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Agricultural Experiment Station

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**SMALL FRUITS:—Strawberries, Raspberries, Blackberries.
GRAPES**

Bulletins of this Station will be sent, upon application, free of charge,
to any Farmer in the State.

KNOXVILLE, TENNESSEE, U. S. A.

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KNOXVILLE, TENN.

 The Experiment Station building, containing its offices, laboratories and museum, and the plant-house and horticultural department, are located on the University grounds, fifteen minutes walk from the Custom House in Knoxville. The Experiment farm, stables, milk laboratory, etc., are located one mile west of the University, on the Kingston pike. Farmers are cordially invited to visit the buildings and experimental grounds.

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DIVISION OF BOTANY AND HORTICULTURE.

SMALL FRUITS.

R. L. WATTS.

I. STRAWBERRIES.

Luscious strawberries! Whose appetite does not become keener with the mere mention of this delicious fruit? And what edible product of mother earth is sought with greater eagerness and consumed with more pleasure than the strawberry? The mild, rich, acid flavor renders it not only palatable but wholesome. It ripens at a time when no other fruit can be obtained to gratify our tastes. Hence, the strawberry is popular everywhere and with everybody.

From a commercial aspect the strawberry industry is of vast importance to our State. Each of the three great political divisions produces them for market as well as for home consumption in greater or less quantity. West Tennessee is noted for its extensive plantations. The fruit-growers of Gibson, Crockett, Madison and other counties are devoting immense areas to the culture of berries for northern markets. Thousands of crates are shipped annually in refrigerator cars to Chicago, Cincinnati, Columbus, Louisville, Pittsburgh, Buffalo, Indianapolis, Toronto and other remote cities. From one station, Gadsden, of Crockett county, over 20,000 crates were shipped in 1892. Greenfield shipments amounted to nearly 15,000; Dyer, 13,000; Humboldt, 13,000; Pomona, 10,500. Total shipments from the entire State amounted to 115,000 crates, or 2,760,000 quarts. After deducting the expense of picking, transportation and commissions, the net sum received amounted to about \$100,000. The magnitude of the business is thus shown. These figures do not include the sale of berries in our home markets. Were such additional data obtainable, the statement of the net product of the State would be greatly increased.

Many towns and villages of the State, however, are not supplied as they should be with strawberries. This promoter of good health should be liberally provided for every table during the bearing season.

The strawberry is almost as easily grown as corn, cotton or potatoes. Farmers as a rule do not realize this fact, or more of their gardens would contain at least a few plants. Lack of time is an excuse very frequently given for the absence of berries on the farmer's table. Such an excuse is scarcely acceptable, since the same cultivation and attention that is given the corn or cotton plantation would, on a small plat, produce an abundance of fruit for home use.

SOILS.—Most of the soils of Tennessee are peculiarly well adapted to the production of strawberries. They may be successfully grown in every county of the State. Any of our soils which yield good farm crops will, with the same care, give equally good results with strawberries. No soil is too rich, however, if large, fine specimens are desired. Superior fruit can be obtained only by supplying an abundance of the proper food elements. If any one of the necessary constituents is wanting or deficient, pleasing results can not be expected.

A friable, loamy soil is preferable for most varieties. Some sorts seem to thrive better in light clayey soils, while others should be set in those of a more sandy texture. Judgment must be exercised in selecting soils which are adapted to the varieties to be grown. Thorough drainage is absolutely necessary. Healthy and productive plants can not be grown in cold wet soils.

PREPARATION OF THE SOIL.—The field or patch designed for the strawberry plantation should be cultivated in some hoed crop for at least a year previous to the setting of the plants. This frees the land from weeds and noxious insects, and makes it loose and in a good mechanical condition for the reception of the young plants. Unless the soil is very rich, proper fertilizers should be added in sufficient quantities. Nothing can excel well rotted barn-yard manure, when a general fertilizer is wanted. If nitrogen is deficient, a light application of sodium-nitrate will prove beneficial. Ashes or potash salts are frequently necessary to supply this important and indispensable element. Coarse, undecayed manure from the barn-yard should not be used, for this is liable to produce an unhealthy succulent growth, and also forms a safe harbor for noxious insects that infest the strawberry. All manures of a coarse nature should be plowed under in the fall, if spring planting is to be resorted to. Plow deeply, and the next spring, with a good harrow, pulverize the soil and thoroughly mix any commercial fertilizer that may be applied.



