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Lateral Development Following Special Pruning Practices on Peach Shoots

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To the Graduate Council:

I am submitting herewith a thesis written by Tayis S. Hamid entitled "Lateral Development Following Special Pruning Practices on Peach Shoots." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Plant Sciences.

Bill S. Pickett, Major Professor

We have read this thesis and recommend its acceptance:

Joe S. Alexander, Homer D. Swingle, O. E. Goff

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

July 29, 1959

To the Graduate Council:

I am submitting herewith a problem written by Tayis S. Hamid entitled "Lateral Development Following Special Pruning Practices on Peach Shoots." I recommend that it be accepted for three quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Horticulture.

Major Professor

We have read this problem
and recommend its acceptance:

Joe S. Alexander

Homer D. Lumsden

O. E. Goff

LATERAL DEVELOPMENT FOLLOWING SPECIAL PRUNING PRACTICES ON PEACH SHOOTS

A PROBLEM

Submitted to
The Graduate Council
of
The University of Tennessee
in
Partial Fulfillment of the Requirements
for the degree of
Master of Science

---

by

Tayis S. Hamid

July 1959

126947

Acknowledgement

The writer wishes to express his gratitude to Dr. B. S. Pickett, Head, Department of Horticulture for suggesting the study, reviewing the problem and supervision throughout this work.

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Introduction

The peach bears fruit buds laterally on long shoots. The flower buds are usually borne in pairs, one on either side of a vegetative or shoot bud. When borne singly no further growth will occur at that node. New growth develops from the terminal bud or from lateral buds or, in some instances, from adventitious or latent buds lower in the tree. It is, therefore, characteristic of the peach that its fruiting wood is carried a foot or two further away from the trunk each year, leaving long stretches of non-fruiting wood that serve only as connecting links between the fruiting periphery of the tree and its root system.

Seldom does the peach tree of bearing age fail to differentiate enough fruit buds for a heavy crop. In fact, it commonly produces many more than are desired. Pruning becomes desirable as a means of thinning the crop.

All fruit on a peach tree is produced on the previous year's wood growth. This fact makes it necessary to adjust pruning practices and some other cultural practices so that sufficient new wood is produced each season to provide just about enough fruit buds for the next season's prospects. The location of renewal wood in the tree is also important.

Because of its fruiting habit the peach creates a problem for growers. The problem is how to develop fruit wood nearer the trunk each year, so that propping, picking, spraying and fruit thinning will require about the same, rather than more, labor each year.

The ever rising costs of production without the corresponding

increases in returns have forced fruit growers to adopt time and labor saving devices in the production of their crop.

As a result of the above problem, this experiment was conducted to study and investigate the influence of some special pruning practices on one year peach shoots and their effect on the location and number of lateral branch development.

Review of Literature

The literature did not show that much work of this type had been done. In fact, the literature failed to mention anything about this kind of study in the United States.

Since the study was designed to test different kinds of heading back of one year peach shoots, a statement by Gardener (1952) to the effect that "heading back may be a good practice in growing the peach because it encourages the shoot's growth on which the fruit buds are borne and on the other hand may be a bad practice for pear, because it generally limits the formation of fruit spurs on which most of the fruit of this species is borne" may be useful.

Furthermore Gardener stated that "analysis shows that the new growth from near the cut ends of headed shoots has a higher nitrogen content than the new growth from unpruned shoots, a fact that helped to explain the relatively vigorous growth that results from heading."

Materials and Methods

The study was carried on in the Cherokee Orchard, College of Agriculture Farm at The University of Tennessee through the spring season of 1959.

Four varieties of peaches were used in this experiment: Sun Haven, Rich Haven, Red Skin and Shipper Late Red.

Ten trees of each variety were selected in each of two rows 100 feet apart. The first row was located on the northeast side of a steep hill, and the second row was located on the top of the hill.

Ten one year old shoots were chosen on each tree, five of the shoots were >10 inches in length and five of the shoots were <10 inches in length. The shoots were pruned according to the following plan:

One shoot >10 inches in length was not headed back (only shoots having terminal buds were acceptable). The terminal bud was removed from the second shoot; the third shoot was headed back to 1/4 total length of the shoot; the fourth shoot was headed back to 1/2 total length of the shoot; the fifth shoot was headed back to 3/4 total length of the shoot. The <10 inch shoots were treated the same way.

All shoots >10 inches in length were marked with red paint, while shoots <10 inches long were marked with white paint.

Treatment	Mark Used
1. Not headed back (terminal bud present)	One red line
2. Terminal bud removed	One red line and one red dot.

