted, weighed and the percentage of mature fruits from blossoms was calculated. The total results are given in table 8 and individual lateral records are given in appendix tables G, H, and I.

The effects of removal of all the foliage from some laterals and removal of one-half the foliage from some laterals on Rubel plants on fruit production were compared. Ten laterals on each of three plants were selected. These laterals were five thirty-seconds inch in diameter and of comparable length. All of the foliage was removed from ten laterals, one-half the foliage was removed from ten laterals and ten undefoliated laterals served as checks. The harvested berries were counted and weighed. Results of this study are given in table 8 and individual lateral records are given in appendix tables J and K.

Thinning studies were made on thirty laterals on Rubel plants. These laterals were selected on three plants. The laterals were five thirty-seconds inch in diameter and of comparable length. One-fourth of the fruits were removed at random from ten laterals, one-half the fruits were removed from ten laterals, and ten laterals from which no fruits were removed were used as checks. Results of this study are given in table 8. Individual lateral records are given in appendix tables L, M, and N.

Table 8. Summary of Results Foliage Removal, Fruit Thinning and Removal of Terminal and Basal Blossoms on Yield and size of Berries Produced - Averages of Ten Laterals

Treatment	Dia. (in.)	Length (in.)	No. Buds		Blossoms Remaining	No. Berries Harvested	Percent Fruit Set	Wt. of Berries oz.	Av. wt. per berry-oz.	Grade
			Fruit	Leaf						
Basal half blossoms removed	5/32	6.19	3.4	7.0	18.0	14.2	70.68	.479	.0304	Columbia
Terminal half blossoms removed		7.55	3.6	11.6	16.6	13.9	83.94	.481	.0345	Golden Moon
Check - no blossoms removed		6.37	3.8	7.7	32.1	22.5	72.76	.707	.0316	Columbia
All foliage removed	5/32	6.50	3.8	7.7	33.7	21.7	66.57	.577	.0276	Lake State
One-half foliage removed		6.41	3.8	8.1	34.5	25.4	74.48	.657	.0255	Lake State
Check- no foliage removed		6.39	3.8	7.5	32.8	19.5	59.95	.596	.0324	Columbia
One-fourth the fruits removed	5/32	7.45	3.8	7.7	32.9	18.7	57.74	.583	.0312	Columbia
One-half the fruits removed		8.33	3.8	9.2	32.8	12.8	38.13	.556	.0418	Golden Moon
Check - no fruits removed		6.08	3.6	7.3	29.0	19.8	68.08	.611	.0285	Columbia

Table 9. Comparison of Effects of Pruning Off and of Removal of Blossoms from One-third to one-half the Laterals of Stems on Fruit Set, Total Weight and Size of Berries

Treatment	Dia. (in.)	No. Blossoms	No. Berries	Percent Fruit Set	Wt. of Berries Per Stem - oz.	No. Berries Per Cup	Grade
1/2 to 1/3 of the laterals removed	.87	1291.6	1199.4	93.02	29.92	215.9	Lake State
Blossoms removed from 1/2 to 1/3 of the laterals	.87	1061.8	997.8	94.48	33.76	214.4	Lake State
Check - No treatment	.87	1828	1714.6	94.07	38.33	221.2	Lake State

A comparison of the effects of pruning off one-third to one half of the laterals from certain stems and of the removing of the blossoms from one-third to one-half of the laterals on other stems on fruit production was made. For this comparison fifteen uniform plants were selected and on each plant three comparable stems were selected. One-third to one-half the laterals were pruned from fifteen stems on five plants, the blossoms were removed from one-third to one-half the laterals on fifteen other stems, and fifteen stems were used as checks. The harvested berries were weighed and graded and per cent of fruit set was determined after spring dropping was over. Results are given in table 9. Individual stem records are given in tables O and P.

Results

The Rubel check plants gave considerably higher yields than did plants pruned by the light, intermediate, moderately-heavy or heavy method. The check plants averaged 376.58 ounces per plant, those pruned by the light method 279.62 ounces, those pruned by the intermediate method 237.58 ounces, those pruned by the moderately-heavy method 121.51 ounces, and those pruned by the heavy method 62.30 ounces per plant, as shown in table 3.

Pruning increased the size of berries. Table 3 shows the average number of berries per grading cup for the season for the different methods of pruning as follows: check plants 222.0, light method 189.0, intermediate method 173.8, moderately-heavymethod 147.0 and heavy method 121.0.

The heavily pruned plants matured their fruits earlier than did the check plants, as indicated by the number of berries remaining on the laterals in figure 16. Fruits on the check plants not only matured later but over a longer period of time (table 1). On check plants 67.82 per cent of the total yield of fruit was harvested with the first two pickings, 89.07 per cent of the total yield of plants pruned by the light method, 90.09 per cent of the total yield of plants pruned by the intermediate method, 98.25 per cent of total yield of plants pruned by the moderately-heavy method, and 99.03 per cent of the total yield of fruits of plants pruned by the heavy method.

The results of different pruning methods on Pioneer plants were very similar to those obtained from Rubel plants.

Figure 16. Representative twigs from Rubel plants after first picking from plants pruned by different methods. Check, light, intermediate, moderately-heavy and heavy methods - left to right.
(Note few berries on twig from heavily pruned plant)

The average yield per plant of the check plants was 404.81 ounces; of plants pruned by the light method 294.00 ounces; of plants pruned by the intermediate method 279.00 ounces; and of plants pruned by the heavy method 93.42 ounces (table 2).

Table 2 shows the average number of berries per grading cup for the season from plants pruned by the different methods of pruning as follows: 190.3 from the check plants, 173.4 from plants pruned by the light method, 152.1 from plants pruned by the intermediate method, and 85.3 from plants pruned by the heavy method.

As was the case with the Rubel variety, the heavily pruned Pioneer plants matured earlier and clusters matured more uniformly than did the lightly pruned or the check plants. The first three pickings harvested 39.21 per cent of the yield of the check plants, 53.58 per cent of yield of plants pruned by the light method, 66.07 per cent of the yield of plants pruned by the intermediate method, and 91.54 per cent of the total yield of plants pruned by the heavy method.

Direct correlation was noted between average diameter and length of fruiting laterals and total yield of berries. The number of berries per lateral is given in table 4 and averages for laterals one thirty-second to nine thirty-seconds of an inch in diameter are given in table 6. As shown in table 5, the average numbers of berries per lateral one thirty-second to nine thirty-seconds of an inch in diameter were: 7.6, 15.9, 28.0, 30.0, 37.8, 50.2, 46.9,

66.9, and 85.9; the total weights of berries per lateral were: .196, .378, .758, .860, 1.051, 1.514, 1.544, 2.089, and 2.537 ounces. The average weights per berry on the above laterals in the same order were: .026, .025, .027, .028, .028, .030, .034, .031, and .031 ounces. Laterals seven thirty-seconds inch in diameter produced the largest berries.

A correlation is noted between size of lateral and season of maturity, tables 4 and 5. The smaller laterals matured a larger percentage of their crop later in the season than did the larger laterals. A large number of the smaller laterals are removed in pruning and consequently the plant matures its crop on the large laterals which mature early in the season. Table 5 shows that laterals one to three thirty-seconds inch in diameter, inclusive, matured 70.2 per cent of the total number of berries the first two pickings, laterals four to six thirty-seconds inch in diameter, inclusive, matured 85.8 per cent of the total number of berries the first two pickings, and laterals seven to nine thirty-seconds inch in diameter, inclusive, matured 92.3 per cent of the total number of berries the first two pickings.

A removal of one-half the buds from shoots by pruning resulted in an increased amount of lateral growth. A removal of one-fourth of the buds gave no increase over the checks. Table 7 shows the total length of lateral growth to be greater on shoots pruned to one-half the original number of buds and a smaller number of laterals. The unpruned shoots produced the largest number of laterals.

The average weight per berry produced on laterals from which the terminal half of the blossoms was removed was greater than that of berries produced on laterals from which the basal half of the blossoms was removed. The basal fruits matured slightly before the terminal fruits. The average weights (table 8) of berries produced were as follows: check laterals .707 ounces; laterals from which basal half of blossoms was removed, .479 ounces; and laterals from which the terminal half of the blossoms was removed, .481 ounces.

Berries produced on laterals from which no foliage was removed were larger than those produced on laterals from which one-half the foliage or all the foliage was removed. The yields and average weights per berry, as given in table 8, were: check laterals, yield .596 ounces and average weight per berry .0324; laterals from which one-half the foliage was removed, yield .657 ounces and average weight per berry .0255; laterals from which all the foliage was removed, yield .577 ounces, average weight per berry .0276 ounces. Laterals from which all the foliage was removed produced larger berries than laterals from which only one-half the foliage was removed. This is probably due to the fact that the laterals having one-half the foliage removed matured a larger number and total weight of berries.

Fruit thinning increased the average weight per berry. Table 8 indicates that the average weight of berries

produced on laterals from which one-half of the fruits were removed was much greater than either that of berries produced on laterals from which one-fourth of the berries were removed or of berries produced on laterals from which no berries were removed. Table 8 shows the check laterals yielded .611 ounces of berries averaging .029 ounces, laterals from which one-fourth of the fruits were removed yielded .583 ounces of berries averaging .031 ounces, and laterals from which one-half the berries were removed yielded .556 ounces of berries averaging .042 ounces per berry.

A comparison of pruning off one-third to one-half the laterals from stems was made with the removal of blossoms from one-third to one-half the laterals on stems. (table 9) The stems from which one-third to one-half the laterals were pruned off yielded 29.92 ounces, stems from which blossoms were removed from one-third to one-half the laterals yielded 33.76 ounces, and the check stems yielded 38.33 ounces.