CRESCENT.



BUBACK.

SETTING THE PLANTS—Most growers in our State prefer early spring setting. The plants may then be cultivated through the summer, and the second season they will be in fine bearing condition. Fall setting is objectionable in many localities because the frosts and excessive rains of winter are liable to destroy the plants.

The operation of inserting the plants in the soil must be done with care. If the roots are long and slender, it is desirable to shorten them at least one-third their length. The effect of this pruning is to cause a new set of fibres, or feeding rootlets, to be produced, and new roots are sent out from near the crown, thus enabling the plant to assimilate more food. After the hole is made, insert the plant, distribute the roots, cover them up to the crown, and thoroughly firm the soil. Puddling the roots at the time of planting is a common and desirable practice if the weather is dry, or if the plants have been shipped a long distance. Frequent cultivation, after the plants are established, is necessary to keep the weeds under control and the soil in a loose, friable condition. As is well known, an inch or less of loose surface soil is a valuable mulch during drouth.

TWO SYSTEMS OF CULTIVATION.—All strawberry producers are more or less familiar with two modes of cultivation, namely, the "hill system" and "matted row system." They are not all of one opinion as to which is the best method. Some recommend unhesitatingly the hill system, and claim that they invariably secure the best results with this method of culture. Others prefer matting the rows, and say berries should be grown exclusively according to this method. In hills, the plants are usually set three feet apart each way. When grown in mats, the plants are set in rows about three or four feet apart, allowing from twelve to eighteen inches between the plants in the rows. Each system possesses decided merits. If large, rank-growing varieties are to be used, the hill system is perhaps preferable. With the smaller growing sorts, matting will doubtless give the best results. The hill system is usually practiced when very large berries are desired. Both systems have been tried at the Station. We prefer mats with most varieties; when grown in this manner, special mulching is not necessary to keep the fruit clean. Renewals are frequently made in this state by directing the runners into the intervals between the rows, allowing them to strike root at midway, plowing under the old mats, thus leaving rows of well-established plants which have practically transplanted themselves. Fields or patches should be renewed every two or three years. If retained longer than this, the plants must be thinned out every season to obtain good results.

VARIETIES.—A question which often perplexes the inexperienced grower, is, What varieties shall I plant? If he consults the long list contained in the average catalogue, he receives but little aid, perhaps, for all the varieties described therein seem to possess merits of decided value. The glowing accounts of newly-introduced varieties are especially calculated to attract his attention. He is not aware of the fact that the exorbitant prices of the new and untried varieties are no indication, whatever, as to the worth of these kinds. Hence, many beginners are frequently disappointed and discouraged simply because of an injudicious selection of varieties.

The Station has undertaken to help solve the variety problem for the growers of Tennessee. It is an exceedingly difficult task, because of the great variation in soils. No State in the Union possesses a greater number of soils, each characterized by prominent and distinct traits. But by comparing our notes with those of reliable parties in different localities, we are enabled to give information which we trust will be of value to all interested in this industry.

Our experimental plantation was made at the farm, March 12, 1892. The soil is a heavy clay loam overlying a magnesian limestone formation, and with a southwest exposure. The soil is somewhat too stiff for the strawberry, but with liberal manuring and thorough cultivation, the plants have made a strong growth, and the yield the past season was quite satisfactory with most varieties. Twenty-four plants were set of each variety, the rows three feet apart, and plants eighteen inches apart in the row. During the summer of 1892, all runners were removed as fast as they appeared, so that vigorous plants were produced. Accurate notes on 31 varieties are given in the accompanying table.

SEXUALITY.—Under the column headed sex, are the two letters B and P. B is placed after the names of such varieties as Bidwell, Charles Downing, Glendale, Jucunda, Sharpless, &c. If we examine a flower from any of these sorts, we find that it is composed of four sets of organs. In the centre is a cluster of light green bodies which are called pistils, and they develop into the fruit of the plant. Surrounding it are yellow organs, anthers, each borne on a tiny stem. The pollen which is necessary for the fertilization of the pistils is contained in the anthers. Just without this set are five white petals, and beneath and back of them is a corresponding number of green scales called sepals. Flowers of this structure are said to be perfect or bi-sexual, as indicated by B. But the blossoms of the strawberry, like those of the rose and many other cultivated plants, are subject to constant changes.



WINDSOR CHIEF.