3. Headed back 1/4 total length	Three red dots
4. Headed back 1/2 total length	Two red dots
5. Headed back 3/4 total length	One red dot

Shoots $<$10 inches in length were marked with the same system as the above except that white paint was used.

The pruning operation and marking were done between March 25 and 30 of 1959. The buds had made little growth at that time.

May 25, 1959 was the starting date for collecting the data. Each shoot was recorded individually. The number of buds which initiated lateral shoots, leaves, or initiated nothing were counted and recorded according to their location on the shoot. The first bud was at the base of the shoot.

A total of 800 shoots were studied, counted and recorded; 400 of them were $>$10 inches in length shoots and 400 of them were $<$10 inches long.

Collection of data ended May 31, 1959. The growth period from the pruning time until the time the data were collected was about 2 months.

Results and Discussion

Data for this study were combined and presented in tables.

The basic data of this study are presented in Tables I and II. These data are presented as actual counts of leaves and new lateral branches developing on the pruned branches, each datum in columns L and S being of the sum of the leaves for five treated shoots. Leaves are identified by the initial L and new lateral by the initial S.

It is as important to the peach grower to produce a satisfactory number of new laterals as it is for him to know the effect of a cut on the future development of the branch.

When all varieties are considered it is found that unpruned branches over ten inches long produced a total of 283 laterals as compared with 289 laterals when the terminal bud was removed. Shoots three fourths their original length produced 226 shoots, those headed back to half of their original length produced 112 shoots, those headed back to one fourth their original length produced only 46 shoots.

There are some distinctive variety responses to pruning. Red Skin shows a consistent reduction in the number of shoots produced as the heading back becomes more severe. This can be ascribed to nothing more than that there are fewer buds available to produce new laterals as the shoots are reduced in length. Shipper's Late Red, on the other hand, seems to show, a positive to pruning with more, or at least as many new shoots being produced following pruning which shortens the shoots by one fourth of their length. The removal of the terminal bud seems to produce a positive response toward new lateral formation for

TABLE I

THE EFFECT OF DIFFERENT AMOUNTS OF HEADING BACK ON THE NUMBER AND LOCATION OF LEAVES AND LATERAL SHOOTS DEVELOPED ON SHOOTS >10 INCHES IN LENGTH

Varieties	Rich Haven				Shipper's Late Red				Sun Haven				Red Skin			
	Number		Percentage		Number		Percentage		Number		Percentage		Number		Percentage	
Treatments	L[1]	S[2]	L	S	L	S	L	S	L	S	L	S	L	S	L	S
Terminal Bud Present	122	81	60.1	39.9	196	76	72.1	27.9	196	46	81.0	19.0	135	80	62.8	37.2
Terminal Bud Removed	92	85	52.0	48.0	123	80	60.6	39.4	152	48	76.0	24.0	117	76	60.6	39.4
1/4 Headed Back	89	52	63.1	36.9	79	82	49.1	50.9	142	38	78.9	21.1	96	54	64.0	36.0
1/2 Headed Back	56	33	62.9	37.1	59	22	72.8	27.2	88	25	77.9	22.1	66	32	67.3	32.7
3/4 Headed Back	12	14	46.2	53.8	14	9	60.9	39.1	32	9	78.0	22.0	17	14	54.8	45.2

[1]Leaves

[2]Lateral Shoots

TABLE II

THE EFFECT OF DIFFERENT AMOUNTS OF HEADING BACK ON THE NUMBER AND LOCATION OF LEAVES AND LATERAL SHOOTS DEVELOPED ON SHOOTS <10 INCHES IN LENGTH

Varieties	Rich Haven				Shipper's Late Red				Sun Haven				Red Skin			
	Number		Percentage		Number		Percentage		Number		Percentage		Number		Percentage	
Treatments	L[1]	S[2]	L	S	L	S	L	S	L	S	L	S	L	S	L	S
Terminal Bud Present	52	51	50.5	49.5	67	59	53.2	46.8	106	36	74.6	25.4	79	40	66.4	33.6
Terminal Bud Removed	43	64	40.2	59.8	47	80	37.0	63.0	100	25	80.0	20.0	72	45	61.5	38.5
1/4 Headed Back	33	44	42.8	57.2	38	48	44.2	55.8	54	37	59.3	40.7	49	38	56.3	43.7
1/2 Headed Back	18	40	31.0	69.0	20	34	37.0	63.0	34	17	66.7	33.3	15	21	41.7	58.3
3/4 Headed Back	9	20	31.0	69.0	2	17	10.5	89.5	19	6	76.0	24.0	13	9	59.1	40.9

[1]Leaves

[2]Lateral Shoots

Rich Haven, Shipper's Late Red, and perhaps Sun Haven.