A large number of berries were calipered to the nearest thirty-second of an inch. The results of these measurements are given in table 10. The average weight per berry ranged from .010 ounces for berries eleven thirty-seconds inch in diameter to .063 ounces for berries twenty thirty-seconds inch in diameter. The Michigan grade ranges are as follows:

Lake State	-	to .027 ounces per berry
Columbia	- .027 to .035	" " "
Golden Moon	- .036 to .053	" " "

Table 10. Diameter of Berries and Average Weight - Rubel

Diameter of Berry - in.	Total No. of Berries	Total weight of berries oz.	Berries per Grading Cup	Av. Weight Per berry (oz.)	Grade
11/32	6	.06		.0100	Lake State
12/32	299	4.94	297	.0165	Lake State
13/32	291	5.50	247	.0189	Lake State
14/32	242	5.56	204	.0229	Lake State
15/32	169	4.87	165	.0288	Columbia
16/32	205	7.19	137	.0350	Columbia
17/32	154	6.00	118	.0389	Golden Moon
18/32	122	5.69	105	.0466	Golden Moon
19/32	54	2.87	94	.0531	Golden Moon
20/32	8	.50		.0625	Golden Moon

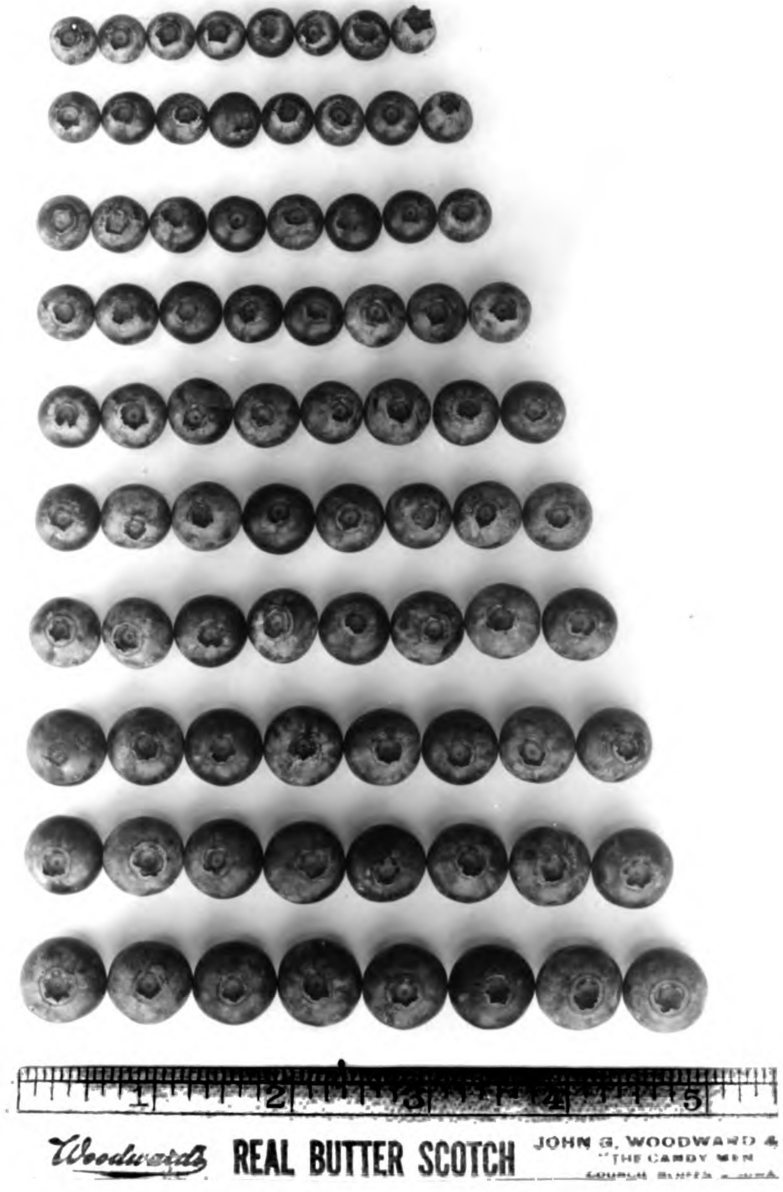

Figure 17. Berries eleven thirty-seconds to twenty thirty-seconds in diameter - top to bottom.

Discussion

It is very difficult to evaluate a system or method of pruning a fruiting plant correctly after studying only one season's fruiting records. Pruning has long been a topic of discussion and many investigators recommend different methods and systems for many different fruits. Ricks and Gaston (15) indicate that removal of small weak wood from apple trees increases the value of the crop produced. Loree (13) states that the black raspberry produces more fruits than it can properly mature and removal of part of the crop by proper pruning is essential to production of high quality fruits. This is also true of the blueberry plant (1), (2), (3), (4), (11), and (12).

The plants in this experiment which received no pruning gave the largest yield as was also shown by Johnston (1) the first season after pruning. The yield decreased from light, intermediate, to heavy pruning and the size of berries increased in the same order. Plants receiving heavy pruning made more vegetative growth than plants receiving light or no pruning.

There is a definite correlation between size of fruiting wood and size and total yield of some fruits. Ricks and Gaston (15) showed the average weight and also total weight of apples to be proportional to diameter of the branch on which they are produced. Loree (13) and Johnston (10) state that with the raspberry the largest canes produce the largest fruits. Beckwith, Coville, and Doehlert (3) found

by experiment that the largest blueberries are found on the most vigorous shoots. This was found to be generally true in this study on laterals up to seven thirty-seconds inch in diameter. Above seven thirty-seconds inch laterals produced smaller berries but total yield increased.

Berries on the most vigorous laterals matured earlier than did berries on small laterals. This fact may be used to influence to some extent the time of ripening. This influence on season of maturity should be such as to place the berries on the market when competition is least. The type of pruning is governed by season the berries are desired to be marketed.

Lateral growth on shoots was more vigorous on those pruned more severely. This was shown to be also true on red raspberries by Brierley (5).

The average weight per berry was larger on laterals from which the terminal half of the blossoms were removed than on those from which the basal half of the blossoms were removed.

Laterals from which no foliage was removed yielded more and larger berries than did laterals from which one-half or from laterals from which all the foliage was removed. Laterals from which one-half the foliage produced the largest number of berries which were the smallest in size.

The laterals from which one-half of the fruits were thinned off produced larger berries than did laterals from which one-fourth of the fruits or laterals from which no fruit were removed. Thinning of fruits reduced the total weight of

berries produced, but increased the size of berries.

Little difference in size of berry was noted from stems from which one-third to one-half of the laterals were pruned as compared to stems from which blossoms were removed from one-third to one-half of the laterals. Berries from the check plants were slightly smaller. Stems from which part of the blossoms were removed yielded slightly higher than did stems from which one-third to one-half the laterals were removed. Check stems gave the largest total yield.

Summary

1. Pruned plants gave a smaller total yield the first season after the pruning than did the check plants. The decrease in yield was in proportion to severity of pruning. The berries on pruned plants were larger than those on check plants.

2. The size of berry was shown on the whole to be proportionate to diameter of the lateral, up to seven thirty-seconds of an inch. The size of berry then decreased but total yield increased with diameter of lateral.

3. Shoots which were severely headed back produced more lateral growth than did lightly headed or check shoots.

4. Laterals from which the terminal half of the blossoms were removed produced larger berries than those from which the basal half of the blossoms were removed.

5. The average weight per berry was greater from check laterals than from laterals from which either one-half or all the foliage was removed.

6. Laterals from which one-half the fruits were thinned produced larger berries than did laterals from which one-fourth of the berries were thinned or the checks. The check laterals produced the greatest total yield.

7. Little difference in size of berry was shown from stems

from which one-third to one-half of the laterals were pruned off as compared to stems from which the blossoms were removed from one-third to one-half of the laterals. Check stems produced smallest berries and gave the largest total yield.

APPENDIX TABLES

Table A. Weight of Berries in Ounces from Plants Pruned by Light, Intermediate, Moderately-heavy, Heavy and Check Plants - Rubel

Check Plants

Row No.	2					3						
Plant No.	2	3	4	5	6	2	3	4	5	6	Total	Av.
Picking Date												
July 28-30	87.19	91.12	111.94	177.94	144.62	144.31	118.87	127.81	150.75	74.56	1229.11	122.91
Aug. 9	120.44	120.50	125.00	125.87	106.87	120.50	113.81	180.56	199.56	112.12	1325.23	132.52
Aug. 18-21	79.75	73.56	76.12	57.56	68.19	52.81	84.87	105.69	121.44	82.62	802.61	80.26
Aug. 28	42.69	31.75	32.38	24.38	30.31	10.44	29.87	49.06	34.75	30.12	315.75	31.57
Sept. 4	12.19	7.25	8.12	4.50	5.12	1.38	7.00	12.25	16.00	19.31	93.12	9.32
Total	342.26	324.18	353.56	390.25	355.11	329.44	354.42	475.37	522.50	318.73	3765.82	376.58

Light Pruning Method

Row No.	2					3						
Plant No.	7	8	9	10	11	7	9	10	11	12	Total	Av.
Picking Date												
July 28-30	114.38	140.94	116.19	199.94	119.00	168.75	231.44	182.12	194.00	212.62	1729.38	172.93
Aug. 9	52.38	46.94	66.00	113.19	75.44	99.94	75.94	17.31	98.75	115.62	761.51	76.15
Aug. 18-21	13.12	7.06	14.12	43.25	32.31	34.31	16.62	3.00	28.06	46.38	238.23	23.82
Aug. 28	2.81	1.25	2.50	10.31	4.75	6.81	1.94	0.44	5.12	14.87	50.80	5.08
Sept. 4	0.69	0.50	0.44	3.00	1.87	3.44	1.56	0.25	1.50	3.06	16.31	1.63
Total	183.38	196.69	249.25	369.69	233.37	313.25	327.50	203.12	327.43	392.55	2796.23	279.62