Sometimes a certain part is enlarged, and in other cases they may be suppressed. These changes are due to climatic conditions, stimulation, cultivation, exposure, protection, starvation, &c. Now if we examine a flower from the Crescent, Bubach, Windsor, &c., we find that the anthers or stamens are wanting. Hence, such varieties are termed imperfect or pistillate, as indicated by P. This fact is of great significance to the strawberry culturist, for if varieties producing these imperfect flowers are planted alone, no fruit will be produced because there is no pollen present to fertilize the pistils. Many of the pistillate varieties, however, are the best yielders, provided other perfect sorts are in close proximity to supply the indispensable pollen. This fact must be kept in mind when making the strawberry plantation. If imperfect flowering kinds are planted, every third or fourth row should be set with bi-sexual varieties. The pollen is conveyed by the wind, insects or other agencies. It is essential that the blossoms of each expand at the same time.

TABLE I.—STRAWBERRIES.

ABBREVIATIONS: B, Bisexual; P, Pistillate; S, Small; M, Medium; L, Large.

VARIETY	Sex	First Picking	Last Picking	Vigor Plant Scale 0-10	Production Scale 0-10	Size	Quality Scale 0-1
Bidwell.....	B	May 1	May 20	8	4	M	8
Bubach.....	P	" 4	" 25	7	8	L	8
Crawford.....	B	" 6	" 17	3	1	S	8
Crescent.....	P	April 29	" 20	8	10	M	7
Cornelia.....	P	May 10	" 20	4	1	S	7
C. Downing.....	B	" 3	" 20	9	6	M	6
Cumberland.....	B	" 6	" 20	8	3	S	7
Early Canada.....	P	April 29	" 17	5	3	S	6
Glendale.....	B	May 13	" 27	8	3	M	7
Haverland.....	P	" 2	" 27	9	9	L	8
Gandy.....	B	" 13	" 27	5	2	M	9
Golden Defiance.....	P	" 5	" 20	7	6	M	8
Greenville.....	P	" 3	" 25	9	5	M	8
Jessie.....	B	" 3	" 17	10	6	L	8
Jucunda.....	B	" 10	" 17	2	1	M	7
Jersey Queen.....	B	" 6	" 20	4	3	M	8
Kentucky.....	B	" 5	" 27	8	4	S	7
Mt. Vernon.....	B	" 6	" 27	9	6	M	7
Monarch.....	B	" 10	" 20	9	2	S	8
Miner's Prolific.....	B	" 2	" 17	9	5	S	8
Monmouth.....	B	" 2	" 17	8	4	S	7
Iron Clad.....	B	" 3	" 17	9	5	S	7
Parry.....	P	" 10	" 20	7	1	S	8
Prince.....	B	" 6	" 20	6	3	S	8
Sharpless.....	B	" 6	" 20	8	5	M	8
Summit.....	B	" 10	" 20	5	1	S	6
Sweetzer's Early.....	B	" 29	" 17	9	6	M	8
Tennyson.....	—	" 13	" 17	9	6	M	8
Windsor Chief.....	P	" 3	" 27	7	9	M	8
Wilson.....	B	" 6	" 17	3	2	S	8
West Lawn.....	P	" 5	" 20	8	4	M	7

In the foregoing table the dates of first and last pickings should be carefully noted. Very early strawberries, or those which ripen fruit late in the season, are the most remunerative, as early and late berries always command the highest prices. A few ripe specimens were picked from two sorts, Crescent and Early Canada, on April 29. Quite a number of varieties ripened fruit by the third of May. On this date more than double the amount of fruit was picked from the Crescent than from any other variety. Haverland, Windsor Chief and Miner's Prolific also gave excellent results as early varieties.

The latest producers were Glendale, Gandy, Kentucky and Mount Vernon. Fruit was picked from these as late as May 27. Haverland and Windsor Chief also continued to bear as late as this date. It will be noticed that the yield was small of all varieties which began to bear late in the season. This fact was largely due to an insufficient quantity of rain.

It is interesting to notice the duration of the fruiting period with different varieties. Some sorts produced ripe berries for nearly a month. These in most instances were the best yielders. Others fruited for a very brief period, and their product was small in every case.

The vigor of the plants should be carefully studied. A scale of 0-10 is used to show the vigor or luxuriance of growth. It will be observed that the strongest plants gave, in most instances, the largest yields. They also produced runners and new plants more freely than the weak growing sorts.

