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PRODUCTION OF IMPROVED HARDY STRAWBERRIES FOR ALASKA

BY

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[Under the supervision of the Office of Experiment Stations, United States Department of Agriculture.]

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By C. C. GEORGESON, *Agronomist in Charge.*

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INTRODUCTION.

Alaska is a vast country of very diverse physiographic configuration, lying between latitudes 54° 40′ and 71° 20′ N. and longitudes 130° W. and 172° E., and covering an area of 580,000 square miles. It has two climatic belts, that skirting the Pacific Ocean along the coast region, and that of the interior. The climatic differences in these two belts are due to the grouping of mountain ranges. In the coast region the winters are comparatively mild, the summers are cool, the temperature ranging between 50° and 70° F., and in some places rising to 80° F., and the precipitation, averaging from 40 to 160 inches a year in different places, is conducive to a luxuriant vegetation. Southeastern Alaska, which is an extension of the coast range, is a rough, mountainous section valued for its minerals and its timber. There are only few areas of real farming land in this section, but there are, nevertheless, small tracts of land in valleys, bays, coves, and inlets which are suitable for farming on a small scale and especially for gardening. In the interior, a vast area lying north of the Coast Range Mountains, the winters are severe, the temperature occasionally falling to 65° below zero, the summers are short and uncomfortably warm, the temperature at Rampart frequently reaching 96° F., and the rainfall (including melted snow) is light, averaging between 9 inches in the Copper River Valley and 14 inches in the Tanana Valley in normal years. The growth of vegetation in the interior is not so luxuriant, but more nearly approaches that of the normal in the States. In the interior are many valleys which again differ from each other in climatic conditions.

Such are the conditions that confront farmers and gardeners in Alaska. The common tree fruits, such as the apple, pear, plum, and cherry, have not as yet given much promise of success. Doubtless in time there will be developed by hybridization varieties which will be adapted to these climatic peculiarities. In favorable years some apples and cherries reach maturity, but ordinarily the summers in the coast region are not warm enough to mature these fruits. In the interior the summers are not long enough to mature fruits, and the

trees freeze down to the snow line in winter. Although Alaska is not as yet adapted to fruit growing in a general way, it is adapted to small fruit growing—that is, to bush fruits. Red currants and raspberries are indigenous in Alaska and grow wild in abundance up to and beyond the Arctic Circle.

HISTORY OF STRAWBERRY GROWING IN ALASKA.

Strawberry growing in Alaska is of recent origin. Very few of the settlers attempted to grow strawberries before the establishment of the Alaska Agricultural Experiment Stations in 1898. About 1902 a resident of Skagway grew some plants in a sheltered corner of his garden. Settlers at Haines then began raising strawberries on a small scale, and, as the experiment became a success, gradually increased their plantings. It was reported that some plants had been introduced from Puget Sound into Prince of Wales Island, where the winters are the mildest in Alaska, but what varieties were represented in any of these early plantings are not known. In 1910 the Sitka station began distributing hybrid strawberry plants to the homesteaders. These plants were widely scattered and rapidly propagated, and their descendants are to-day found growing in nearly every garden. Some of the first hybrid plants which were produced at the Sitka station were transplanted to the Rampart station in 1911, where they survived the winter without other protection than that afforded by the snow. The successful production of strawberries in the interior was a revelation to settlers in that section, and plants were distributed to all who wanted them. In 1912 strawberry plants were transplanted from the Rampart station to the Fairbanks station, which then became another distributing center.

About this time a market gardener living in Fairbanks purchased in Seattle 10,000 strawberry plants which he brought into Fairbanks at great expense. Many of the plants died en route, notwithstanding the fact they were bundled in furs and other protecting material. The several thousand which did survive, however, produced during the first summer several hundred pints of berries which sold at $2 per pint. In the fall these plants were placed in a pit and covered with earth and litter as a winter protection, but the following spring only a few of them were alive. The gardener then attempted to cross his Puget Sound plants with pollen from the native wild species (*Fragaria platypetala*) and succeeded in raising some plants which proved to be hardy. He did not, however, have hybrids enough to make selections from, and the best of his selections produced only small to medium berries of no great merit. In the meantime he obtained some plants from the Fairbanks station which he raised successfully. During the next few years the placer mines were exhausted and the population of Fairbanks shifted and dwindled. With the decline of his market the gardener left the town and his garden grew to weeds and grass. Four years later (1922) the writer and others found large, delicious strawberries growing in the grass and weeds where the strawberry bed had been. The plants had survived without the slightest care.

COMMERCIAL STRAWBERRY GROWING.