Intermediate Pruning Method

Row No.	2					3						
Plant No.	12	13	15	16	17	13	14	15	16	17	Total	Av.
Picking Date												
July 28-30	91.56	153.38	172.19	116.81	151.62	170.06	177.50	144.56	182.19	162.31	1522.18	152.21
Aug. 9	56.75	56.31	57.56	58.38	68.69	65.69	68.12	54.19	65.75	67.06	618.50	61.85
Aug. 18-21	15.62	12.12	11.00	14.12	16.75	13.62	12.50	11.62	17.44	51.94	176.73	17.65
Aug. 28	2.87	3.81	2.69	2.19	3.25	3.75	3.44	3.25	3.19	17.69	46.13	4.61
Sept. 4	1.06	1.12	0.44	0.75	1.00	0.69	0.38	1.00	1.12	4.75	12.31	1.23
Total	167.86	226.74	243.88	192.25	241.31	253.81	261.94	214.62	269.69	303.75	2375.85	237.58

Table A. Weight of Berries in Ounces From Plants Pruned by Different Methods - Rubel

Moderately-heavy Pruning Method

Row No. 1

Plant No.	12	13	14	15	17	18	19	20	21	22	Total	Av.
Picking Date												
July 28-30	125.19	132.00	86.38	87.56	84.31	77.62	89.00	111.25	103.69	112.50	1009.50	100.95
Aug. 9	11.44	14.38	11.81	18.75	7.00	14.25	27.94	25.06	30.69	23.12	184.44	18.44
Aug. 18-21	1.25	2.81	0.69	1.25	0.87	1.31	2.00	1.87	2.69	2.44	17.18	1.71
Aug. 28	0.12	0.38	0.06	0.44	0.25	0.31	0.25	0.25	0.31	0.38	2.75	0.27
Sept. 4	0.06	0.06	0.06	0.31	0.12	0.12	0.06	0.19	0.19	0.12	1.29	0.12
Total	138.06	149.63	99.00	108.31	92.55	93.61	119.25	138.62	137.57	138.56	1215.16	121.51

Heavy Pruning Method

Row No. 2 3

Plant No.	18	20	22	23	24	25	26	27	19	Total	Av.
Picking Date											
July 28-30	69.19	48.06	41.38	39.69	69.56	44.44	66.31	78.56	67.44	524.63	58.29
Aug. 9	1.75	1.50	1.56	1.75	4.38	5.25	5.62	6.12	2.94	30.87	3.43
Aug. 18-21	0.38	0.38	0.25	0.12	0.38	0.31	0.44	0.38	0.75	3.39	0.37
Aug. 28	0.12	0.26	0.12	0.12	0.19	0.19	0.44	0.31		1.55	0.17
Sept. 4	0.06	0.12			0.06	0.06	0.12	0.06		0.48	0.05
Total	71.50	50.12	43.31	41.68	74.57	50.25	72.93	85.43	71.13	560.92	62.31

Table B. Effect of Light, Intermediate, Moderately-Heavy and Heavy Methods of Pruning on Number of Berries Per Measuring Cup.

Check Plants

Row No.	2					3						
Plant No.	2	3	4	5	6	2	3	4	5	6	Total	Av.
Picking Date												
July 28-30	161	167	156	179	164	174	151	149	122	151	1574	157.4
Aug. 9	198	209	207	224	231	208	205	190	205	210	2087	208.7
Aug. 18-21	223	210	223	206	209	224	210	217	218	209	2149	214.9
Aug. 28	252	254	282	266	235	263	247	245	259	253	2556	255.6
Sept. 4	205	295	282	235	235	305	305	304	295	275	2736	273.6
												222.0

Light Method of Pruning

Row No.	2					3						
Plant No.	7	8	9	10	11	7	9	10	11	12	Total	Av.
Picking Date												
July 28-30	150	130	145	144	145	150	141	136	133	141	1415	141.5
Aug. 9	197	173	185	181	168	176	162	151	183	184	1760	176.0
Aug. 18-21	205	207	194	208	184	194	189		187	245	1813	201.4
Aug. 28			247	270	239	221			239		1216	243.2
Sept. 4		313*						289*			602	301.0
												212.6

* Berries from more than one plant required to fill a measuring cup.

Intermediate Method of Pruning

Row No. 2						3						
Plant No.	12	13	15	16	17	13	14	15	16	17	Total	Av.
Picking Date												
July 28-30	127	129	126	127	136	128	135	118	127	141	1294	129.4
Aug. 9	177	173	174	160	170	178	175	176	174	188	1740	174.0
Aug. 18-21	187	178	184	164	197	192	196	169	186	193	1846	184.6
Aug. 28		223*		238*		237*			221	232	1151	230.5
Sept. 4					228*						228	228.0
												189.3

* Berries from more than one plant required to fill a measuring cup.

Table B. Berries Per Cup
From Plants Pruned by Different Methods - Rubel

Moderately-heavy Pruning Method

Row No. 1

Plant No.	12	13	14	15	17	18	19	20	21	22	Total	Av.
Picking Date												
July 28-30	116	120	112	129	110	112	118	124	120	119	1180	118.0
Aug. 9	150	164	155	165	148	145	157	168	156*	155	1563	156.3
Aug. 18-21	218*				216*				204*			219.0
Aug. 28												
Sept. 4												
												164.4

Heavy Pruning Method

Row No. 2 3

Plant No.	18	20	22	23	24	25	26	27	19	Total	Av.
Picking Date											
July 28-30	95	103	99	97	99	111	101	97	100	902	100.2
Aug. 9			154*		145	145	150	130		724	144.8
Aug. 18-21					190*					190	190
Aug. 28											
Sept. 4											
											145

* Berries from more than one plant required to fill a measuring cup.

Table C. Weight of Berries in Ounces from Plants Pruned by Light, Intermediate, and Heavy Methods and Check Plants - Pioneer

Check Plants

Row No.	4											
Plant No.	2	6	7	8	10	11	13	14	15	16	Total	Av.
Picking Date												
July 10-11	13.31	10.81	12.25	12.69	17.38	26.69	20.00	20.81	13.50	8.12	155.56	15.55
19-21	50.50	32.44	52.50	51.25	42.25	66.38	54.00	65.87	59.19	38.44	512.82	51.28
24-25	78.81	53.12	75.25	98.56	78.38	132.81	97.75	106.56	120.94	76.81	918.99	91.89
Aug. 7-9	147.62	90.25	131.81	141.25	84.31	145.56	129.56	132.62	132.12	79.56	1214.66	121.46
15	73.69	51.69	71.25	86.75	41.25	64.87	75.87	84.24	84.31	58.06	691.98	69.98
28	46.81	29.75	52.56	63.19	24.19	37.31	45.00	56.00	47.50	43.12	445.43	44.54
Sept. 4	11.31	11.87	22.31	10.62	4.38	4.62	11.62	12.56	6.50	12.87	108.66	10.86
Total	422.05	279.93	417.93	464.31	291.14	478.24	433.80	478.66	464.06	316.98	4048.10	404.81

Light Method

Row No.	4								5			
Plant No.	17	18	19	20	21	23	24	25	5	10	Total	Av.
Picking Date												
July 10-11	20.50	25.50	22.69	20.94	13.69	7.87	6.00	5.56	8.12	3.31	134.18	13.41
19.21	64.69	71.69	47.94	47.94	48.25	42.81	39.19	48.38	39.87	45.00	507.13	50.71
24.25	129.00	113.19	75.81	75.81	72.00	75.56	39.44	105.19	83.00	99.44	934.50	93.45
Aug. 7-9	106.25	88.81	63.38	63.38	64.87	100.00	109.69	100.50	32.06	71.50	810.62	81.06
15	41.75	20.06	19.06	19.06	23.50	63.81	62.38	76.31	14.06	57.25	378.68	37.86
28	14.94	1.94	3.31	3.31	5.19	29.00	23.12	47.56	1.75	20.87	149.55	14.95
Sept. 4	1.87	0.06	0.25	0.25	0.31	6.06	6.12	9.12	0.12	2.19	26.09	2.60
Total	379.00	321.25	240.86	230.69	227.81	325.11	339.94	392.62	178.98	299.56	2940.75	294.07

Table C. Weight of Berries in Ounces From Plants Pruned by Different Methods

Intermediate Method

Row No.	5				6							
Plant No.	15	16	17	21	4	5	6	7	8	11	Total	Av.
Picking Date												
July 10-11	12.56	28.56	6.31	5.94	11.50	15.94	12.56	19.12	14.25	8.69	135.43	13.54
19-21	65.56	67.00	50.38	35.12	61.19	78.69	52.44	81.12	62.44	54.87	608.81	60.88
24.25	110.38	114.44	71.06	65.62	114.81	143.42	92.87	115.50	183.12	88.38	1099.31	109.93
Aug. 7-9	70.31	54.00	43.50	51.69	83.50	104.69	62.38	84.87	55.06	49.56	659.56	65.95
15	43.25	21.62	14.19	31.19	23.50	27.00	12.94	26.69	16.00	17.69	234.07	23.40
28	9.69	1.25	3.62	8.00	4.31	6.00	1.62	6.50	3.75	5.56	50.30	5.03
Sept. 4	0.69	0.12		0.38	0.38	0.06	0.06	0.56	0.06	0.25	2.56	0.25
Total	312.44	286.99	189.06	197.94	299.19	375.50	234.87	334.36	334.68	225.00	2790.03	279.00