The following varieties, in order of their naming, gave the largest yields: Windsor Chief, Haverland, Bubach and Golden Defiance. Each of the three first mentioned produced one third more fruit than any other kinds. Taking all points into consideration, Crescent, Windsor Chief, Haverland, Bubach and Jessie gave the best satisfaction out of the 31 tested. The accompanying illustrations were taken from berries picked in the Station garden.

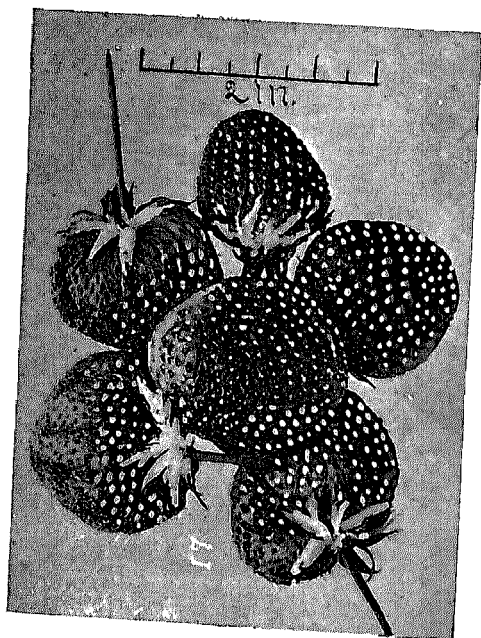
VARIETY DESCRIPTIONS.

Bidwell.—This variety ripened fruit May 1, and continued in bearing for three weeks; berries large, dark crimson in color, and of good quality; plants moderately vigorous; not very prolific.

Bubach.—One of the best varieties tested; berries large, showy and of good quality; it lacks somewhat in firmness for a shipping berry; the Bubach seems to be universally successful; it is grown in many sections of our State, and generally reported as doing well.



HAVERLAND.



JESSIE.

Crawford.—Plants small, and fruit inferior; we cannot recommend this variety.

Crescent.—An old, well-known reliable sort; it excelled all others in production; berries medium in size; the firmness of its fruit renders it a desirable berry for transportation; it is extensively grown in Tennessee for shipping; being a pistillate variety, it is necessary that a perfect sort be planted near to supply the pollen.

Cornelia.—Both plants and berries small; it made a poor showing, and is of little value.

Charles Downing.—Quite productive; fruit is well known to most growers; plants healthy and vigorous; it is grown in different sections of this State.

Cumberland.—Not very prolific; fruit small and fair in quality.

Early Canada.—Although this is a very early variety, it yields too sparingly to make it desirable either for market or home consumption.

Glendale.—A very late variety; we did not pick ripe specimens from the Glendale until May 13; it continued in bearing for two weeks; fruit medium in size, of fair quality; plants moderately productive.

Gandy.—An excellent late variety in some localities; did not produce well on our grounds; berries rather small but good in quality; plants lack vigor.

Golden Defiance.—A desirable pistillate variety; fruited well; berries medium sized and highly flavored; plants strong and vigorous.

Greenville.—Recently introduced; it is reported as a good yielder and a desirable berry in most States where it has been tried; our plants were of good size, but their yield was not satisfactory.

Haverland.—One of our five best varieties; plants large, healthy and vigorous; fruit large, ripens well and of excellent flavor; this is a very prolific variety and deserves attention as a market berry.

Iron Clad.—Plants large, very vigorous; berries small, and yielded fairly well.

Jessie.—Produced large, handsome, dark crimson berries; other varieties were more prolific, but the Jessie gave much the largest specimens; plants in a good healthy condition; a desirable sort for the home lot.

Jucunda.—Gave very poor results on our soil.

Jersey Queen.—The fruit of this variety was excellently flavored; berries medium sized, but yielded too sparingly to be worthy of general cultivation.

Kentucky.—Yield limited, fruit small and not attractive.

Mount Vernon.—A variety of considerable merit; plants large, health and prolific; berries medium in size and finely flavored.

Monarch.—One of the last to ripen fruit and continued in bearing for ten days; production small.

Miner's Prolific.—This sort ripened berries May 2, and continued fruiting until the 17; plants vigorous; berries small.

Parry.—One of the most unsatisfactory varieties tested.

Prince.—Possesses few desirable qualities; plants and berries small and yield limited.