Strawberry growing for market on a fairly large scale is as yet (1923) confined to residents of the town of Haines and to homesteaders in

that vicinity. Nearly every farmer has 1 or more acres in strawberries. The crop is shipped to all near-by markets affording transportation facilities, and more especially to Canadian territory, White Horse, Dawson, and to points on the Yukon. Haines has a favorable climate, light rainfall, and much sunshine, and usually winters that are not too severe for the crop. The Haines strawberry growers have won a deservedly enviable reputation for their fruit, which nets them 35 cents per box. A homesteader near Juneau grows strawberries on a fairly large scale and others are following his example. There are beds in many of the town gardens. These are sources of supply which meet a large share of the local demand.

At Anchorage there is a growing interest in strawberry culture. Many of the residents raise their own berries and sell the surplus at 60 cents a box. Larger areas are being devoted to the growing of strawberries by near-by homesteaders.

The Sitka hybrids have been established at the Matanuska station and plants have been so freely distributed to settlers that Matanuska strawberries were shipped regularly to the Fairbanks market at 75 cents a box for the first time in the summer of 1922. One homesteader living 2 miles from the station sold several hundred dollars' worth in that market. The Sitka hybrids are not particular as to soil, apparently thriving in any type of soil. At Sitka they were raised in peaty soil, at Haines, in a mixture of clay and sand, at Skagway, in sandy soil, and at Matanuska and Fairbanks, in silt loams.

THE NATIVE ALASKA STRAWBERRY.

Two species of strawberries are indigenous to Alaska, one (*Fragaria chiloensis*) a large, vigorous plant, in the coast region (Pl. I, fig. 1), and the other (*F. platypetala*) a small, smooth plant, in the interior (Pl. I, fig. 2). They differ materially from each other in habitat, manner of growth, and intrinsic value.

THE WILD STRAWBERRY OF THE COAST REGION.

The species *Fragaria chiloensis* is found growing in abundance along the beaches in certain sections of the coast region, more especially from Icy Strait to Prince William Sound. It is very rarely, if ever, found far from the water. This species is adapted to a wet climate and to a temperature that seldom exceeds 20° or 25° F. below zero. It is at home on almost pure sand and gravel along the old beach line just above the high-water mark and disputes possession of the ground with the grasses and other plants peculiar to the region. Being a low, spreading species with leaves that are flattened against the surface of the ground, the plant is nearly always partly hidden by the associated vegetation. It sends out numerous runners which establish themselves and crowd out other less persistent growth. The blossoms are large and white and bear an abundance of stamens. The flowers when borne aloft on upright peduncles seldom produce fruit. Fertile flowers are for the most part carried on slender peduncles which bend to the ground where the berries develop and ripen. The fruiting peduncles are usually buried by grass and leaves and are not readily found, even when abundant, until one has burrowed through the grass around the base of the plants.

Owing perhaps to the shade in which they grow the berries remain white until they ripen when they turn light red. In general shape they are spherical to conical with slight variations therefrom, and are small, only an occasional one being as large as an inch in diameter (Pl. II, fig. 1). They are of a firm consistency so that they can be handled and shipped to considerable distances without injury, are sweet and delicious, and have a delicate aroma that is seldom equaled by other species. A few berries will fill a room with their aroma. The seeds are large and prominent, and brown or black in color when ripe. The leaves are large, woolly, rather coarse, and have well-marked ribs. A peculiarity of this species is the production of many leaves having four and sometimes five leaflets, a characteristic that is often shown in many of its hybrids.

Efforts to cultivate F. chiloensis at Sitka.—In an effort to cultivate this species at Sitka, the experiment station in 1901 introduced from Yakutat Beach 150 plants which were given the name "Yakutat." These were set in good soil and given the usual culture in the hope that they would produce berries that would be an improvement over those grown in the wild state. The results were disappointing. The plants made luxuriant growth, sending out innumerable runners which took root freely and producing large leaves that were borne on long petioles. By the end of the summer the ground was covered with a thick matted growth which produced very few blossoms and no berries.

Some of these plants were then transferred to a sterile volcanic soil which produces almost nothing unless it is fertilized. In this soil they became dwarfed, sent out the usual number of runners, and bloomed and bore fruit as they do on their native sandy beaches. The fruit was small, averaging perhaps half an inch in diameter; some were three-fourths to 1 inch in diameter, but all were of good quality. Being too small for commercial purposes, these berries were not deemed worthy of further cultivation. When this experiment was begun the writer knew of no successful attempts having been made to domesticate this species, but attention has recently been called to its successful cultivation in South America and elsewhere. It seems to be well adapted to sandy flats along the beach beyond the reach of high tide.

