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RESPONSES OF THE SOUR CHERRY TO FERTILIZERS AND TO PRUNING IN THE HUDSON RIVER VALLEY

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ABSTRACT

This report treats of growth studies and of fertilizer and pruning tests with bearing Early Richmond, Montmorency, and English Morello sour cherry trees. Each variety shows a characteristic relation between length of terminal shoot and spur formation, lateral shoot formation, and production.

The average moderately vigorous sour cherry orchard in the Hudson River Valley may be expected to respond to applications of nitrogenous fertilizers even when kept clean cultivated and sown to a cover crop. No evidence has yet appeared showing any benefit from either phosphorus or potassium, alone or in combination. Because of the growing habit of the cherry, little or no increase in fruit yield may be expected the first year fertilizers are applied. The second season should see some gain and the third season a still larger one. Increases in terminal growth, trunk diameter, and leaf area and delayed maturity of fruit are accompanying responses.

Severe pruning to outside lateral branches in order to reduce the height of tall trees, as well as thinning out of unproductive wood and cutting back to outside lateral growths in order to restore vigor, has resulted in renewed growth when nitrogen applications have been made in combination with pruning; otherwise not.

INTRODUCTION

There are three major varieties of sour cherry produced in the Hudson River Valley, *viz.*, Early Richmond, Montmorency, and English Morello. They are extensively grown, especially Montmorency and English Morello, and in recent years have been among the outstandingly profitable orchard fruits. Experimental evidence regarding cultural practices that may be helpful to cherry growers is therefore especially desirable at this time.

The work reported upon in this publication treats of growth studies and of fertilizer and pruning tests with the three varieties named above, emphasis having been placed upon the varieties in the order of their economic importance, namely, Montmorency, English Morello, and Early Richmond. Altho the fertilizer and pruning tests have been in progress only three years, the evidence is so plain that it seems unnecessary to wait for additional data.[1]

THE PROBLEM

Each variety presents a problem in itself. In the case of Early Richmond the trees are tall growing and are picked with difficulty by the boys and girls usually employed for this work. Montmorency trees are not so erect, but they, too, grow out of hand, especially under the crowded conditions found in the majority of Hudson River Valley orchards. The trees of English Morello are small growing and seldom present this difficulty.

On the other hand, English Morello trees are frequently low producers, tho under optimum conditions they are very productive. Early Richmond trees are seldom highly productive, tho they, too, yield heavily upon occasions. Montmorency is characteristically a heavy producer, yet often not as productive as experience shows it might be.

Still another factor, time of fruit maturity, is becoming of increasing importance in the Hudson River Valley, the market paying a premium for Early Richmond early in the season and for Montmorency and English Morello late in the season. Blossom-bud hardiness is not of great concern in the major producing regions, altho in the Upper Hudson River Valley and the Lake Champlain sections it becomes so.

From this brief introduction the principal problems presenting themselves are seen to be:

1. The growing and fruiting habits of the sour cherry.
2. The response of the sour cherry to various cultural treatments directed at increased production.
3. The response of the sour cherry to pruning directed at lowering the height of the tree and also at increasing production.

[1]The progress of the work has been materially assisted by the helpfulness of Wessel Ten Broeck, Wessel Ten Broeck, Jr., and R. L. Meyer, all of Hudson.

PREVIOUS RESULTS

Until quite recently, very little information was available on the growth and culture of the sour cherry. In 1910, Blake and Farley (1),[2] reporting upon a limited fertilizer test in New Jersey, observed a definite response in both yield and tree growth in trees growing on a heavy moist loam fairly rich in nitrogen which received nitrate of soda at the rate of 150 pounds per acre in addition to 500 pounds per acre of equal parts of ground bone, acid phosphate, and potash. Trees with which they were compared were also supplied with 500 pounds per acre of equal amounts each of ground bone, potassium chloride, and acid phosphate, the only difference between treatments lying in the nitrate of soda application.

Collison (5), in 1920, reported what seemed to be an increase in yield on a stony sandy loam in western New York due to nitrogen applications and to a lesser extent to potassium and phosphate. Growth responses measured by trunk diameter were considered problematical, while the cost of fertilizers was found to be more than the value of any increase in yield. Reporting upon the same experiment in 1923, Collison and Harlan (6) concluded that tree growth, as measured by trunk diameter, showed a definite response to nitrogen, altho yield records indicated no clear gain.