Sharpless.—An old reliable sort, extensively grown in Tennessee; it is fairly productive, but quite a number of berries excelled it in this respect; berries not as large as we would expect from the Sharpless.

Summit.—Not worthy of recommendation; fruits small and plants not prolific.

Sweetzer's Early.—Sent to the Station for trial. It was one of the first to ripen; production above the average; berries medium in size and well flavored; plants vigorous.

Tennyson.—Another new variety that did well; berries medium sized, attractive; plants vigorous.

Windsor Chief.—Among the best that we tested; very productive; berries not large, but richly flavored; a desirable sort.

Wilson.—This old variety gave results that were entirely unsatisfactory.

West Lawn.—A new variety sent for trial; it has given fair results; plants large and healthy, but bore sparingly; fruit well flavored.

SELECTION OF VARIETIES.—No rules can be fixed by which growers in different parts of the State may be governed in the selection of varieties best adapted to their special localities. The results of our experiments are largely of local value, and strawberry culturists whose soils are of a different nature than that on which the Station work was performed, should not place too much dependence upon our notes. Varieties which gave us the best satisfaction are more likely, however, to give you better results than those which we report as inferior. Some varieties seem to have gained a national reputation, and do well under the greatest variety of circumstances and conditions. Only these sorts should be given attention by inexperienced persons who desire to make extensive plantations. Each of the five varieties which we report as deserving the highest praise out of the 31 tested, are considered as valu-

able berries in many parts of the United States. It would be much safer to plant these, or other well tried varieties, than those of more recent introduction, or older varieties that possess merely local reputations. We would urge growers to plant, if possible, an experimental plat containing a few plants of each of the more promising varieties. They may be secured for a few dollars, and the actual results obtained will be of great value.

REPORTS FROM GROWERS.—The Experiment Station has been in correspondence with over a hundred strawberry growers in Tennessee, in regard to the best varieties for the various localities. Replies were not received from all of whom we made inquiries, hence a number of counties are not reported. The following varieties are reported as excellent berries for the counties under which they are named:

Bedford: Glendale, Crescent, Sharpless. *Carter*: Jumbo, May King, Henderson. *Claiborne*: Crescent, Bubach, Wilson, Banquet. *Decatur*: Crescent, Sharpless, Jessie. *Giles*: Sharpless, Charles Downing. *Grainger*: Monmouth. *Hamblen*: Sharpless, Greener's Prolific. *Hamilton*: Big Bob's. *Henry*: Longfellow. *Humphreys*: Monarch, Pearl. *Jefferson*: Howard. *Lauderdale*: Crescent, Wilson. *Loudon*: Wilson, Monarch, Sharpless. *Madison*: Sharpless, Wilson, Vick, Cumberland, Monmouth. *Marion*: Cumberland, Clowd, Wilson. *McNairy*: Crescent. *Montgomery*: Sharpless, Charles Downing. *Polk*: Wilson, Shuster's Gem, Iowa, Monarch. *Rhea*: Crescent, Philadelphia, Sharpless. *Smith*: Sharpless, Wilson, Crescent. *Sumner*: Bubach, Gandy, Jessie, Charles Downing, Crescent, Kentucky. *Gibson*: Crescent, Crystal City, Mitchell's Early. *White*: Charles Downing, Gandy, Lovett's Early, Shuster's Gem. *Crockett*: Crystal City, Crescent, Mitchell's Early, Columbian. *Van Buren*: Sharpless.

Notes from J. N. Koffman, Fruitland, Gibson County:

"This year the frost and cold wave struck our plants in full bloom, and where they were not sheltered by woods on the north and west, the crop was reduced more than one-half, and three-fourths in some cases. But the prices remained firm and reasonable during the entire season. Our best berries netted \$100.00 per acre. Medium ones, \$25.00 to \$50.00 per acre, net profits. I have not secured the entire statistics for this year, but am sure that the gross receipts for Gibson County during the past season were more than \$130,000.

"We plant by breaking the soil deep early in the spring, as soon as the freezing is over. Then list or bed four feet apart, open with a corn planter and set plants three feet apart. We usually plant eight rows of Crescent and then two rows of Crystal City or Mitchell's Early. Plants produce best on fresh mellow loam. We give them clean cultivation as with cotton until the first of August, cutting

away most of the runners so that strong well-rooted plants are produced. If the grass appears in the fall, we rake them clean at early blooming in the spring with a horse rake. Our shipping time is from the first to the middle of May; this year we had several crates in April. We use 24-quart cases, and pay two cents per quart for picking. They are sent in refrigerator cars or by express to various northern markets."