A similar comparison for shoots less than 10 inches in length shows quite different responses. In this case the total number of new laterals produced by unpruned shoots was 186. When the terminal bud was removed the shoots were able to produce 214 shoots. However, more severe pruning noticeably reduced the number of new laterals produced per shoot. When shoots were headed back by 1/4 of their original length the number of new laterals produced was only 167. When headed back to half the original length the number of new laterals was 112 and when headed back to three fourths the original length there were only 52 new laterals produced.

There are distinctive varietal responses with the short shoots as well as the long ones. Sun Haven and Red Skin made little response to removal of the terminal bud. Both tend to show more stimulation toward new lateral development when headed back one fourth than Rich Haven and Shipper's Late Red.

Comparison of the percentages, for shoots more than 10 inches in length, indicated that the greatest percentage of leaves were developed on branches headed back to three fourths their original length in the case of Rich Haven, branches with terminal bud present in case of Shipper's Late Red and Sun Haven, and 1/2 headed back in case of Red Skin. The least percentage of leaves developed on 3/4 headed back in case of Rich Haven and Red Skin, 1/4 headed back in case of Shipper's Late Red and terminal bud cut in case of Sun Haven.

Comparison of the percentage of lateral shoots developed showed that the greatest percentage of lateral shoots was developed on 3/4

branches headed back in case of Rich Haven and Red Skin, 1/4 headed back in case of Shipper's Late Red and terminal bud cut in case of Sun Haven. The least percentage of lateral shoots developed was on shoots 1/2 headed back for Shipper's Late Red and Red Skin, 1/4 headed back for Rich Haven and terminal bud present for Sun Haven.

Table II represents five treatments on shoots $<$10 inches long of four varieties.

Comparisons, based on percentage of leaves to percentage of lateral shoots, for the individual treatment and varieties showed that the greatest percentage of leaves was developed on shoots with terminal bud present for all varieties except Sun Haven. The least percentage of leaves developed was on shoots 1/2 and 3/4 headed back in case of Shipper's Late Red, 1/4 headed back in case of Sun Haven, and 1/2 headed back in case of Red Skin.

The greatest percentage of lateral shoots was developed in 1/2 and 3/4 headed back in case of Rich Haven, 3/4 headed back in case of Shipper's Late Red, 1/4 headed back in case of Sun Haven, and 1/2 headed back in case of Red Skin.

The least percentage of lateral shoots was developed with terminal bud present in case of Rich Haven, Shipper's Late Red and Red Skin, and with terminal bud removed in case of Sun Haven.

The percentages of leaves developed for five treatments and four varieties on $>$10 inch long shoots of one year old wood were subjected to analysis of the variance. It was shown that there were no significant differences between the five different treatments, but there were significant differences between varieties at 1% level (Tables III and IV).

TABLE III

THE EFFECT OF DIFFERENT TREATMENTS ON THE PERCENTAGE OF LEAVES DEVELOPING ON SHOOTS >10 INCHES LONG

Treatments	Percent
Terminal Bud Present	69.0
Terminal Bud Removed	62.3
1/4 Headed Back	63.8
1/2 Headed Back	70.2
3/4 Headed Back	60.0

N. S. Not significant as determined by F test.

TABLE IV

THE PERCENTAGE OF LEAVES PRODUCED BY DIFFERENT VARIETIES ON SHOOTS >10 INCHES LONG AS AFFECTED BY DIFFERENT AMOUNTS OF HEADING BACK PRUNING

Variety Names	Percent
Rich Haven	56.8
Shipper's Late Red	63.1
Sun Haven	78.4
Red Skin	61.9

LSMD at 1% level = 11.0

The percentages of lateral shoots developed on > 10 inch long one year old shoots for five treatments and four varieties were subjected to analysis of the variance. Again there were no significant differences between the five different treatments, and there were significant differences between the varieties at 1% level (Tables V and VI).

The percentages of leaves developed on shoots < 10 inches long for five different treatments and four varieties were subjected to analysis of the variance. No significant difference appeared between the treatments. There were significant differences between the varieties at 1% level (Tables VII and VIII).

The percentages of lateral shoots developed on < 10 inches long were analyzed and again there was no significant difference between the treatments. There were significant differences between the varieties at 1% level (Tables IX and X).