THE WILD STRAWBERRY OF THE INTERIOR.

The strawberry of interior Alaska (*Fragaria platypetala*) differs greatly from that of the coast region. It is not abundantly present, but is found here and there in small patches in the valleys. It grows in good soil, preferring that of a clayey nature. This species is a slender, but exceedingly hardy plant, thriving in places where the temperature occasionally falls to 65° and 70° F. below zero. When transplanted to good garden soil, the plants, like the coast species, attain great size, send out numerous runners, but bear few blossoms and scarcely any fruit.

Fragaria platypetala is hardier than the coast species and produces light red berries of globular shape. They are small, being scarcely larger than good-sized currants, lack flavor, have no aroma, and are not considered to have any economic value. The leaves of *F. platypetala* are small, narrow, and sharply serrated, and the

small, white blossoms are perfect. They are borne on slender peduncles which do not bend to the ground as do the fruiting peduncles of the coast species. Probably the only characteristic of merit of this plant lies in its hardiness.

Efforts to cultivate F. platypetala at Rampart and at Sitka.—In 1905 a number of plants of *F. platypetala* were obtained from the neighborhood of Fairbanks and brought by the writer to the stations at Rampart and Sitka where they were set in good soil and given the best of care. At Rampart the plants immediately established themselves and in the course of a year developed into a vigorous growth. At Sitka, on the other hand, they were maintained with the greatest difficulty, and in 1908, three years after their introduction, only three were alive and they were doing poorly. Their failure must be ascribed to the excessively wet climate to which they were not accustomed. Given careful nursing, these plants gradually responded and sent out runners, but continued a precarious existence on a hillside in unfertilized soil.

THE INTRODUCED CULTIVATED STRAWBERRY.

The introduced cultivated strawberry from the States can be grown with moderate success in some parts of Alaska, but all varieties do not do equally well, and there are probably only a few that will not fail. It is known that hardy sorts can be successfully grown in some parts of the coast region, and it is thought that some varieties can be raised wherever the snowfall amounts to 2½ feet or more as a covering for the whole winter. The region of most successful culture is southeastern Alaska, and especially at Haines, where it is generally conceded that they do well. The rainfall is not heavy at Haines, the winters though colder than at Sitka are not severe, and the soil is well adapted to the growing of strawberries.

Fifteen years ago the Sitka station undertook the growing of some of the popular varieties that are commonly raised in the States, but the attempt was unsuccessful owing to the soil and climatic conditions. Sitka, the headquarters station, is representative in agricultural lines of much of the coast region, more particularly of southeastern Alaska. Whatever can be grown at Sitka probably can be grown in most places throughout the coast region. Vegetables and small fruits are at home in this region which is mountainous and heavily timbered. The soil is naturally peaty, wet, and poorly drained. It acts like a sponge in that it holds a large amount of moisture. That at the station has been improved and made suitable for culture by the addition of gravel, ashes, seaweed and other fertilizer. The rainfall is heavy, particularly during August and September, and the major part of the strawberry crop normally ripens about August. The ripening period is, however, largely influenced by the season, starting in some years about July 15 and continuing until August 15.

The introduced varieties invariably made good growth at Sitka the first summer and often bore fruit, but they winterkilled, or if they survived the first winter they succumbed the second, the fruits produced being in many instances misshapen, small, and few in number.

THE HOLLIS STRAWBERRY.

After importing, testing, and finally discarding between 40 and 50 popular cultivated sorts, the station obtained from Hollis, Prince of Wales Island, Alaska, a small stock of strawberry plants that were said to be hardy and fairly satisfactory. The origin of this variety was unknown, but it was thought to have probably come from Michigan. It did not have any striking characteristic by which it might be readily identified as a variety in common culture, and for want of a better name was called "Hollis" after the settlement from which it came. (Pl. II, fig. 2.)

The Hollis is a moderately vigorous variety which produces medium to small, light red berries varying in shape from spherical to conical. They are medium early, of fairly good quality, but inclined to be acid. The plant bears some pistillate flowers and some that are perfect. At Sitka it was a medium producer of fruit, however, and could be classed only as a moderate success regardless of what it may be at Hollis or elsewhere in southeastern Alaska. Fully 15 per cent or more of the plants would winterkill each year at the station, leaving bare spaces in the beds which had to be refilled with fresh plants each spring. Many of the berries when grown in the open were malformed and irregularly developed owing to the imperfect fertilization of the blossoms.

HYBRIDIZATION WORK.