Heavy Method

Row No.	6											
Plant No.	13	14	15	16	18	22	23	24	26	27	Total	Av.
Picking Date												
July 10-11	5.31	3.75	6.94	2.87	6.56	5.75	6.94	7.06	9.00	3.00	57.18	5.71
19-21	33.38	54.62	51.44	53.50	42.31	40.87	49.94	31.56	32.00	70.00	459.62	45.96
24-25	23.75	43.56	43.06	59.38	23.69	29.19	45.94	18.00	17.06	34.81	338.44	33.84
Aug. 7-9	1.12	4.87	3.50	6.56	0.75	5.50	9.19	3.56	1.12	38.31	74.48	7.44
15										4.12	4.12	0.41
28			0.06						0.06	0.31	0.43	0.04
Sept. 4												
Total	63.56	106.80	105.00	122.31	73.31	81.31	112.01	60.18	59.24	150.55	934.27	93.42

Table D. Number of Berries per Grading Cup from Plants Pruned by The Light, Intermediate, and Heavy Methods and Check Plants - Pioneer

Check Plants

Row No. 4

Plant No.	2	6	7	8	10	11	13	14	15	16	Total	Av.
Picking Date												
July 10-11	123	111	120	122	121	124	127	120	133	116	1217	121.7
19-21	146	152	136	139	148	149	148	137	145	137	1437	143.7
24-25	175	171	161	173	171	151	147	147	156	152	1604	160.4
Aug. 7-9	156	187	165	192	194	188	164	173	190	172	1781	178.1
15	200	259	207	213	229	209	219	218	221	199	2174	217.4
28	210	245	240	216	210	247	239	243	221	206	2277	227.7
Sept. 4.	292	226	276	308	243*		289	325	304	289	2552	283.5
												190.3

Light Method

Row No. 4 5

Plant No.	17	18	19	20	21	23	24	25	5	10	Total	Av.
Picking Date												
July 10-11	107	121	113	123	118	106	107	117	109		1021	113.4
19-21	123	127	123	130	122	118	112	125	132	146	1258	125.8
24-25	143	136	123	136	152	119	123	138	119	149	1338	133.8
Aug. 7-9	148	139	139	159	172	147	151	166	164	180	1565	156.5
15	159	159		173	160	194	140	185	188	175	1533	170.3
28	184				235	185	190	193		234	1221	244.2
Sept. 4						249	291				540	270.0
												173.4

* Berries from more than one plant required to fill a measuring cup.

Table D. Number of Berries Per Grading Cup From Plants Pruned by Different Methods

Intermediate Method

Row No.	5				6							
Plant No.	15	16	17	21	4	5	6	7	8	11	Total	Av.
Picking Date												
July 10-11	110	122	132	116	107	112	99	119	118	121	1156	115.6
19-21	118	124	120	132	111	126	112	132	116	130	1221	122.1
24-25	124	124	112	126	121	142	118	137	123	151	1278	127.8
Aug. 7-9	164	138	129	149	136	155	133	157	142	158	1461	146.1
15	175	150	163	182	164	175	161	208	162	197	1737	173.7
28	211			212	222	213		259		250	1367	227.8
Sept. 4												
												152.1

Heavy Method

Row No.	6											
Plant No.	13	14	15	16	18	22	23	24	26	27	Total	Av.
Picking Date												
July 10-11	79*		83	81		82	78	85	84		572	81.7
19-21	80	76	80	78	78	89	84	83	85	83	816	81.6
24-25	74*	85	92	77	81	84	83	91	90	87	844	84.4
Aug. 7-9		98*		88*		102*	82*			99*	469	93.8
15												
28												
Sept. 4												
												85.3

* Berries from more than one plant required to fill a measuring cup.

Table E. Fruit Production, Per Cent Set, and Size of Berries Produced on Laterals One to Nine Thirty-seconds Inch in Diameter

Lateral No.	Diameter (inches)	Length (inches)	No. Fruit Buds	No. Blossoms	No. Berries Picked	Per cent Fruit set	Wt. of Berries- oz.	Av. wt. per berry	Grade
13	1/32	1.56	1	9	8	88.8	.25	.0312	Columbia
15		.87	1	3	1	33.3	.02	.0200	Lake State
21		1.56	1	7	7	100.0	.25	.0375	Columbia
31		1.75	3	18	10	55.5	.22	.0222	Lake State
39		2.31	3	17	13	76.4	.29	.0223	Lake State
46		1.56	2	12	10	83.3	.22	.0220	Lake State
48		1.69	2	14	12	85.7	.30	.0250	Lake State
49		.81	1	5	3	60.0	.10	.0333	Columbia
51		1.00	1	5	5	100.0	.16	.0320	Columbia
80		.81	1	16	10	62.5	.23	.0230	Lake State
83		1.62	2	15	6	40.0	.17	.0283	Lake State
97		2.50	2	12	8	66.6	.17	.0212	Lake State
Total		18.04	25	133	93		2.38		
Average		1.50	2.0	11.0	7.6	69.1	.196	.0256	" "

Table E. Fruit Production, Per Cent Set, and Size of Berries Produced on Laterals One to Nine Thirty-seconds Inch in Diameter

Lateral No.	Diameter (inches)	Length (inches)	No. Fruit Buds	No. Blossoms	No. Berries Picked	Per Cent Fruit Set	Wt. of Berries- oz.	Av. Wt. per berry	Grade
1	2/32	5.12	4	27	12	44.4	.24	.0200	Lake State
5		2.06	3	13	3	23.0	.08	.0266	Lake State
8		2.00	2	11	9	81.8	.24	.0266	Lake State
16		2.25	2	15	13	86.6	.30	.0230	Lake State
18		3.19	3	25	24	96.0	.54	.0225	Lake State
22		2.87	3	29	26	89.6	.55	.0215	Lake State
25		2.62	2	12	10	83.3	.24	.0240	Lake State
28		4.19	9	61	21	34.4	.43	.0204	Lake State
32		2.62	4	25	14	56.0	.30	.0214	Lake State
38		5.38	5	36	26	72.2	.74	.0284	Columbia
45		3.19	3	20	10	50.0	.17	.0170	Lake State
52		2.94	1	10	8	80.0	.27	.0337	Columbia
54		3.62	2	11	8	72.7	.22	.0275	Lake State
55		3.94	3	17	17	100.0	.44	.0258	Lake State
56		2.50	2	9	6	66.6	.24	.0400	Golden Moon
81		2.06	3	12	9	75.0	.19	.0211	Lake State
84		2.38	2	13	11	84.6	.24	.0218	Lake State
86		6.19	8	65	40	61.5	.96	.0240	Lake State
88		4.19	5	29	22	75.8	.44	.0200	Lake State
90		3.62	6	36	27	75.0	.74	.0274	Lake State
Total		66.86	72	473	316		7.57		
Average		3.34	3.6	23.6	15.9	67.4	.378	.0247	" "

Table E. Fruit Production of Laterals of Various Sizes

Lateral No.	Diameter (inches)	Length (inches)	No. Fruit Buds	No. Blossoms	No. Berries Picked	Per Cent Fruit Set	Wt. of Berries- oz.	Av. wt. per berry	Grade
9	3/32	6.31	6	45	30	66.6	.67	.0223	Lake State
17		5.87	5	26	24	92.3	.63	.0262	Lake State
19		5.19	3	22	13	59.0	.33	.0253	Lake State
20		5.12	3	34	24	70.5	.73	.0304	Columbia
23		5.56	5	23	11	47.8	.31	.0281	Lake State
30		5.12	7	64	60	93.7	1.55	.0258	Lake State
33		7.06	6	52	35	71.1	1.09	.0302	Columbia
35		3.81	4	34	16	47.0	.63	.0393	Golden Moon
37		6.50	2	21	12	57.1	.41	.0341.	Columbia
40		6.00	4	34	26	76.4	.77	.0296	Columbia
44		6.00	3	19	6	31.5	.18	.0300	Columbia
47		6.75	6	50	41	82.0	.95	.0231	Lake State
59		7.50	6	53	48	90.5	1.36	.0283	Lake State
73		6.50	3	28	20	71.4	.58	.0290	Columbia
74		5.50	5	37	33	89.1	.99	.0300	Columbia
78		7.12	5	36	31	86.1	.99	.0287	Columbia
82		5.81	3	17	11	64.7	.32	.0290	Columbia
87		7.81	7	68	48	70.5	1.19	.0247	Lake State
89		5.31	8	59	48	81.3	1.01	.0210	Lake State
106		4.31	4	38	22	57.8	.55	.0250	Lake State
Total		119.15	95	757	559		15.24		
Average		5.95	4.7	37.8	28.0	74.1	.758	.0272	" "

Table E. Fruit Production of Laterals of Various Sizes

Lateral No.	Diameter (inches)	Length (inches)	No. Fruit Buds	No. Blossoms	No. Berries Picked	Per Cent Fruit Set	Wt. of Berries- oz.	Av. wt. per berry	Grade
3	4/32	7.75	7	45	27	60.0	.53	.0196	Lake State
29		7.31	8	87	58	56.1	1.40	.0280	Lake State
34		6.87	7	50	39	78.0	.92	.0235	Lake State
36		6.62	7	30	18	60.0	.50	.0277	Lake State
50		10.12	4	46	44	95.6	1.23	.0279	Lake State
57		10.06	5	37	36	97.2	.94	.0261	Lake State
69		4.31	2	20	11	55.0	.32	.0290	Columbia
70		6.25	2	22	22	100.0	.65	.0295	Columbia
77		9.38	9	66	43	65.1	1.14	.0265	Lake State
98		7.81	4	41	36	87.8	1.29	.0358	Golden Moon
99		7.25	4	26	25	96.1	.89	.0356	Golden Moon
100		7.06	3	30	10	33.3	.40	.0400	Golden Moon
103		7.75	3	31	17	54.8	.58	.0341	Columbia
104		7.25	2	23	14	60.8	.51	.0364	Golden Moon
107		8.38	5	48	40	83.3	1.30	.0325	Columbia
115		8.38	6	48	41	85.4	1.14	.0278	Lake State
118	(conc'l)	5.94	5	47	44	93.6	1.24	.0281	Lake State
125		8.19	8	41	24	58.5	.50	.0208	Lake State
Total		136.68	91	740	549		15.48		
Average		7.55	5.0	41.1	30.0	73.1	.860	.0281	Lake State