A comparison between all varieties, all shoots, and all treatments was made. There was no significant difference between the treatments and there were significant differences due to varieties at 1% level (Tables XI and XII).

A comparison was made between all treatments and all varieties and all shoots confirmed the information gathered from the independent analyses.

There was no significant difference between the 5 treatments and there was a significant difference between the 4 varieties (Tables XIII and XIV).

Finally a comparison was made between the > 10 inch long shoots and < 10 inch long shoots to discover whether or not they responded the

TABLE V

THE EFFECT OF DIFFERENT TREATMENTS ON THE PERCENTAGE OF LATERAL SHOOTS DEVELOPING ON SHOOTS >10 INCHES LONG

Treatments	Percent
Terminal Bud Present	31.0
Terminal Bud Removed	38.0
1/4 Headed Back	36.2
1/2 Headed Back	29.8
3/4 Headed Back	40.0

TABLE VI

THE PERCENTAGE OF LATERAL SHOOTS PRODUCED BY DIFFERENT VARIETIES ON SHOOTS >10 INCHES LONG AS AFFECTED BY DIFFERENT AMOUNTS OF HEADING BACK PRUNING

Variety Name	Percent
Rich Haven	43.2
Shipper's Late Red	36.9
Sun Haven	21.6
Red Skin	38.1

LSMD at 1% level = 11

TABLE VII

THE EFFECT OF DIFFERENT TREATMENTS ON THE PERCENTAGE OF LEAVES DEVELOPING ON SHOOTS < 10 INCHES LONG

Treatments	Percent
Terminal Bud Present	61.2
Terminal Bud Removed	54.7
1/4 Headed Back	50.6
1/2 Headed Back	44.1
3/4 Headed Back	44.1

TABLE VIII

THE PERCENTAGE OF LEAVES PRODUCED BY DIFFERENT VARIETIES ON SHOOTS < 10 INCHES LONG AS AFFECTED BY DIFFERENT AMOUNTS OF HEADING BACK PRUNING

Variety Names	Percent
Rich Haven	39.1
Shipper's Late Red	36.4
Sun Haven	71.3
Red Skin	57.0

LSMD at 1% level = 18.3

TABLE IX

THE EFFECT OF DIFFERENT TREATMENTS ON THE PERCENTAGE OF LATERAL SHOOTS DEVELOPING ON SHOOTS <10 INCHES LONG

Treatments	Percent
Terminal Bud Present	38.8
Terminal Bud Removed	45.3
1/4 Headed Back	49.4
1/2 Headed Back	55.9
3/4 Headed Back	55.8

TABLE X

THE PERCENTAGE OF LATERAL SHOOTS PRODUCED BY DIFFERENT VARIETIES ON SHOOTS < 10 INCHES LONG AS AFFECTED BY DIFFERENT AMOUNTS OF HEADING BACK PRUNING

Variety Names	Percent
Rich Haven	60.9
Shipper's Late Red	63.6
Sun Haven	28.7
Red Skin	43.0

LSMD at 1% level = 18.3

TABLE XI

COMPARISON OF THE PERCENTAGE OF BUDS FORMING LEAVES BETWEEN DIFFERENT PRUNING TREATMENTS

Treatments	Percent of Buds Forming Leaves
Terminal Bud Present	65.2
Terminal Bud Removed	58.5
1/4 Headed Back	57.2
1/2 Headed Back	57.1
3/4 Headed Back	52.0

TABLE XII

PERCENTAGE OF BUDS FORMING LEAVES ON 4 VARIETIES OF PEACHES

Variety Names	Percentage of Buds Forming Leaves
Rich Haven	48.0
Shipper's Late Red	36.4
Sun Haven	71.3
Red Skin	57.0

LSMD at 1% level = 13.5

TABLE XIII

COMPARISON OF THE PERCENTAGE OF BUDS FORMING LATERAL SHOOTS BETWEEN DIFFERENT PRUNING TREATMENTS

Treatments	Percent of Buds Forming Lateral Shoots
Terminal Bud Present	34.8
Terminal Bud Removed	41.5
1/4 Headed Back	42.8
1/2 Headed Back	42.9
3/4 Headed Back	48.0

TABLE XIV

PERCENTAGE OF BUDS FORMING LATERAL SHOOTS ON 4 VARIETIES OF PEACHES

Variety Names	Percentage of Buds Forming Lateral Shoots
Rich Haven	52.0
Shipper's Late Red	41.5
Sun Haven	42.8
Red Skin	48.0

LSMD at 1% level = 13.5

LSMD at 5% level = 10.0

same way with respect to leaves and lateral shoot development. It was found that there were significant differences between the two classes of shoots and the percentage of leaves and shoots which developed on them at the 1% level. Shoots >10 inches long tended to produce a higher percentage of leaves and a lower percentage of lateral branches than shoots <10 inches long (Tables XV and XVI).