The work of Roberts (7, 8, 9, 10, 11) and of Roberts and Potter (12) in Wisconsin has added materially to information concerning the growing habits of the cherry and its response to fertilizers and pruning. In 1917, Roberts (7) showed that with the Montmorency and Early Richmond cherries yields might be affected by killing of fruit buds, more killing being associated with small tree growth and less injury with greater tree growth, the explanation lying in the retarded maturity of fruit buds where greater growth occurs. In 1919, Roberts (8) offered the explanation that generally on short growths, less than 6 inches in length, no spurs are formed and winter injury occurs to the blossom buds, while on growths over 12 inches in length most buds develop into spurs whose fruit buds are also less easily injured by cold. In 1922, he (10) carried the explanation still further and reported that Richmond trees receiving no fertilizer had 64 per cent of the blossom buds killed by winter cold in contrast to pruned and

[2]Refers to Literature Cited, page 26.

nitrated trees where 19.5 per cent of the blossom buds were killed and to young trees where 10.0 per cent were killed.

Previous to this Roberts and Potter (12), in 1919, reported a definite response in yield of Early Richmond trees receiving nitrogenous fertilizer either alone or in combination with phosphoric acid and potash, but no gain for the last two by themselves. In addition, it was observed that trees receiving nitrogen carried a large proportion of their crop on two- and three-year-old spurs, while trees receiving no nitrogen produced their fruit largely from lateral buds on one-year-old wood precluding the possibility of spur formation.

In the same year Roberts (9) reported for both Early Richmond and Montmorency cherries an increase in the percentage of leaf buds on terminal growths coincident with an increase in their length. In the case of Montmorency, the increase ranged from 4.3 per cent with 4 inches of growth to 93.7 per cent with 18 inches, and in the case of Early Richmond from 2.3 per cent to 75.8 per cent for similiar lengths. It was also stated that pruning which reduced the number of terminals helped to keep up the length of the terminal growth and therefore to induce spur formation. Trees kept open and low responded in a similar way.

In the light of these findings the report of work by Roberts (11) in 1922 showed a decided gain from vigorous-growing trees, whether induced by pruning, nitrogen fertilizers, or a combination of both, and indicated that in Wisconsin cherry trees should be kept in a vigorous growing condition by means of cultivation, fertilizer application, and pruning in order to secure maximum yields.

Chandler (3), in 1925, tells of Montmorency cherry trees under a system of clean cultivation on a heavy clay soil in New York responding markedly in tree growth to nitrogen applications, altho apple trees under similar conditions failed to respond. On a light sandy soil at the Cornell Experiment Station cherry trees made striking increases in growth due to nitrogen applications when adjacent apple trees did not. He (4) has also indicated the higher proportion of long shoots on severely pruned young Early Richmond trees in contrast with the greater number of spurs and short growths on unpruned trees.

Bradbury (2) has suggested the importance of unfavorable nutritional conditions in bringing about arrested development and dropping of the immature sour cherry fruits. She has shown that 42 per cent of the blossom buds on spurs of two-year-old wood set fruit when they were thinned as early as practicable to one blossom to a bud, while only 24 per cent set fruit on unthinned branches.

GROWING AND FRUITING HABITS OF THE SOUR CHERRY

There are two kinds of buds on the cherry, namely, leaf buds, which carry no flower parts and which develop into wood growth, and blossom buds, which carry principally the flowers or fruit-producing parts, together with a few enclosing leaves (Plate I). Obviously the leaf buds are concerned with shoot and tree growth, while the function of the blossom buds is to produce fruit. Both kinds of buds may occur in any position on the treetop, side, inside, outside, and so on. They may also appear on any season's growth—such as one-year wood, two-year wood, three-year wood, and so on.

There are, moreover, two kinds of wood growth which develop from the leaf buds (Plate I). The one is characterized by a long vigorous growth, such as that of a sucker or a strong terminal shoot. The other is a short side growth, usually growing less than an inch in any one season and which is found on wood which is two years old or older. The vigorous-growing wood is commonly called a "shoot" in contrast to the slow-growing wood which is commonly called a "spur." Either type may or may not bear fruit.

Normally, the spur is a cluster of blossom buds which develop into flowers and fruit. On the other hand, the vigorous-growing shoot normally develops only leaf buds. Under certain conditions, however, the shoot growth of a tree may develop blossom buds instead of leaf buds, that is it may form blossom buds as side buds or lateral buds during the same season that it is making its growth. The next season these blossom buds may blossom and fruit, and when the fruit has been picked the growth is bare of both fruit and foliage. In fact the terminal or wood growth of a cherry tree may be so short that it approaches a spur in its general fruiting habits, but for the purpose of this discussion only the short growths occurring on wood two years old or older will be considered as spurs. The conditions that determine position of blossom bud formation are very important in cherry production. They will be discussed in detail with each of the varieties in turn.