Table E. Fruit Production of Laterals of Various Sizes

Lateral No.	Diameter (inches)	Length (inches)	No. Fruit Buds	No. Blossoms	No. Berries Picked	Per Cent Fruit Set	Wt. of Berries oz.	Av. wt. -per berry	Grade
14	5/32	14.00	9	74	48	64.8	1.37	.0285	Columbia
24		9.81	3	37	31	83.7	1.00	.0322	Columbia
58		10.31	7	94	82	87.2	2.41	.0330	Columbia
60		9.81	7	53	6	11.3	.12	.0200	Lake State
66		8.12	1	9	7	77.7	.22	.0314	Columbia
76		10.44	3	17	13	76.4	.36	.0276	Lake State
94		15.38	4	33	18	54.5	.51	.0283	Lake State
95		15.38	5	41	21	51.2	.66	.0314	Columbia
101		10.00	7	66	46	69.6	1.27	.0276	Lake State
114		12.31	13	118	61	51.6	1.20	.0196	Lake State
119		12.56	11	92	70	76.0	2.01	.0287	Columbia
123		13.38	18	153	65	42.4	1.50	.0230	Lake State
130		10.12	6	54	50	92.5	1.54	.0308	Columbia
140		10.00	1	11	11	100.0	.33	.0300	Columbia
142		13.94	4	50	47	94.0	1.38	.0293	Columbia
143		11.44	4	43	29	67.4	.94	.0324	Columbia
Total		187.00	103	945	605		16.82		
Average		11.68	6.4	58.3	37.8	64.8	1.051	.0278	Lake State

Table E. Fruit Production of Laterals of Various Sizes

Lateral No.	Diameter (inches)	Length (inches)	No. Fruit Buds	No. Blossoms	No. Berries Picked	Per Cent Fruit Set	Wt. of Berries- oz	Av.wt. per berry	Grade
4	6/32	14.06	10	90	52	57.7	2.36	.0453	Golden Moon
7		13.69	8	83	47	55.4	1.49	.0323	Columbia
11		15.06	3	30	24	80.0	.86	.0329	Columbia
61		19.31	14	153	73	47.7	2.09	.0286	Columbia
67		12.62	5	59	39	66.1	1.36	.0348	Golden Moon
71		17.62	5	68	31	45.5	1.17	.0377	Golden Moon
72		14.31	5	44	34	77.2	1.02	.0300	Columbia
93		16.25	4	27	8	29.6	.36	.0450	Golden Moon
102		14.19	9	73	68	93.1	1.98	.0291	Columbia
108		14.56	10	124	96	77.4	2.95	.0307	Columbia
113		16.06	15	160	115	71.8	2.60	.0226	Lake State
120		17.19	7	82	76	92.6	2.26	.0297	Columbia
122		20.44	23	155	108	69.6	2.52	.0233	Lake State
126		20.62	8	80	47	58.7	1.29	.0274	Lake State
127		16.38	4	44	41	93.1	1.48	.0360	Golden Moon
131	(concl'd)	16.38	1	11	3	27.2	.11	.0366	Golden Moon
133		20.06	2	20	1	5.0	.03	.0300	Columbia
138		18.94	10	60	43	71.6	1.40	.0325	Columbia
Total		297.74	143	1363	906		27.33		
Average		16.54	7.9	75.7	50.2	66.3	1.514	.0301	Columbia

Table E. Fruit Production of Laterals of Various Sizes

Lateral No.	Diameter (inches)	Length (inches)	No. Fruit Buds	No. Blossoms	No. Berries Picked	Per Cent Fruit Set	Wt. of Berries- oz.	Av. wt. per berry	Grade
12	7/32	17.87	2	27	18	66.6	.59	.0327	Columbia
42		24.31	8	59	53	89.8	2.05	.0386	Golden Moon
53		20.19	5	30	11	36.6	.32	.0290	Columbia
62		26.01	14	98	74	75.5	2.97	.0401	Golden Moon
63		19.31	3	16	14	87.5	.63	.0450	Golden Moon
65		20.25	7	40	31	77.5	1.23	.0396	Golden Moon
91		17.38	6	54	52	96.2	1.55	.0298	Columbia
110		15.06	3	37	36	97.2	1.08	.0300	Columbia
112		14.56	8	65	39	60.0	1.25	.0320	Columbia
128		17.81	4	43	31	72.0	1.28	.0336	Columbia
132		17.38	7	64	53	82.8	1.69	.0318	Columbia
137		23.19	11	89	54	71.9	1.83	.0285	Columbia
139		18.25	4	38	35	92.1	1.45	.0414	Golden Moon
146		22.56	5	43	33	76.7	1.44	.0436	Golden Moon
147		18.81	16	132	111	84.0	3.31	.0298	Columbia
149		19.31	9	86	57	66.2	1.43	.0250	Lake State
150		16.69	10	87	79	90.0	2.16	.0273	Lake State
Total		328.94	122	1008	781		26.26		
Average		19.34	7.17	59.29	46.9	79.1	1.544	.0336	Columbia

Table E. Fruit Production of Laterals of Various Sizes

Lateral No.	Diameter (inches)	Length (inches)	No. Fruit Buds	No. Blossoms	No. Berries Picked	Per Cent Fruit Set	Wt. of Berries- oz.	Av. wt. per berry	Grade
26	8/32	19.44	12	91	90	98.9	3.02	.0335	Columbia
41		27.69	6	60	49	81.6	1.97	.0402	Golden Moon
64		26.06	9	64	53	82.8	2.04	.0384	Golden Moon
109		28.87	8	80	58	72.5	1.86	.0320	Columbia
116		24.25	5	44	36	77.7	1.12	.0400	Golden Moon
124		18.81	14	171	119	69.5	2.73	.0229	Lake State
141		19.62	11	121	100	82.6	2.58	.0258	Lake State
144		23.94	13	109	89	80.7	3.15	.0357	Golden Moon
145		27.44	4	28	18	64.2	.68	.0377	Golden Moon
148		23.69	6	58	57	98.2	1.74	.0310	Columbia
Total		239.81	88	826	669		20.89		
Average		23.98	8.8	82.6	66.9	80.6	2.08	.0312	Columbia

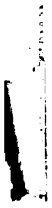

Table E. Fruit Production of Laterals of Various Sizes

Lateral No.	Diameter (inches)	Length (inches)	No. Fruit Buds	No. Blossoms	No. Berries Picked	Per Cent Fruit Set	Wt. of Berries- oz.	Av.wt. per berry	Grade
75	9/32	32.12	6	68	25	36.7	.71	.0284	Columbia
79		24.50	13	142	134	94.3	4.28	.0319	Columbia
92		19.31	4	54	44	81.4	1.48	.0336	Columbia
105		26.50	17	175	148	81.7	4.28	.0353	Golden Moon
111		27.87	11	111	47	42.3	1.50	.0319	Columbia
117		31.00	21	216	183	84.7	5.36	.0292	Columbia
121		26.31	11	122	75	62.2	4.14	.0297	Columbia
129		21.19	9	70	50	71.4	1.86	.0372	Golden Moon
134		36.19	9	60	24	40.0	.60	.0250	Lake State
135		29.31	11	92	78	84.7	2.68	.0343	Columbia
136		25.62	19	167	109	65.2	2.90	.0266	Lake State
Total		299.92	131	1172	968		29.79		
Average		27.26	11.9	106.5	85.90	79.0	2.537	.0308	Columbia

Table F. Effect of Heading of Shoots on Lateral Growth

Shoot No.	Lateral Growth from Basal Half of buds Length in	Dia in	Lateral Growth from Terminal Half of buds lg in	dia in	lg in	dia in
1	0	0	40	.31	12	.19
			25	.19	7	.06
2	0	0	9	.12	10	.12
			7	.12	3	.06
			4	.06		
3	0	0	7	.12	10	.12
			9	.12		
4	0	0	9	.12	16	.19
			23	.19	30	.25
5	0	0	29	.12	3	.06
			34	.25	36	.31
6	0	0	4	.06	9	.12
			10	.12	7	.06
			2	.06	22	.25
			13	.19		
7	0	0	5	.06	11	.12
			3	.06	9	.12
			1	.06	12	.12
			8	.12	5	.12
			16	.25	7	.12
			24	.25		
8	0	0	4	.12	9	.12
			9	.12	9	.12
			9	.06	9	.12
			8	.12	10	.12
			22	.25	24	.25
			9	.06	26	.25

Shoot No.	Lateral Growth from Basal Half of buds lg in	dia in	Lateral Growth from Terminal Half of buds lg in	dia in	lg in	dia in
11	0	0	19	.19	6	.06
			37	.31		
12	0	0	1	.06	12	.12
			3	.06	5	.12
			6	.12	8	.12
13	0	0	3	.06	2	.06
			8	.12	19	.19
14	0	0	12	.12	14	.12
15	0	0	10	.12	18	.19
			21	.19	1	.06
			12	.12	6	.06
			3	.06	16	.19
			8	.12		
16	0	0	9	.06	10	.12
			13	.12	7	.06
			22	.19	29	.25
17	0	0	24	.19	13	.12
			4	.06	1	.06
			8	.12	38	.25
18	0	0	7	.06	14	.19
			25	.19	10	.12
			11	.12	15	.19
			2	.06	7	.12
			7	.12	1	.06
			19	.19		
19	0	0	13	.19	22	.19
			4	.06	9	.12
			9	.12	15	.19