TABLE XV

COMPARISON OF THE PERCENTAGE OF BUDS FORMING LEAVES BETWEEN >10 AND <10 INCHES LONG SHOOTS

Treatments	Percentage of Buds Forming Leaves
+10 inches shoot	65.0
-10 inches shoot	51.0

LSMD at 1% level = 9.50

LSMD at 5% level = 7.04

TABLE XVI

PERCENTAGE OF BUDS FORMING LATERAL SHOOTS ON >10 AND <10 INCHES LONG SHOOTS

Treatments	Percentage of Buds Forming Lateral Shoots
+10 inches shoot	35.0
-10 inches shoot	49.0

LSMD at 1% level = 9.50

LSMD at 5% level = 7.04

Summary and Conclusion

The influence of special pruning practices on lateral shoot and leaf development of shoots >10 inches long and <10 inches long of 4 varieties of peaches was studied during the spring of 1959.

Comparisons were made and based on the total number of lateral shoots and on the total number of leaves developed on twenty >10 inch and on twenty <10 inch one year old shoots, for each variety in each treatment.

These comparisons indicated that all varieties with a shoot length >10 inch and shoot lengths <10 inch initiated and developed the greatest number of leaves on shoots having terminal bud present, and the least number of leaves on headed back to 1/4 their original length.

The greatest number of lateral shoots developed in case of shoots >10 inches long when the terminal bud was removed in case of Rich Haven and Sun Haven, 1/4 headed back for Shipper's Late Red and with terminal bud present for Red Skin.

The greatest number of lateral shoots developed in case of <10 inch shoots when terminal bud was removed in case of Rich Haven, Shipper's Late Red, and Red Skin, and when 1/4 headed back for Sun Haven.

The least number of lateral shoots developed was on 3/4 headed back for all varieties and both for > 10 inch and < 10 inch shoots.

Comparisons which based on the percentage of leaves to the percentage of lateral shoots developed for each individual treatment and variety gave different results from comparisons based on total

number of leaves and lateral shoots.

Comparisons of the percentage indicated that on shoots > 10 inches long the greatest percentage of leaves was developed when terminal bud present in case of Shipper's Late Red and Sun Haven, when 1/4 headed back in case of Rich Haven, and 1/2 headed back in case of Red Skin. The lowest percentages of leaves developed on shoots 3/4 headed back for Rich Haven and Red Skin, 1/4 headed back for Shipper's Late Red and with terminal bud removed for Sun Haven.

The greatest percentage of lateral shoots developed was when the shoots were 3/4 headed back in case of Rich Haven and Red Skin, 1/4 headed back in case of Shipper's Late Red and with terminal bud removed in case of Sun Haven. The least percentage of lateral shoots developed on shoots 1/2 headed back for Shipper's Late Red and Red Skin, 1/4 headed back for Rich Haven and with terminal bud present for Sun Haven.

Comparisons of the percentages in case of < 10 inch shoots indicated that the greatest number of leaves was developed when terminal bud was present in case of Rich Haven and Shipper's Late Red and with terminal bud absent in case of Sun Haven and Red Skin. The lowest percentage of leaves was developed on shoots 1/2 and 3/4 headed back in case of Rich Haven, 3/4 headed back in case of Shipper's Late Red, 1/2 headed back in case of Red Skin, and 1/4 headed back in case of Sun Haven.

The greatest percentage of lateral shoots developed when shoots were 1/2 and 3/4 headed back in case of Rich Haven, 3/4 headed back in

case of Shipper's Late Red, 1/4 headed back in case of Sun Haven, and 1/2 headed back in case of Red Skin.

The lowest percentage of lateral shoots developed was with the terminal bud present in case of Rich Haven, Shipper's Late Red and Red Skin, and with terminal bud absent in case of Sun Haven.

Analysis of the variance indicated that there was no significant difference between treatments in >10 inch long shoots and <10 inch shoots, but there were significant differences between the varieties and their responses to the pruning systems.

On shoots less than 10 inches long the more severe the pruning the higher proportion of buds can be forced to form lateral shoots, on shoots more than 10 inches long not much difference in the proportion of leaves to lateral shoots developed.

Different varieties responded in a quite dissimilar manner to pruning of the same severity.

References

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