TREATMENT OF PLANTATION AFTER FRUITING.—Immediately after the plants have fruited, the garden or field should be cultivated and cleared of all weeds. If the weeds are not destroyed at once, they are liable to take possession of the plantation and render it a difficult and unpleasant task to remove them later in the season. Clean cultivation is the key-note of success in the strawberry business. Neglect of this always results in failure. Not infrequently a small patch is established with a view to supplying the home table, but for lack of attention weeds soon infest the soil and grow so rapidly and luxuriantly that the strawberry plants are greatly reduced in vigor, and not one-tenth of a crop is harvested the next season. Failure is then pronounced, and perhaps the strawberry patch, with its host of conquering weeds, is plowed under.

Mulching in the fall of the year is a practice frequently resorted to. This is done with three objects in view, namely, fertilization, for winter protection, and to keep the berries clean during the fruiting season. A good plan is to add old well-rotted barn-yard manure, over which place long straw or any coarse material, which will serve for protection in cold weather and mulch under the berries while the plants are fruiting.

"LEAF BLIGHT," (*Sphærëlla fragariæ*, *Sacc.*)—This is a familiar fungous disease of the strawberry, which, where prevalent, is more or less destructive to all varieties. It is known by the appearance of reddish areas on the upper surface of the leaves. Later in the season the centre changes to gray or whitish in color, with a reddish border. The effect of this disease is to destroy the leaf tissue, and if vigorous attacks are made the plants may be seriously injured, or perhaps killed. It is more destructive to old plantations than new ones, hence the importance of frequent renewals. Copper compounds, as Bordeaux mixture or ammoniacal solution of copper carbonate, have been used with considerable success as remedies. In some sections, the plants are mowed after they have fruited, allowed to remain on the ground until dry, and then burned, thus destroying the spores of the fungus.

II. RASPBERRIES.

Twenty-three varieties of raspberries were planted in the small fruit garden on March 12, 1892. Twenty varieties are noted in the following table. The other three sorts were winter-killed, or so seriously injured that we do not record them in the table.

TABLE II.—RASPBERRIES.

ABBREVIATIONS: M, Medium; L, Large; S, Small.

VARIETY	Vigor Plant Scale 1-10	First Picking	Last Picking	Produc- tion Scale 1-10	Quality Scale 1-10	Size
<i>Red Fruiting Varieties.</i>						
<i>Rubus strigosus.</i>						
Turner.....	8	May 21	July 3	10	9.5	M
Marlboro	8	" 25	June 24	3	6	L
Cuthbert.....	9.5	" 27	" 28	4	8	L
Crimson Beauty.....	7.5	" 27	" 28	4	8	M
Shaffer's Colossal	6	June 3	July 3	2	7	L
Brandywine	9	May 30	June 24	4	6	M
Clarke	5	June 7	" 10	1	5	M
Reliance	6	May 27	" 28	6	7	L
<i>Yellow Fruiting Varieties.</i>						
<i>Rubus neglectus.</i>						
Randocas	5	May 30	June 28	3	9	M
Golden Queen.....	10	" 30	" 28	8	7.5	L
Caroline	5	" 30	" 15	4	6	M
<i>Black Fruiting Varieties.</i>						
<i>Rubus occidentalis.</i>						
Doolittle's Improved.....	7	May 27	June 15	8	7	M
Palmer's Seedling.....	8	" 27	" 15	10	7	M
Ohio	5.5	June 3	" 15	2	6	S
Gregg	6	" 3	" 28	2	7	M
Soughegan.....	7	May 27	" 15	6	7	M
Hilton	5	" 30	" 24	2	7	M
Johnson's Sweet.....	6	" 30	" 20	2	8	M
Sweet Home.....	4	June 3	" 15	1	6	S
Bracket.....	8	" 15	" 20	2	7	M

RED FRUITING VARIETIES, (*Rubus strigosus*.) *Turner*.—This variety was the first to produce ripe berries, and continued in bearing longer than any other sort. The first berries were picked May 21, and the last ones July 3, making the entire length of season 42 days. Such an extended period of ripening renders it especially desirable for the home lot. The Turner is an old, well known and popular variety. It is reported as an excellent berry for many sections of Tennessee. Our plants are healthy and vigorous; fruit medium in size, and finely flavored; it deserves extensive cultivation.