Shoot No.	Lateral Growth from Basal half of buds lg	dia	Lateral Growth from Terminal Half of buds lg	dia	lg	dia	lg	dia
20 cont'd	0	0	1	.06	5	.06	2	.06
			8	.12	8	.12	3	.06
			3	.06	10	.12	15	.19
21	0	0	2	.06	29	.19	34	.31
			17	.19				
22	0	0	5	.12	2	.06	8	.12
			10	.12	3	.06	6	.06
			4	.06	6	.12	7	.12
			7	.12	8	.12	7	.12
			8	.12	18	.19		
23	0	0	9	.12	9	.12	11	.12
			14	.19	7	.12		
24	0	0	25	.25	9	.12	12	.12
			4	.06	3	.06	10	.12
			13	.19	26	.25	6	.06
			11	.12				
25	0	0	26	.25	7	.12	23	.25
26	21	.25	9	.12	3	.06	8	.12
			1	.06	4	.06	6	.06
			6	.12	6	.06	1	.06
			6	.06	2	.06	8	.12
			6	.12	1	.06	2	.06
			6	.06	5	.12		
27	0	0	3	.06	3	.06	8	.12
			6	.06	9	.12	8	.12
			9	.12	18	.25	8	.12
			9	.12				
28	0	0	10	.12	15	.12	4	.06

Table F. Effect of Heading of Shoots on Lateral Growth
cont'd

Shoot No.	Lateral Growth from Basal Half of buds lg	dia	Terminal Half of buds lg	dia	lg	dia
9	0	0	5	.06	5	.06
			7	.12	7	.12
			17	.12		
10	0	0	9	.12	10	.12
			8	.12	31	.25
			10	.12	6	.06
			2	.06	6	.12
			6	.06	9	.12
			33	.31		
20	0	0	5	.06	7	.12
			8.	12	7	.12
			8	.12	1	.06
			16	.12	19	.19
			24	.25		
29	0	0	6	.12	8	.12
			11	.12		
			10	.12	26	.25
30	0	0	1	.06	2	.06
			3	.06		
			21	.19	5	.06
			5	.06		
			7	.12	11	.19
			13	.19		

Table G. Effect of Removal of Terminal Half and Basal Half of Blossoms from Laterals on Weight of Fruit Produced

Terminal Half of Blossoms Removed

Lateral No.	1	2	3	4	5	6	7	8	9	10	Total	Av.
Picking Date												
Aug. 1-2	.81	.21	.22	.44	.42	.61	.53	.47	.46	.31	4.48	.448
15					.10		.03	.07	.06	.05	.31	.031
24		.02									.02	.002
28												
Sept. 2												
Total	.81	.23	.22	.44	.54	.61	.56	.54	.52	.36	4.81	.481

Basal Half of Blossoms Removed

Lateral No.	11	12	13	14	15	16	17	18	19	20	Total	Av.
Picking Date				Broken								
Aug. 1-2	.63	.52	.53		.52	.08	.47	.45	.91	.28	4.39	.487
15		.08	.06						.03	.12	.29	.032
24					.02	.02	.02				.06	.006
28	.01	.01								.01	.03	.003
Sept. 2	.01						.01				.02	.002
Total	.65	.61	.59		.54	.10	.50	.45	.94	.41	4.79	.528

Table G. Effect of Removal of Terminal Half and Basal Half of Blossoms from Laterals on Weight of Fruit Produced

Check - No Blossoms Removed

Lateral No.	21	22	23	24	25	26	27	28	29	30	Total	Av.
Picking Date												
Aug. 1-2	.50	.72	.59	.42	.85	.63	.16	.18	.72	.53	5.30	.530
15	.03	.06		.24	.12	.13	.07	.36	.07	.31	1.39	.139
24	.05	.02		.07	.03		.03	.07		.07	.34	.034
28								.02			.02	.002
Sept. 2	.01							.01			.02	.007
Total	.59	.80	.59	.73	1.00	.76	.26	.64	.79		7.07	.707

Table H. Total Effect of Removal of Terminal Half and Basal Half of Blossoms from Laterals on Number, Weight, and Size of Fruit Produced

Lateral No.	Treatment	Dia.	Length	No. Buds	No. Blossoms Remaining	Total No. Fruits	Per Cent Fruit Set	Total Wt.	Av. Wt. per berry	Grade
1	Terminal	5/32	8.06	4	11	24	21	87.5	.81	.0385	Golden Moon
2	half of		9.19	3	13	8	7	87.5	.23	.0328	Columbia
3	blossoms		9.06	4	18	12	8	66.6	.22	.0275	Lake State
4	removed		8.25	3	12	20	14	70.0	.44	.0314	Columbia
5			5.44	5	6	25	21	84.0	.52	.0247	Lake State
6			7.75	4	9	17	14	82.3	.61	.0435	Golden Moon
7			7.69	3	12	14	14	100.0	.56	.0400	Golden Moon
8			7.31	3	14	14	13	92.8	.54	.0415	Golden Moon
9			6.56	4	10	16	13	81.2	.52	.0400	Golden Moon
10			6.25	3	11	16	14	87.5	.36	.0257	Lake State
Total			75.56	36	116	166	139		4.81	.3456	
Average			7.55	3.6	11.6	16.6	13.9	83.94	.481	.0345	Golden Moon
11	Basal Half		6.19	5	8	29	20	68.9	.65	.0342	Columbia
12	of blos-	5/32	8.56	4	7	21	18	85.7	.61	.0338	Columbia
13	soms		6.19	5	6	25	19	76.0	.59	.0310	Columbia
15	removed		6.19	5	8	20	17	85.0	.54	.0317	Columbia
16			12.19	3	8	15	4	26.6	.10	.0250	Lake State
17			4.50	3	5	17	14	82.3	.50	.0384	Golden Moon
18			6.62	2	12	10	10	100.0	.45	.0450	Golden Moon
19			5.36	4	5	26	26	100.0	.94	.0361	Golden Moon
20			5.94	3	11	17	14	82.3	.41	.0292	Columbia
Total			61.94	34	70	180	142		4.79	.3044	
Average			6.88	3.7	7.7	20.0	15.7	78.53	5.32	.0338	Columbia

Table H. Total Effect of Removal of Terminal Half and Basal Half of Blossoms from Laterals on Number, Weight, and Size of Fruit Produced (cont'd)

Lateral No.	Treatment	Dia.	Length	No. Buds	No. Blossoms Remaining	Total No. Fruits	Per Cent Fruit Set	Total Wt.	Av. Wt. per berry	Grade
21	Check -	5/32	7.87	5	7	44	19	43.1	.59	.0327	Columbia
22	No blos-		9.50	4	14	25	23	92.0	.80	.0347	Golden Moon
23	soms		5.81	3	7	25	21	84.0	.59	.0280	Lake State
24	removed		4.81	4	5	41	28	68.2	.73	.0260	Lake State
25			4.38	3	4	38	32	84.1	1.00	.0315	Columbia
26			8.31	4	9	40	20	50.0	.76	.0380	Golden Moon
27			7.31	4	12	24	10	41.6	.26	.0260	Lake State
28			6.25	5	8	36	25	69.4	.64	.0266	Lake State
29			4.25	3	6	21	20	95.2	.79	.0395	Golden Moon
30			5.25	3	5	27	27	100.0	.91	.0337	Columbia
Total			63.74	38	77	321	225	727.6	7.07	.3164	
Average			6.37	3.8	7.7	32.1	22.5	72.7	.707	.0316	Columbia

Table I. Effect of Removal of Terminal Half and Basal Blossoms from Laterals on Number and Date of Ripening of Berries

Terminal Half of Blossoms Removed

Lateral No.	1	2	3	4	5	6	7	8	9	10	Total	Av.
Picking Date												
Aug. 1-2	21	6	8	14	16	14	13	11	12	12	127	12.7
15					5		1	2	1	2	11	1.1
24		1									1	0.1
28												
Sept. 2												
Total	21	7	8	14	21	14	14	13	13	14	139	13.9

Basal Half of Blossoms Removed

Lateral No.	11	12	13	14	15	16	17	18	19	20	Total	Av.
Picking Date				Broken								
Aug. 1-2	18	14	16		16	3	12	10	24	8	121	13.4
15		3	3						2	5	13	1.4
24					1	1	1				3	3
28	1	1								1	3	3
Sept. 2	1						1				2	2
Total	20	18	19		17	4	14	10	26	14	142	15.7

Table I. Effect of Removal of Terminal Half and Basal Blossoms from Laterals on Number and Date of Ripening of Berries (cont'd)

Check - No Blossoms Removed

Lateral No.	21	22	23	24	25	26	27	28	29	30	Total	Av.
Picking Date												
Aug. 1-2	14	20	21	15	25	16	6	6	18	14	155	15.5
15	1	2		9	5	4	3	14	2	10	50	5.0
24	3	1		4	2		1	3		3	17	1.7
28								1			1	.1
Sept. 2	1							1			2	.2
Total	19	23	21	28	32	20	10	25	20	27	225	22.5

Table J. Effect of Removal of One-half and All the Foliage from Laterals on Weight of Fruit Produced

All Foliage Removed

Lateral No.	31	32	33	34	35	36	37	38	39	40	Total	Av.
Picking Date												
Aug. 1-2	.21	.33	.58	.51	.01	.02	.25	.61	.33	.18	3.03	.303
15	.36	.30		.12	.12	.14	.39	.08	.05	.11	1.67	.167
24	.20	.09		.03	.06	.08	.08	.03	.02	.11	.70	.070
28	.06	.07				.01			.02.	.12	.28	.028
Sept. 2	.02				.01	.02				.04	.09	.009
Total	.85	.79	.58	.66	.20	.27	.72	.72	.42	.56	5.77	.577

