

INFLUENCE OF SIZE OF TIPS USED IN BLACK RASPBERRY PROPAGATION ON SUBSEQUENT GROWTH AND YIELD

THESIS FOR THE DEGREE OF M. S. Earl Martin Berry 1932





INFLUENCE OF SIZE OF TIPS USED IN BLACK RASP-BERRY PROPAGATION ON SUBSEQUENT GROWTH AND YIELD.

THESIS

SUBMITTED TO THE GRADUATE FACULTY OF MICHIGAN STATE COLLEGE OF AGRICULTURE AND APPLIED SCIENCE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE.

BY

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THESIS

INTRODUCTION

When looking over a raspberry plantation one notes not only missing plants, but a certain percentage of small and weak. though healthy, plants. The loss of plants before they come into bearing together with the individual differences in production is of real importance to the fruit grower. If it is found that failure to grow in the field is usually associated with small size of tip, or if small, weak, unproductive plants as they are found in the field is likewise associated with small size of tip, these things can be avoided by selecting more suitable tips for plantang.

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According to Teske and Gardner.(4). Michigan. as well as the country as a whole, has shown a steady decline in raspberry production during the past generation. They cite the main reason for this decline as the dying out of plants after the plantation is started, due primarily to soil conditions, poor care and disease. Their data show that the total cost of establishing a raspberry plantation, and bringing it up to the bearing age (one year), was an average of \Im 69.80 per acre. The cost is approximately the same in caring for a field with a one hundred percent stand as it is with a fifty percent stand. Profits or losses in the raspberry business depend primarily on yield per acre.

Hoffman and Schlubatis. (1). state that root development and depth of penetration were closely correlated with the height of the water table. Top growth, yield of fruit and longevity of the plant were directly proportional to root development.

Yield and size of berries have been found. by Johnston. (2). to be directly proportional to the diameter or size of cane. In this study. records of individual canes are not available but production from the average canes in each group is tabulated and this correlates with Johnston's work.

Johnston.(3). states that the size of the tip is relatively unimportant in determining the subsequent yields of the plant. except possibly in the case of tips weighing from three to five-sixteenths ounces. (3)

PUELEO

The purpose of this study is to determine whether any benefit can be derived from careful tip selection in black raspberry propagation.

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PROCEDURE

In September, 1929, arrangements were made with Mr.E. 7. Ewald, who lives one-half mile west and one mile south of Hartford. Van Buren County, Lichigan, to use his plants for the carrying out of this project. This field of Cumberland raspberries was selected because it was recommended by Mr.E. C. Mandenberg, State Inspector of Orchards and Nurseries, es being one of the cleanest fields in south-western Michigan. It was a three acre, five-year-old field, and had survived two rigid inspections a year by state inspectors since it was planted.

In early September, 1929, one hundred of the strongest and healthiest plants in the fields were tagged and tipped for the purpose of producing new plants for this study. In the spring of 1930 the young plants were dug from around the above-mentioned mother-plants and were divided into three groups, according to the diameter at the base of the "handle" and the size of the root system. As a basis for selection. the plants with a "handle" diameter of one-fourth inch or above were classed as the "strong" group, those ranging from three-sixteenths to one-fourth inch were placed in the "medium" group and those plants with a "handle" diameter of less then three-sixteenths of an inch were placed in the "weak" group. The size of the root system was directly proportional to the above mentioned classification. If either the diameter of the "handle" or the size of the root system did not come up to the standard, the plant was placed in the next lower group.

Extra precautions were taken to select a field welldrained and of the proper soil structure. The location selected for the experimental field was on a rather high elevation and sloping gently to the north and east. It is favorably situated for atmospheric and soil drainage. The surface soil is a gravelly, sandy loam about six to ten inches deep; the subsoil is likewise sandy and gravelly, but contains enough clay to retain water satisfactorily. However, water drains through it well enough to permit good seration and hence deep root penetration.

On April 21 st., 1950, 150 plants from each of the three groups were set out in the new field, eight by four feet apart, two rows to each group, seventy-five plants to a row. During the summer these plants were cultivated five times and hoed twice so were kept entirely free from weeds. Four inspections were made for diseases, of which none were discovered, but several of the weaker plants failed to grow at all. Shortly after planting and again in the spring of 1951 each plot was fertilized with sulphate of ammonia at the rate of 100 lbs. per scre.

After growth had ceased for the first year. diameter measurements in millimeters were made at the base of 100 canes in each group. Representative plants were selected and all the canes of each plant were measured. This work was repeated at the end of the second season.

This field was under the close supervision of Mr. Eweld and was cultivated and cared for identically the same as he

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would care for any field. The new shoots were topped for the purpose of growing new plants. so it was impossible to collect data on the length of shoots. although the correlation between cane diameter and plant production and between cane diameter and fruit production is available. In the spring of 1951 close watch was kept on the development of the field. All diseased plants or those which had died from the winter were recorded. The laterals were sut back to approximately six inches in length, which is recommended by Johnston(2).

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Harvesting was begun on July 8 th. and completed July 23 rd. involving six pickings. Yields were recorded in pints and pounds from the respective groups of plants. This study was begun with the selection and tipping of the mother plants, but the first data of any importance was collected from the classification of the young plants into the three respective groups. In march, 1900, just a month before the plants were dug, there was a heavy snow storm which broke off many of the smaller plants. At least a hundred were lost.