Repeated unsuccessful attempts to grow berries introduced from the coast region and the interior and cultivated sorts from the outside convinced the station that hybridization work was necessary to develop a variety which would be perfectly adapted to the climatic conditions of Sitka and other parts of the Territory. Crossbreeding work was therefore started in 1905 in the hope of obtaining a variety which would have the hardiness of the native berry and the productivity and size of the cultivated sort. The Hollis was chosen as the mother parent and was fertilized with pollen from the wild berry (*F. chiloensis*) that originally came from Yakutat (Pl. II, fig. 2). The Yakutat bloomed in the open three weeks earlier than did the Hollis and to hasten the blooming period of the latter as well as to have full control of the pollination, the station set the plants in boxes in the small lean-to greenhouse.

The blossoms were watched, the anthers removed, and the pistils artificially fertilized with pollen from the wild flowers. The resulting seed was washed from the berries as soon as they thoroughly matured and was sown in flats in the greenhouse. During the first summer the small seedlings appeared weak and made only little progress. When stronger they were transferred to other flats and set 2 inches apart. The following spring they were planted out in good soil.

A remarkable feature about these hybrids is that they were decidedly more vigorous than either of the parents and developed into large plants (Pl. II, fig. 2). The stems and leaves were larger and the peduncles stouter than those of the cultivated plant, but the hybrids were not early producers of fruit. They showed another peculiarity in that they inherited from the wild species a strong ten-

FIG. 1.—FRAGARIA CHILOENSIS, COAST SPECIES. YOUNG PLANT IN BLOOM AT SITKA.

FIG. 2.—FRAGARIA PLATYPETALA, INTERIOR SPECIES. YOUNG PLANT IN BLOOM AT SITKA.

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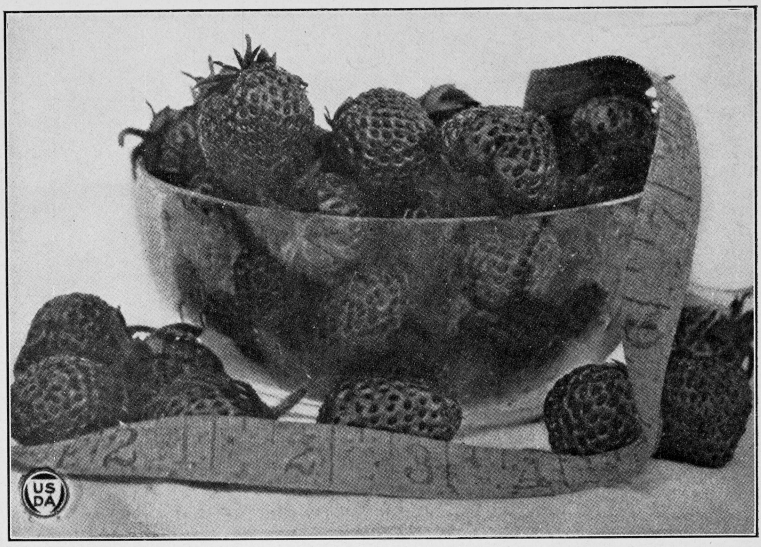

FIG. 1.—WILD STRAWBERRIES (F. CHILOENSIS), SHOWING SIZE AND SHAPE OF FRUIT.

FIG. 2.—STRAWBERRIES GROWN IN BOXES, SHOWING TYPICAL GROWTH, RELATIVE VIGOR, AND SIZE OF BERRIES. LEFT, WILD PLANT FROM YAKUTAT; CENTER, HOLLIS, CULTIVATED VARIETY; RIGHT, HYBRID BETWEEN YAKUTAT (STAMINATE) AND HOLLIS (PISTILLATE) PLANT.

FIG. 1.—HYBRID STRAWBERRY NO. 320; 200 BERRIES ON PLANT.