One-half Foliage Removed

Lateral No.	41	42	43	44	45	46	47	48	49	50	Total	Av.
Picking Date												
Aug. 1-2	.54	.26	.15	.19	.28	.83	.57	.40	.36	.07	3.65	.365
15	.14		.22	.18	.20	.25	.07	.30	.35	.32	2.03	.203
24	.03	.02	.07		.16	.06	.01	.06	.07	.13	.62	.062
28			.07				.01		.03	.10	.21	.021
Sept. 2	.01	.02			.02		.01				.06	.006
Total	.72	.30	.52	.37	.66	1.14	.67	.76	.81	.62	6.57	.657

Table J. Effect of Removal of One-half and All the Foliage from Laterals on Weight of Fruit Produced (cont'd)

Check - No Foliage Removed

Lateral No.	51	52	53	54	55	56	57	58	59	60	Total	Av.
Picking Date												
Aug. 1-2	.71	.65	.28	.60	.72	.15	.27	.12	.88	.10	4.48	.448
15	.07	.12	.03	.39	.03	.11	.03	.13	.10	.16	1.17	.117
24	.01	.02	.01			.03		.06	.04	.07	.24	.024
28		.01					.02	.01	.02	.01	.07	.007
Sept. 2												
Total	.79	.80	.32	.99	.75	.29	.32	.32	1.04	.34	5.96	.596

Table K. Comparison of Effects of Removal of One-half and All of the Foliage from Laterals on Yield and Size of Berries

Lateral No.	Treatment	Dia.	Length	No. Buds Fruit	Leaf	No. Blossoms	No. Berries Picked	Per Cent Set	Wt. of Berries	Av. Wt. per berry	Grade
31	All	5/32	6.19	4	7	36	33	91.6	.85	.0257	Lake State
32	foliage		7.38	5	9	36	31	86.1	.79	.0254	Lake State
33	removed		7.69	3	10	23	14	60.8	.58	.0414	Golden Moon
34			7.31	3	12	24	17	70.8	.66	.0388	Golden Moon
35			5.81	5	5	48	16	33.3	.20	.0125	Lake State
36			4.50	3	4	25	21	84.0	.27	.0218	Lake State
37			8.19	4	11	30	26	86.6	.72	.0276	Lake State
38			6.87	3	7	33	17	51.5	.72	.0423	Golden Moon
39			4.94	3	4	29	14	48.2	.42	.0300	Columbia
40			6.19	5	8	53	28	52.8	.56	.0200	Lake State
Total			65.07	38	77	337	217	665.7	5.77	.2765	
Average			6.50	3.8	7.7	33.7	21.7	66.57	.577	.0276	Lake State
41	One-	5/32	6.31	3	11	31	22	70.9	.72	.0327	Columbia
42	half of		5.81	4	7	36	14	38.8	.30	.0214	Lake State
43	the		8.62	4	8	30	21	70.0	.52	.0247	Lake State
44	foliage		5.56	4	8	26	16	61.5	.37	.0231	Lake State
45	removed		3.06	3	3	28	27	96.4	.66	.0244	Lake State
46			10.38	4	16	39	37	94.8	1.14	.0308	Columbia
47			6.75	5	8	47	29	61.7	.67	.0231	Lake State
48			6.19	3	9	30	26	86.6	.76	.0290	Columbia
49			7.56	5	7	46	31	67.3	.81	.0261	Lake State
50			3.94	3	4	32	31	96.8	.62	.0200	Lake State
Total			64.18	38	81	345	254	744.8	6.57	.2553	
Average			6.41	3.8	8.1	34.5	25.4	74.48	.657	.0255	Lake State

Table K. Comparison of Effects of Removal of One-half and All of the Foliage from Laterals on Yield and Size of Berries

Lateral No.	Treatment	Dia.	Length	No. Buds Fruit	Leaf	No. Blossoms	No. Berries Picked	Per Cent Set	Wt. of Berries	Av. Wt. per berry	Grade
51	Check -	5/32	6.94	5	11	32	21	65.2	.79	.0376	Golden Moon
52	no		8.38	4	10	34	28	82.3	.80	.0285	Columbia
53	foliage		4.81	3	5	28	5	17.8	.32	.0640	Golden Moon
54	removed		5.31	3	8	39	31	79.4	.99	.0319	Columbia
55			7.00	4	10	32	26	81.2	.75	.0288	Columbia
56			7.75	3	5	27	12	44.4	.29	.0241	Lake State
57			4.75	3	6	24	11	45.8	.32	.0290	Columbia
58			6.06	3	6	25	14	56.0	.32	.0228	Lake State
59			6.62	5	9	44	35	79.5	1.04	.0297	Columbia
60			6.31	5	5	43	12	27.9	.34	.0283	Lake State
Total			63.93	38	75	328	195	579.5	5.96	.3247	
Average			6.39	3.8	7.5	32.8	19.5	57.95	.596	.0324	Columbia

Table L. Effect of Thinning One-fourth and One-half the Fruit from Laterals on Weight of Fruit Produced

One-fourth of the Fruits Removed

Lateral No.	61	62	63	64	65	66	67	68	69	70	Total	Av.
Picking Date												
Aug. 1-2	.73	.86	.80	.35	.61	.28	.20	.50	.61	.09	5.03	.503
15	.11	.02	.08	.07			.12	.09		.24	.73	.073
24	.03									.04	.07	.007
28												
Sept. 2												
Total	.87	.88	.88	.42	.61	.28	.32	.59	.61	.37	5.83	.583

One-half the Fruits Removed

Lateral No.	71	72	73	74	75	76	77	78	79	80	Total	Av.
Picking Date												
Aug. 1-2	.41	.88	.78	.30	.44	.39	.76	.70	.79	.06	5.51	.551
15					.02						.02	.002
24										.03	.03	.003
28												
Sept. 2												
Total	.41	.88	.78	.30	.46	.39	.76	.70	.79	.09	5.56	.556

Table L. Effect of Thinning One-fourth and One-half the Fruit from Laterals on Weight of Fruit Produced

Check - No Fruits Removed

Lateral No.	§1	§2	§3	§4	§5	§6	§7	§8	§9	90	Total	Av.
Picking Date												
Aug. 1-2	.13	.63	.84	.98	1.33	.64	.19	.35	.43	.18	5.70	.570
15	.01					.02	.05	.02	.02	.20	.32	.032
24						.03	.02			.03	.08	.008
28										.01	.01	.001
Sept. 2												
Total	.14	.63	.84	.98	1.33	.69	.26	.37	.45	.42	6.11	.611

Table M. Effect of Thinning One-fourth and One-half the Fruit from Laterals on Number of Fruits Produced

One-fourth of the Fruits Removed

Lateral No.	61	62	63	64	65	66	67	68	69	70	Total	Av.
Picking Date												
Aug. 1-2	23	22	22	11	17	7	9	16	19	4	150	15.0
15	5	1	3	3			6	4		11	33	3.3
24	2									2	4	.4
28												
Sept. 2												
Total	30	23	25	14	17	7	15	20	19	17	187	18.7

One-half of the Fruits Removed

Lateral No.	71	72	73	74	75	76	77	78	79	80	Total	Av.
Picking Date												
Aug. 1-2	11	17	16	8	11	9	18	14	20	2	126	12.6
15					1						1	.1
24										1	1	.1
28												
Sept. 2												
Total	11	17	16	8	12	9	18	14	20	3	128	12.8

Table M. Effect of Thinning One-fourth and One-half the Fruit from Laterals on Number of Fruits Produced

Check - No Fruits Removed

Lateral No.	81	82	83	84	85	86	87	88	89	90	Total	Av.
Picking Date												
Aug. 1-2	6	23	23	26	36	19	8	12	16	6	175	17.5
15	1					1	3	2	1	10	18	1.8
24						1	1			2	4	.4
28										1	1	.1
Sept. 2												
Total	7	23	23	26	36	21	12	14	17	19	198	19.8

Table N. Total Results of Effect of Thinning One-fourth and One-half the Fruits from Laterals on Yield and Size of Berries

Lateral No.	Treatment	Dia.	Length	No. Fruit Buds	Leaf Buds	No. Blossoms	No. Berries Picked	Percent Set*	Wt-Total oz.	Av. wt. Per Berry	Grade
61	One-four-	5/32	7.31	5	9	51	30	58.8	.87	.0290	Columbia
62	th of		7.61	3	8	27	23	85.1	.88	.0382	Golden Moon
63	the fruits		6.87	4	8	32	25	78.1	.88	.0352	Golden Moon
64	thinned		6.50	3	4	25	14	56.0	.42	.0300	Columbia
65	off		5.00	3	7	26	17	65.3	.61	.0358	Golden Moon
66			11.50	4	8	34	7	20.5	.28	.0400	Golden Moon
67			9.75	4	10	35	15	42.8	.32	.0213	Lake State
68			6.75	4	10	33	20	60.6	.59	.0295	Columbia
69			7.00	4	8	30	19	63.3	.61	.0321	Columbia
70			6.19	4	5	36	17	47.2	.37	.0217	Lake State
Total			74.56	38	77	329	187	577.4	5.83	.3128	
Average			7.456	3.8	7.7	32.9	18.7	57.74	.583	.03128	Columbia
71	One-half	5/32	8.19	4	7	28	11	39.2	.41	.0372	Golden Moon
72	the fruits		8.44	4	10	38	17	44.7	.88	.0517	Golden Moon
73	thinned		12.81	3	13	36	16	50.0	.78	.0487	Golden Moon
74	off		5.06	3	8	22	8	36.3	.30	.0375	Golden Moon
75			5.25	4	7	27	12	44.4	.46	.0383	Golden Moon
76			10.75	3	10	29	9	31.0	.39	.0433	Golden Moon
77			6.31	5	7	39	18	46.1	.76	.0422	Golden Moon
78			7.25	4	9	41	14	34.1	.70	.0500	Golden Moon
79			10.00	5	12	45	20	44.4	.79	.0395	Golden Moon
80			9.25	3	9	27	3	11.1	.09	.0300	Columbia
Total			83.31	38	92	328	128	381.3	5.56	.4184	
Average			8.331	3.8	9.2	32.8	12.8	38.13	.556	.0418	Golden Moon

* The percent fruit set is of total blossoms not considering fruits thinned off.