TABLE 13.—EFFECT OF PRUNING AND FERTILIZING ON THE GROWTH OF ENGLISH MORELLO TREES.

(A record of growth adjacent to pruning cuts made in 1922.)

TYPE OF GROWTH	LENGTH OF NEW GROWTH IN INCHES			
	1923	1924	1925	1926
Average growth	7.5	8.5	9.4	4.6
Average number of spurs formed	9.1	5.4	9.0	—
Average number of laterals formed	1.0	1.5	0.4	—

In another test trees were severely thinned out, that is many of the characteristically long bare shoots of English Morello were removed. Altho no response in the growth of the trees was observed from this treatment as compared with trees not so pruned, the size and quality of the fruit were noticeably improved and the total yield was not reduced. Thinning out was done during the winter of 1925 and 1926 and 3 pounds of ammonium sulfate were applied to each tree the same spring, some trees receiving heavy thinning and some only light thinning but both being cut back and fertilized.

The fruit from severely thinned trees averaged 29/32 of an inch in diameter, with many fruits reaching 30/32 and 1 inch. The trees lightly thinned out averaged fruit 25/32 of an inch in diameter Counts of the number of cherries in a 4-quart basket showed 580 cherries to the basket from lightly thinned trees and 528 cherries to the basket from severely thinned trees.

The evidence is plain, therefore, that English Morello trees respond to cutting back and thinning out in conjunction with nitrogen application much as do Montmorency trees as shown in the preceding paragraphs.

EARLY RICHMOND

Early Richmond trees, because of their tall upright habit of growth, are particularly needful of a type of pruning that will bring their fruiting area closer to the ground. It is not unusual to find old trees of this variety 30 feet in height.

Trees between 25 and 30 feet in height receiving 3 pounds of ammonium sulfate per tree were severely pruned during the winter of 1924 to 1925 in an effort to lower their tops. Pruning consisted of cutting back to outside lateral growths as was done in the case of the Montmorency trees described in previous paragraphs, excepting the cutting was more severe. Branches 6 to 8 feet long and 2 to inches in diameter were frequently removed.

Unfortunately it was impossible to secure satisfactory data in regard to yield but measurements of growth, as given in Table 14, indicate that the response of Early Richmond has been similar to that of its close relative, Montmorency.

TABLE 14.—GROWTH RESPONSE OF EARLY RICHMOND TO PRUNING IN CONJUNCTION WITH FERTILIZER APPLICATION.

TYPE OF GROWTH	BEFORE TREATMENT, 1919–24	ADJACENT TO CUTS MADE IN PRUNING, 1924–25
Percentage forming spurs	0.0	86.4
Percentage forming laterals	0.0	73.2
Average number of spurs on shoots forming spurs	0.0	8.0
Average number of lateral shoots on shoots forming laterals	0.0	2.5
Average growth, inches	1.9	9.3

DISCUSSION AND CONCLUSION

The average moderately vigorous sour cherry orchard in the Hudson River Valley may be expected to respond to applications of nitrogenous fertilizers even when kept clean cultivated and sown to a cover crop. No evidence has yet appeared showing that any benefit may be expected from either phosphorous or potassium when used alone or in combination with nitrogen or with each other.

Because of the growing habit of the cherry, little or no increase in fruit yield may be expected the first year fertilizers are applied. Where nitrogen is a limiting factor the second season should see some gain and the third season a still larger one. Increased shoot growth, greater growth of the trees, larger leaf size, and delayed maturity of fruit are accompanying responses.

Early Richmond and Montmorency trees are similar in their growth and fruiting habits, tho the former is more erect and grows taller. Trees which have reached too great a height for economical harvesting may be lowered by severe pruning consisting in cutting to outside lateral branches. Pruning alone, however, is not in itself sufficient. Nitrogen applications have been necessary in order to restore severely pruned trees to improved vigor. The first season a decrease in yield may be expected, the second season the yield may be expected to have recovered largely, and the third year it may be expected to surpass that of the untreated trees.

English Morello trees behave in much the same way, tho the pruning which they receive should be directed at thinning out unproductive

wood and cutting back to outside lateral growths. In combination with nitrogen applications this procedure should renew the vigor of the trees and either maintain or increase production.

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