Marlboro.—In earliness, the Marlboro ranks next to the Turner, ripening May 25. Berries are large and attractive; the yield on our soil was not very satisfactory; flavor inferior; it must have high cultivation to secure the best results.

Cuthbert.—Familiar to all raspberry growers; plants more robust than the Turner, but did not produce half as much fruit; berries large and of good flavor; it is a general favorite.

Crimson Beauty.—Yielded slightly better than the Cuthbert; plants produced medium sized berries of good quality.

Shaffer's Colossal.—This variety is highly praised by many of our commercial growers; the large firm berries are well adapted to marketing, and their attractive appearance makes them popular with the consumer. We have seen exceptionally large, fine plants in this locality, but the Station plants failed to make a strong growth, hence the yield was small.

Brandywine.—One of the largest red varieties; plants vigorous; production equal to Cuthbert and Crimson Beauty; berries medium in size and fair in quality.

Clarke.—This variety gave the most unsatisfactory results of any of the red sorts; production small, berries inferior.

Reliance.—Ranked next to the Turner in yield; plants moderately vigorous; berries large, and excellently flavored; fine in appearance; a good market variety.

Franconia, Hudson River Antwerp and Fastolf were winter-killed during the severe weather of January.

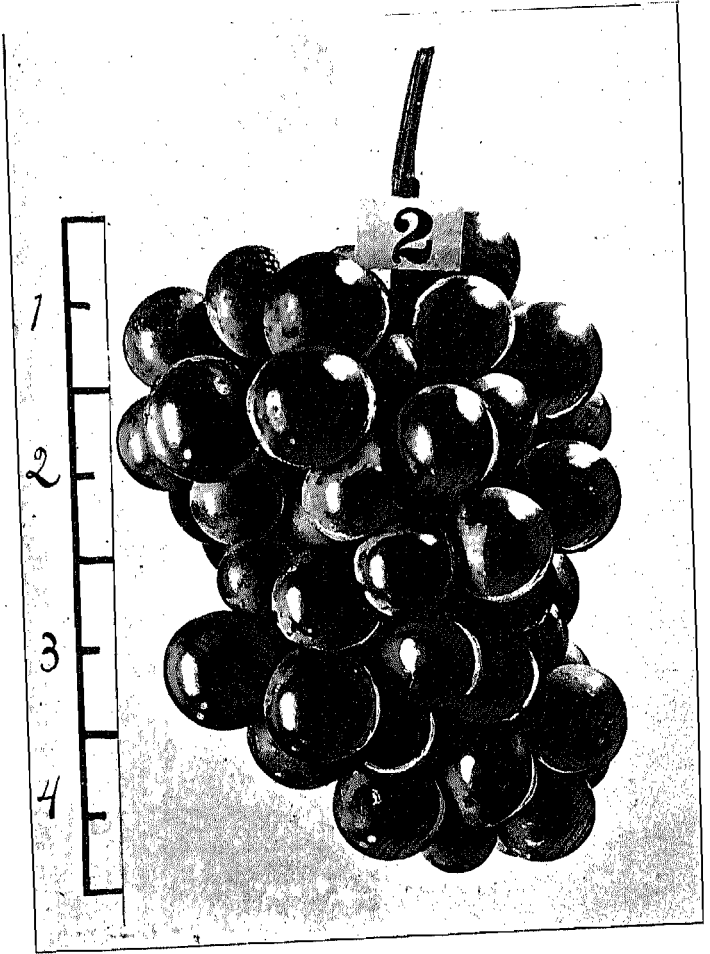
Of the red fruiting varieties, the Turner, Reliance, Crimson Beauty, Brandywine and Cuthbert gave the most pleasing results.

YELLOW FRUITING VARIETIES, (*Rubus neglectus*.) *Rancocas.*—Plants quite robust, and yielded fruit above the average in flavor; not very productive, but its superior flavor makes it desirable for home planting.

Golden Queen.—A most excellent early berry. Out of the 23 varieties tested, it stood third in production; it is generally considered the most desirable of this class; fruit large and firm; plants in good condition.

Caroline.—It slightly excelled the Rancocas in production; flavor inferior to that of both the previously named varieties; berries smaller than those of the Golden Queen.