Table N. Total Results of Effect of Thinning One-fourth and One-half the Fruits from Laterals on Yield and Size of Berries

Lateral No.	Treatment	Dia.	Length	No. Buds Fruit	No. Buds Leaf	No. Blossoms	No. Berries Picked	Percent Set*	Wt-Total oz.	Av. Wt. Per Berry	Grade
81	Check	5/32	6.31	3	9	22	7	31.8	.14	.0200	Lake State
82	No-		6.56	4	13	27	23	85.1	.63	.0273	Lake State
83	Thinning		6.75	3	4	28	23	82.1	.84	.0365	Golden Moon
84			8.25	5	13	35	26	74.2	.98	.0350	Golden Moon
85			5.81	5	6	44	36	81.8	1.33	.0369	Golden Moon
86			4.44	2	4	24	21	87.5	.69	.0328	Columbia
87			6.25	3	7	21	12	57.1	.26	.0216	Lake State
88			5.44	4	7	31	14	45.1	.37	.0264	Lake State
89			5.69	4	3	32	17	53.1	.45	.0264	Lake State
90			5.38	3	7	26	19	73.0	.42	.0221	Lake State
Total			60.88	36	73	290	198	670.8	6.11	.2850	
Average			6.08	3.6	7.3	29.0	19.8	67.08	.611	.0285	Columbia

* The percent fruit set is of total blossoms not considering fruits thinned off.

Table O. Comparison of Effects of Pruning Off and Of Removal of Blossoms From One-third to One-half of the Laterals of Stems on Fruit Set, Total Weight and Average Weight of Berries (Cont'd)

Lateral No.	Treatment	Diameter (in.)	No. Blossoms	No. Berries	Percent Fruit Set	Wt. Fruits Per Stem	No. Berries Per Cup (Av. of Season)	Grade
1	1/2-1/3	.94				26.31		
2	laterals	.90	1668	1455	87.23	34.86	235.25	Lake State
3	removed	.84				21.67		
4		.75	1146	1082	94.41	28.56	217.25	Lake State
5		.84				21.18		
6		.94				26.56		
7		.78				29.37		
8		1.00	1357	1332	98.15	54.42		
9		.94				39.31	217.55	Lake State
10		.75				17.06		
11		.84	1237	1203	97.25	31.06	205.25	Lake State
12		.94				28.19		
13		.87	1050	925	88.09	27.36		
14		.90				31.73	204.25	Lake State
15		1.00				31.25		
Total		13.23	6458	5997	465.13	448.89	1,079.55	
Average		.882	1291.6	1199.4	93.02	29.92	215.91	

Table O. Comparison of Effects of Pruning Off and Of Removal of Blossoms From One-third to One-half of the Laterals of Stems on Fruit Set, Total Weight and Average Weight of Berries

Lateral No.	Treatment	Diameter	No. Blossoms	No. Berries	Percent Fruit Set	Wt. Fruits Per Stem	No Berries Per Cup (Av. of Season)	Grade
16	Blossoms	.87	846	837	98.93	27.05		
17	Removed	.94				34.56	219.75	
18	1/3 - 1/2	.94				27.99		
19	laterals	.94	1255	1086	86.53	39.19		
20		.94				27.44	218.75	
21		.84				31.63		
22		.90				26.05		
23		.94				43.86	200.50	
24		1.00	1040	990	95.19	34.88		
25		.94	1245	1182	94.93	30.37		
26		.94				42.11	222.75	
27		.84				42.75		
28		.81	923	894	96.85	41.36		
29		.81				34.43	210.75	
30		.75				23.06		
Total		13.40	5309	4989	472.43	506.74	1072.50	
Average		.893	1061.8	997.8	9448	33.78	214.5	

Table O. Comparison of Effects of Pruning Off and Of Removal of Blossoms From One-third to One-half of the Laterals of Stems on Fruit Set, Total Weight and Average weight of Berries

Lateral No.	Treatment	Diameter (in.)	No. Blossoms	No. Berries	Percent Fruit Set	Wt. Fruits Per Stem oz.	No. Berries Per Cup (Av. of Season)	Grade
31	Check	.81				38.18		
32	No	.90	1831	1651	90.16	40.43	217.50	
33	Treatment	.90				34.44		
34		.75				31.24		
35		.87	1423	1398	98.24	26.12	223.00	
36		1.00				38.55		
37		.94				45.75		
38		.90				55.37	232.50	
39		.90	2897	2663	91.92	48.56		
40		1.06				35.11		
41		.78				30.63	220.75	
42		.75	1468	1347	91.75	29.80		
43		.84				27.57	212.50	
44		.87	1540	1514	98.31	31.43		
45		.90				63.18		
Total		13.17	9142	8573	470.38	576.36	1106.25	
Average		.878	1828.4	1714.6	94.07	38.42	221.25	

Table P. Comparison of Effects of Pruning Off and of Removal of Blossoms From One-Third to One-Half the Laterals of Stems On Total Weight and Size of Berries

One-half to One-third of the Laterals Pruned Off

Date Picked	August 3		August 11		August 21		August 29		September 4		Total		Average
Stem No.	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Berries Per Cup
1	16.06		7.12		2.44		.44		.25		26.31		
2	22.87	162	8.00	263	2.81	256	.87	260	.31		34.86	941	235.25
3	15.87		4.56		1.12		.06		.06		21.67		
4	20.38		4.56		1.00		2.50		.12		28.56		
5	16.00	148	3.44	225	1.00	236	.62		.12		21.18	869	217.25
6	23.06		1.50		1.75		.19		.06		26.56		
7	24.81		3.44		.81		.25		.06		29.37		
8	49.06	153	3.12	237	2.06	220	.12		.06		54.42	870	217.50
9	35.75		2.50		.75		.25		.06		39.31		
10	14.69		1.62		.38		.25		.12		17.06		
11	23.69	135	6.06	212	1.00	214	.25		.06		31.06	821	205.25
12	19.31		5.87		2.38		.38		.25		28.19		
13	21.62		4.87		.62		.19		.06		27.36		
14	24.87	134	4.81	197	1.87	226	.12		.06		31.73	817	204.25
15	20.56		7.56		2.25		.50		.38		31.25		
Total	348.60	732	69.03	1134	22.24	1152	6.99	260	2.03		488.89	3278	
Average	23.24	146.4	4.602	226.8	1.482	230.4	.466	260	.135		29.92	215.91	215.9

Table P. Comparison of Effects of Pruning Off and of Removal of Blossoms From One-third to One-half the laterals of Stems On Total Weight and Size of Berries

Blossoms Removed From One-third to One-half the Laterals

Date Picked	August 3		August 11		August 21		August 29		September 4		Total		Average
Stem No.	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Berries Per Cup
16	25.19		1.62		.12		.06		.06		27.05		
17	23.56	152	8.50	220	2.06	226	.38		.06		34.56	879	219.75
18	16.25		8.62		2.62		.44		.06		27.99		
19	29.94		6.19		2.81		.19		.06		39.19		
20	16.38	163	8.87	195	1.69	236	.31		.19		27.44	875	218.75
21	19.94		7.87		3.38		.19		.25		31.63		
22	23.87		1.44		.56		.12		.06		26.05		
23	16.62	133	22.87	174	3.38	214	.87		.12		43.86	802	200.50
24	25.50		7.69		1.44		.19		.06		34.88		
25	20.75		6.22		2.25		.50		.25		30.37		
26	31.12	157	6.44	214	3.87	239	.62		.06		42.11	891	222.75
27	32.19		6.25		3.44		.62		.25		42.75		
28	27.12		7.50		4.06		2.62	281	.06		41.36		
29	17.62	154	7.94	212	7.87	194	.62		.38		34.43	841	210.25
30	15.44		3.62		2.44		1.50		.06		23.06		
Total	341.19	759	112.04	1015	41.99	1109	9.23	281	1.98		506.43	3164	
Average	22.74	151.8	7.46	203.0	2.79	221.8	.615	281	.132		33.762	214.5	214.5

Table P. Comparison of Effects of Pruning Off and of Removal of Blossoms From One-third to One-half the Laterals of Stems On Total Weight and Size of Berries

Check Stems - No Treatment

Date Picked	August 3		August 11		August 21		August 29		September 4		Total		Average
Stem No.	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Wt.	Berries Per Cup	Berries Per Cup
31	25.06		8.31		3.81		.69		.31		38.18		
32	29.81	161	7.12	232	2.75	210	.44		.31		43.43	870	217.50
33	24.12		7.00		2.19		.38		.12		34.44		
34	14.87		6.12		7.81		1.69		.75		31.24		
35	13.06	178	4.75	233	6.44	214	1.31		.56		26.12	892	223.00
36	25.56		9.69		2.87		.31		.12		38.55		
37	29.19		10.62		4.56		.94		.44		45.75		
38	32.06	167	12.19	254	8.50	242	1.56	267	1.06		55.37	930	232.50
39	33.50		8.19		3.19		3.62		.06		48.56		
40	27.94		6.12		.87		.06		.12		35.11		
41	23.25	153	5.94	216	.94	247	.31		.19		30.63	883	220.75
42	23.81		4.00		1.56		.31		.12		29.80		
43	20.75	158	4.19	195	2.19	230	.25		.19		27.57	850	212.50
44	16.44		8.06		6.00		.87		.06		31.43		
45	41.12		13.00		7.75		1.12		.19		63.18		
Total	380.44	817	115.30	1130	61.43	1143	13.86	267	4.60		575.63	3357	
Average	25.36	163.4	7.68	226.0	4.09	228.6	.924	267	.306		38.33	221.25	221.25

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