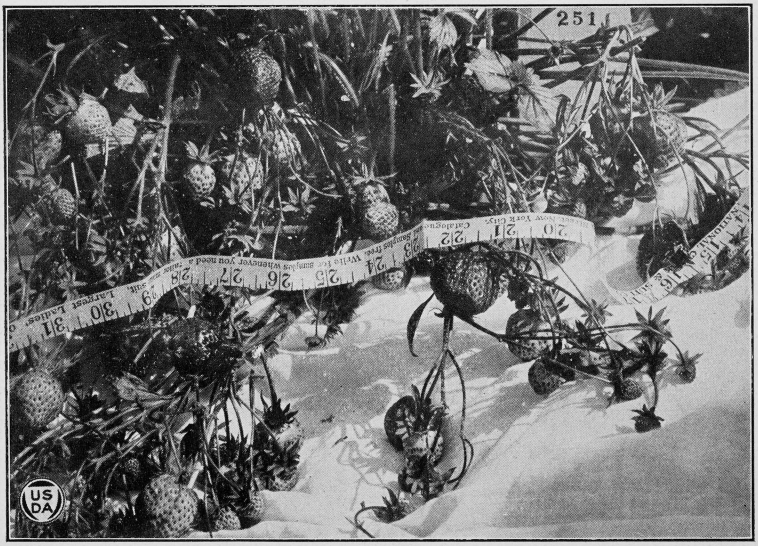

FIG. 2.—HYBRID STRAWBERRY NO. 251. BOTH ARE THE RESULT OF CROSSING HOLLIS AND YAKUTAT. NOTE LONG PEDUNCLES AND ABUNDANT BERRIES.

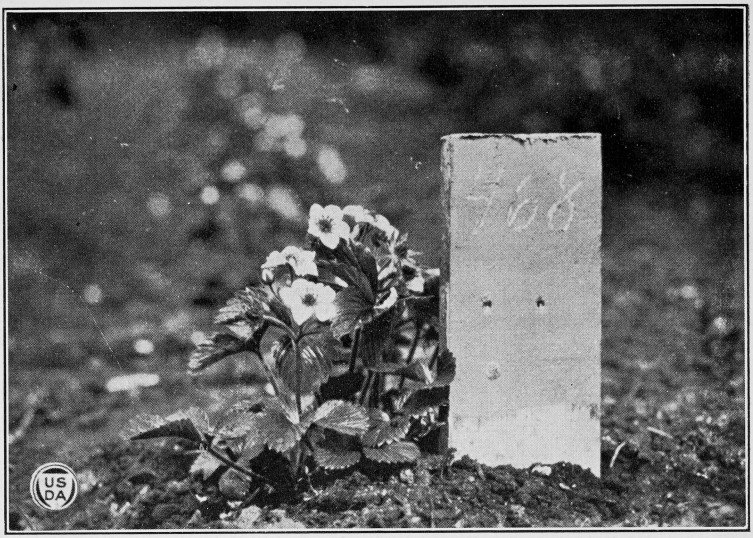

FIG. 1.—HYBRID NO. 468. YOUNG PLANT IN BLOOM. RESULT OF CROSS BETWEEN YAKUTAT AND HOLLIS. PRODUCES LARGE, LIGHT RED BERRIES, TOO SOFT FOR SHIPMENT.

FIG. 2.—HYBRID NO. 8770. CROSS BETWEEN NO. 468 (STAMINATE) AND JOHN H. COOK (PISTILLATE), PARENT.

FIG. 1.—A SEEDLING OF HYBRID NO. 468.

FIG. 2.—HYBRID NO. 275, A CROSS BETWEEN YAKUTAT AND HOLLIS. HARDY AT RAMPART.

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FIG. 1.—HYBRID NO. 1449. CROSS BETWEEN ENHANCE AND YAKUTAT. BERRIES OF MEDIUM SIZE AND HIGH QUALITY.

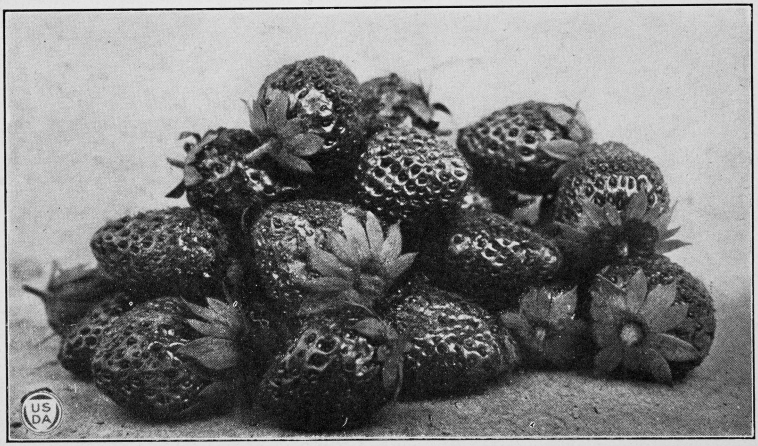


FIG. 2.—BERRIES OF HYBRID NO. 1503, GROWN AT RAMPART STATION. VARIETY HARDY WITH ONLY SNOW PROTECTION.