Table 1.- Young plants at the beginning of the project divided into the three respective groups according to the diameter at the base of the handle, and the size of the root system. A total of 808 plants were included in the classification.

Name	Size	Number	
Weak	1/4" & above	182	
Medium	3/16" - 1/4"	455	
Strong	Under 3/16"	193	

During the first summer's growth no signs of disease showed up, but several plants, especially in the "weak" group, failed to start growth. Lost plants survived the winter of 1930-1931 in good condition with the exception of a small per centage infected with crown gall which was not noticeable on the mother plants. Table 11.- Number of missing plants at time of first harvest (July 8-1931).

Cause	Weak	Medium	Strong
Failed to grow	39 (26%)	3(2%)	0(0%)
Winter killed 1930-'31	4 (2.6%)	0(0%)	0(0%)
Died of crown gall be-			
fore harvest of 1931	3 (2%)	2 \$1 3\$)	1(.6%)

Table 111. - Average diameter in millimeters of 100 canes in each of the respective groups. Representative plants in each group were selected. All the canes of each plant were measured.

Group	Measurements			
-	First year	Second year		
Weak	8.02 mm.	10.34 mm.		
Medium	8.56 mm.	11.14 mm.		
Strong	9.52 mm.	10.78 mm.		

The numbers of new canes produced by the respective groups were directly proportional to the strength of the group. The "medium" plants averaged .49 canes more than the "weak" plants while the "strong" plants averaged .68 canes more than the "medium" plants. This did not hold true to the average number of plants produced per cane in the three groups. The "strong" group producing the largest number of canes per plant averaged the least (9)

number of plants (2.29) per cane. The "weak" group stood second (3.39 plants) while the "medium" group averaged the most plants (3.60) per cane. The yield correlated with the number of canes in each group. The "medium" group averaged 3.58 ounces more fruit per plant than the "weak" group. The "strong" group averaged .33 ounces more fruit per plant than the "medium" group. (1)

Table 1V.-Production record on project for first

Date of picking		Weak		Medium		Strong		
		Pin	ts	Lbs.	Pints	Lbs.	Fints	Lbs.
July	8	32		23-5	72	50-6	62	42-11
Ħ	10	15		10-3	24	16-4	29	19-6
77	13	r	rain		rain		38	27-10
**	14	25	12	17-6	48	32 -5		
17	16	4	1 <u>.</u>	2-8	9	6-2	20	14-10
11	20	7		5-0	13	9-2	20	13-2
Ħ	23	2	12	1-14	4쿨	3-2	8	5-8
Total 86		1 4	60-14	170 1	117-5	177	122-15	
No.of plants		104		145		149		
Av.produc- tion per plant in ounces		9.	36 12,94		.94	13.27		
Av.canes produced per plant 1930		1.	74	2.23		2,91		
Av. plants produced per mother plant 1930		5.	90	8,	,03	6	.66	

season (1930-1931).

DISCUSSION

After checking over the yield record of the three groups of plants very little difference will be observed between the "medium" and "strong" groups, but a decided difference will be found between the "weak" and "medium" groups.

Every plant set out in the above-mentioned "weak" group, as well as the "medium" and "strong" groups. was tipped by a successful fruit farmer in south-western Michigan and would have been sold to a leading nurseryman as first class plants. In comparison with the products of numerous other plant growers these plants would be classified as No. 1 stock. The owner of the plantation set out over two and one-helf acres of his own plants adjacent to the experimental patch and a good comparison could be made. Many plants similar to those in the "weak" group failed to grow in this field. Low yield from the "weak" plants together with such a large per centage which fail to grow, as compared with the "medium" and "strong" groups, would be sufficient reason to discard such plants when setting out a new plantation.

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- 1. In classifying the plants in this study. approximately one-fourth fell into each of the "weak" and "strong" groups. The remaining one-half composed the "medium" group.
- 2. 26% of the plants in the "weak" group failed to start growth. In the "medium" group only 3% failed to grow while every plant in the "strong" group was alive at the end of the first season.
- 3. The average difference of 3.58 ounces of fruit per plant between the "weak" and "medium" groups was recorded, while there was only an average difference of .33 ounces between the plants of the "medium" and "strong" groups.

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Following are three views of the raspberry plots taken from different angles to show the comparative development of the respective groups.



Figure 1.-View of raspberry plot at 8 weeks of age showing the two rows of 'weak' plants at the extreme right. immediately to the left are the 'medium' and 'strong' groups respectively.



Figure 11.- View of rasperry plot at 8 weeks of age taken on the left row of the 'medium' plot. The 'weak' rows can be seen at the extreme right and the 'strong' rows just to the left of the row from which the picture was taken.



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Figure 111. - View of raspberry plot at 8 weeks of age taken between the two 'strong' rows. Immediately to the right are the 'medium' and 'weak' plots respectively.

Following are individual pictures of representative plants in each plot, showing comparative development at the end of the first year's growth.



Figure 1V. - 'Strong' plant



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Figure V.- 'Medium' plant.



Figure Vl. - 'Weak' plant.



Figure VIL.- View showing comparative development of root systems and *`hendle*` diameters of representative specimens in each plot. The specimen at the left is representative of the 'strong' plant. The specimen in the center is representative of the 'medium' plant. The specimen at the right is representative of the 'weak' plant.

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