BLACK FRUITING VARIETIES, (*Rubus occidentalis*.) *Doolittle's Improved.*—Considered one of the most satisfactory black caps; it stood second in production; fruit superior in flavor; valuable for market or the home plat.



AGAWAM.

Palmer's Seedling.—The most promising of this class; only one variety of the red fruiting berries excelled it in production, namely, the Turner; the large plants produced fruit medium in size and of good flavor.

Ohio.—Not desirable on our soil; fruit small and inferior.

Gregg.—A universally popular variety; it gave poor results, however, in our trial.

Souhegan.—Of the black caps it ranked third in production; berries equal to Palmer's Seedling in every respect.

Hilton.—Yielded too sparingly to make desirable for the commercial grower; plants are not as strong as they should be.

Johnson's Sweet.—This variety, like the previous one, is not very prolific; fruit excellently flavored.

Sweet Home.—Not at all satisfactory for our soil; fruit very small and plants yielded sparingly.

Bracket.—A new variety sent for trial; berries medium in size, attractive, and well flavored; yield limited.

Palmer's Seedling and Doolittle's Improved seem to be the most worthy of general cultivation.

III. BLACKBERRIES.

The blackberry is not extensively cultivated in the State either for market or home consumption. If planted in suitable locations, it grows well and is very prolific.

Thirteen varieties are on trial at the Experiment Station. Of these only six fruited the past season. Taylor made the best showing; berries of good size and their quality superior. Ancient Briton and Agawam produced almost as satisfactorily. New Rochelle, Snyder and Wachussetts gave small yields. Dorchester, Early Cluster, Early Harvest, Erie, Kittatinny, Wilson's Early and Wilson's Junior did not fruit.

IV. GRAPES.

In Bulletin No. I., Vol. 3, published in January, 1892, reference was made to the establishment of our Station vineyard, the planting of which was done in March 1891, and October and November of the same year. The March setting contained 126 vines, and over 200 were planted the following fall. The vineyard has a southeast exposure, with a loamy clay soil.

The vines have been trained according to the double arm system. A strong trellis has been erected for their support, and careful attention given in the way of pruning, manuring and cultivation. Insect enemies have been rare. The black aphid, or plant louse, attacked the tips of the vines early in the season; these were quickly

removed and destroyed. Kerosene emulsion is the most effective remedy for these foes when they appear in numbers. Systematic sprayings have been made to prevent the depredations of fungous diseases. The vines were first treated with Bordeaux mixture early in the spring, before the buds had opened. This same solution was applied at intervals of ten days until the 25th of June, when ammoniacal solution of copper carbonate was used. With the use of these fungicides, the black rot, mildew or other diseases have not appeared.

VARIETIES OF GRAPES.—Of the first planting, 13 varieties produced fruit the past season. The following brief notes on varieties which fruited may be of some value to our grape culturists:

Agawam. (See figure.)—Vines very vigorous, healthy; bunches medium sized; berries red in color, large, roundish; flesh tender, juicy, sweet; one of the best varieties that we tried.

Delaware.—This well-known variety did not produce very abundantly; bunches small and not compact; it is highly recommended by some growers in the State; flesh very fine in flavor.

Concord.—This variety, which is so well known by every gardener and farmer, produced a fair crop of good grapes.

Worden.—A seedling of the Concord, but much superior to it in every respect. The most productive variety of the 13 sorts that fruited; bunches very large and compact; berries large and excellently flavored; deserves extensive cultivation.

Herbemont.—A variety which does well only in the South; bunches large, shouldered and exceedingly compact; berries small, dark blue-black in color; flesh sweet and vinous; promises to be valuable.

Black Hamburg.—A few small bunches were obtained from this foreign variety.

Diamond.—An excellent white grape; vines strong and healthy; yielded a good crop of medium sized, compact bunches; berries large, flesh tender and sweet.

Uller's Mammoth.—This variety yielded only a few very large berries of rather inferior flavor.

Niagara.—A popular, well-known white grape; bunches medium sized and compact; flavor excellent; yield was smaller than that of the Diamond.

Wyoming.—A small red grape of inferior flavor; not very prolific.

Missouri Reissling.—Moderately prolific; berries large, and of superior flavor.

Jäger.—Produced medium sized purple grapes; the best flavored grape that fruited; only a few bunches were procured.

Jacquez.—A small purple grape of the *Æstivalis* class; exceedingly juicy; productive.