dency to produce leaves having four leaflets. In appearance and strength they displayed great variation, some plants having broad, vigorous leaves and others much smaller, slenderer, and more pointed leaves. Some had smooth, glossy upper surfaces and others rough upper surfaces. Of the 2,000 seedlings under observation in 1907 none produced any fruit. In 1908, when they were 3 years old, 33 of the seedlings bloomed, but the berries produced were not considered an improvement over those of the Hollis. The outlook was discouraging, but it was decided to keep the plants another year. In 1909 nearly all of them bloomed and set fruit, but some never showed any blossoms. Of the many hundred plants which fruited that year approximately 10 per cent produced berries of large size and superior quality. None was ideal, and as a class all were too light in color, some being only pink or almost yellow and the majority light red like the Hollis. The heavy rains of late summer at Sitka cause the berries to decay quickly or soften and for this reason it is thought that they will never make good shippers. When grown in a drier climate these hybrids produce berries of normal firmness.

The hybrids were of a delicious flavor and some of them had also the delicious aroma peculiar to the Yakutat berry. Best of all, they proved to be perfectly hardy at Sitka and also in the interior, where the winters are severe. At the station well-established hybrids did not winterkill. The newly created berries partook of the hardiness of *F. chiloensis*, the staminate parent, and showed improvement in quality and size over the pistillate parent.

On account of its hardiness the interior species was used as the staminate parent in some of the hybridization work, but only a few blossoms were available when wanted. The coast species has given the best results in number of valuable hybrids produced, but the hybrids having the interior species as a parent all show improvement over the wild strawberry. The object for which hybridization work was undertaken has been partly accomplished. Apparently there is no limit to the variations that can be produced from these crosses and each year yields plants of greater promise than any preceding ones.

The work of selecting plants for hybridization work has not been given the attention that it deserves owing to, (1) the length of time involved in carrying it on and the fact that the station has not at its disposal an expert who can devote his entire time to it; and (2) the failure to obtain cultivated plants from the outside early enough in the spring to become established and bear fruit the first summer, and the winterkilling of the plants the following winter. The station has therefore had to use such commercial varieties as were found to be hardy enough to survive at least one winter. It has also crossed some of the better numbers with each other and raised seedlings from some of the best crosses. All of the more recent hybrids have not been critically judged at this writing, and since the years 1920, 1921, and 1922 were very wet during the period of ripening, judgment can not be passed on the quality and character of the berries produced. The only features deserving of mention were the productivity of the plants and the size of the berries.

Some of the later crosses at the station, fruiting for the first time in 1922, have, however, produced excellent berries which show great improvement over their parents in color, the fruit being a dark blood red throughout. The growth of these plants was nearly perfect, showing perfect blossoms, productivity, large berries of good color and excellent flavor, and peduncles strong enough to support the berries and keep them off the ground. If the hybrids continue to hold all the above-mentioned characteristics and become staple varieties, little or no improvement can be made on them. One of the best hybrids so far produced has resulted from crossing the Magoon, a well-known strawberry of the Pacific Coast, with pollen from the wild plant of the interior. This hybrid, so far as tested, possesses all the desired qualities. The berry is large, of deep red color not merely on the surface but throughout, and it is firm enough to stand shipment. The berry has a good flavor and a calyx that separates easily when the fruit is ripe.

CHARACTERISTICS OF THE HYBRIDS.

The hybrids show great variation in vigor of growth, length of petioles and peduncles, size of leaves, and quality of fruit, but they have certain characteristics in common, the most noticeable of which is their vigor. Those grown in good soil would scarcely be recognized as strawberry plants when compared with varieties in general culture in the States. They are two and three times as tall as their parents. Hundreds of the hybrids have stood 18 inches to the topmost leaf or blossom.

Plate II, Figure 2, shows the relative vigor of three plants grown in boxes and the relative size of their berries. None of these plants developed under this method of culture as well as they would have done had they been grown in the open. In the box on the left is the typical wild coast berry (*F. chiloensis*). It is a low-growing plant. In the center is a normal plant of the cultivated variety Hollis, and on the right is a hybrid plant which is the result of fertilizing the Hollis with pollen from the Yakutat. It will be noted that the petioles of the hybrid leaves are very long and that the leaves themselves are not larger than those of the Hollis but more numerous. The peduncles are weak and are bent by the weight of the fruit which is two or three times as large as that of the Hollis plant.

Extraordinary vigor is peculiar to nearly all the hybrids as compared with their parents, even when the latter varied greatly from each other, and the variation in the size and stiffness of the peduncles is very marked. Until the berries begin to develop the peduncles remain upright, being in many instances longer than the leaves (Pl. III).

A cross made with a cultivated seedling of the variety John H. Cook, using pollen from hybrid No. 468 (Pl. IV, fig. 1), which had only half of the wild plant in its composition, resulted in a series of unusually vigorous plants bearing taller and stouter peduncles than those of the mother plant (Pl. IV, fig. 2). The peculiar vigor of the hybrids is further illustrated in Plate V, Figure 1, which shows a second

generation hybrid, a seedling of hybrid No. 468. As far as can be judged from the results obtained, the hybrid plants are more vigorous in every respect than the parents.

Seedlings of the Hollis crossed with the Yakutat have long petioles and long, slender peduncles which bend to the ground at an early stage. The berries are developed under the leaves and for the most part rest on the ground. Those of the wild species also develop under the leaves, but the peduncles are weak, procumbent, and short, and never reach the prodigious length of those of the hybrid. The plants survive without any protection whatever other than that afforded by the snow. The temperature at Rampart often falls as low as 50° F. below zero and sometimes as low as 65° F. below, and hybrids, including Nos. 251, 275 (Pl. V, fig. 2), and 1503, have withstood these temperatures without any sign of winterkilling.

TYPES AND CHARACTERS OF THE HYBRID BERRIES.

The prevailing shape of the hybrid berries is globular or irregularly rounded. Some of them are conical and a very few are long and pointed, but these are comparatively rare. Most of the berries grown in the coast region lack firmness to such a degree that they can not be shipped to distant markets. This is attributed to rains which fall during nearly all of the period of ripening. Lack of sunshine and the ripening of the berries under the leaves, where they are partly excluded from the light, accounts for their poor color. Most of them are light red on the outside and white on the inside. Comparatively few are red throughout.

The berries vary greatly in flavor. They are all luscious, almost devoid of acidity, but some are more highly flavored than others. Some even partake of the fragrance of the wild berry, but this characteristic is not prominent. Nearly all the hybrid berries have brown seeds and in this respect resemble the wild berry rather than the cultivated plant. Among the hybrids are some handsome berries of large size and splendid color, but these are insipid. Hybrid No. 1855 (Enhance × Yakutat) belongs to this class. On the other hand, hybrids Nos. 468 (Hollis × Yakutat) and 1449 (Enhance × Yakutat) (Pl. VI, fig. 1) are deliciously flavored berries. Many who have passed judgment on these berries consider the long-pointed or conical berries sweeter and more delicate as a class than the globular or irregularly shaped berries, but as yet this can not be definitely stated as a fact.

It requires much time and a discriminating taste to pass judgment on all the berries when they are ripening, and although one tastes only one berry of each plant and immediately makes note of its quality, one soon loses the ability to judge between berries differing in flavor and the result is that the characterization becomes reduced to a sense of sweetness or of acidity.

Many of the station hybrids have been distributed by numbers (Pls. VII, VIII, and IX). In order that their parentage may be known and record kept of the various crosses made, the accompanying list is given:

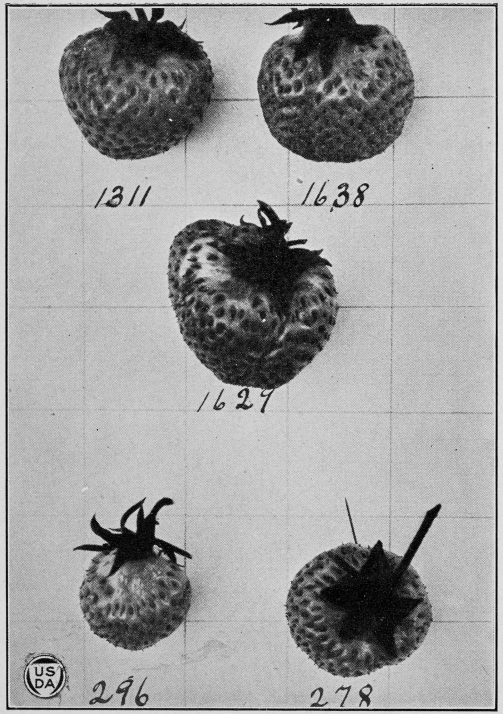
Numbers and parentage of Sitka hybrid strawberries.

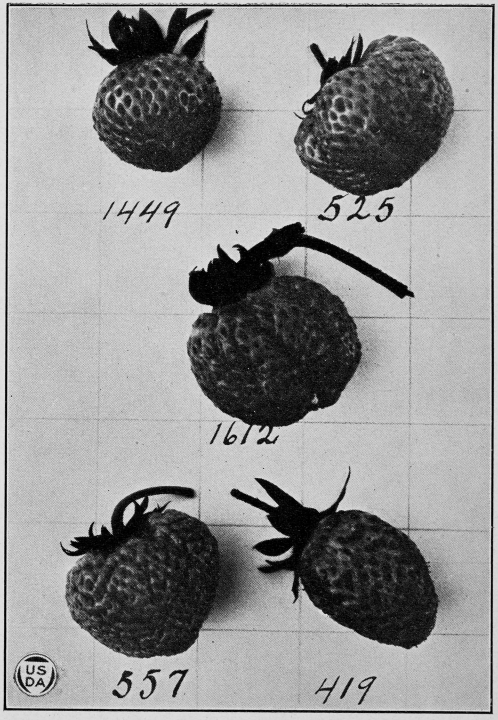
[The mother plant is named first throughout.]

1 to 613—Hollis×Yakutat.
614 to 1349—Enhance×Yakutat.
1350 to 1359—Hollis×Yakutat.
1360 to 1614—Enhance×Yakutat.
1615 to 1632—Hollis×Yakutat.
1633 to 1699—Enhance×Yakutat.
1700 to 1854—Magoon×Yakutat.
1855 to 1902—Enhance×Yakutat.
1903 to 2089—Hollis×Yakutat.
2090 to 2130—Magoon×Yakutat.
2131 to 2142—Bismark×Yakutat.
2143 to 2264—Hollis×Yakutat.
2265 to 2452—Magoon×Yakutat.
2453 to 2500—Enhance×Yakutat.
2501 to 2617—Oom Paul×Native of New Jersey.
2618 to 3619—Magoon×Yakutat.
3620 to 3653—Magoon×Native of Interior (*F. platypetala*).
3654 to 3758—Hollis×Yakutat.
3759 to 3860—Hollis×94.
3861 to 4180—Hollis×Yakutat.
4181 to 4462—Hollis×Native of Interior (*F. platypetala*)
4463 to 4615—Hollis×320.
4616 to 4641—Hollis×251.
4642 to 4977—Hollis×Yakutat
4978 to 5202—1449×320.
5203 to 5382—1503×320.
5383 to 5575—1503×94.
5576 to 5622—Seedlings of 468.
5623 to 5682—Seedlings of 320.
5733 to 5837—Seedlings of 1503.
5862 to 5867—Seedlings of 3601.
5868 to 6029—320×1503.
6449 to 6647—Dunlap×Native of Interior (*F. platypetala*).
6648 to 6705—1503×330.
6707 to 6945—1563×320.
6946 to 7010—Seedlings of 3653.
7041 to 7218—1503×468.
7219 to 7390—Seedlings of 1503.
7436 to 7526—Cape Suckling×Dunlap.
7537 to 7591—Native of Interior (*F. platypetala*)×Dunlap.
7618 to 7741—Dunlap×Native of Interior (*F. platypetala*).
7742 to 8013—468×1855.
8014 to 8075—Haines×1855.
8076 to 8178—3653×1855.
8179 to 8243—468×3653.
8244 to 8332—3653×468.
8333 to 8374—1537×1855.
8375 to 8389—3653×1537.
8390 to 8595—468×Native of Interior (*F. platypetala*).
8596 to 8668—1503×Yakutat.
8669 to 8753—1449×Chesapeake.
8754 to 8768—Early Jersey Giant×Yakutat.
8769 to 8837—468×John H. Cook.
8838 to 8902—John H. Cook×Yakutat.
8903 to 8973—1449×Brandywine.
9009 to 9023—3653×Brandywine.
9024 to 9222—3653×Magoon.
9223 to 9248—1503×Yakutat.
9249 to 9329—1449×Chesapeake.
9330 to 9355—Early Jersey Giant×Yakutat
9356 to 9433—468×John H. Cook.
9434 to 9471—John H. Cook×Yakutat.
9472 to 9517—1449×Brandywine.
9518 to 9541—3653×Brandywine.
9542 to 9571—3653×Magoon.
9572 to 9582—Gold Dollar×Native of Interior (*F platypetala*).
9583 to 9625—1991×Haines.
9626 to 9646—1449×John H. Cook.
9647 to 9663—John H. Cook×Haines.
9664 to 9829—1503×3653.
9830 to 9921—1449×Point Arena.
9922 to 10022—1503×Early Jersey Giant.
10023 to 10182—1503×Brandywine.
10183 to 10280—3653×Early Jersey Giant.
10281 to 10382—1503×Gold Dollar.
10383 to 10443—John H. Cook×1855.
10444 to 10494—1855×Gold Dollar.
10495 to 10511—Cape Suckling×Early Jersey Giant.
10512 to 10540—3653×Brandywine.
10541 to 10692—1503×3653.
10693 to 10781—1449×Point Arena.
10782 to 10870—1503×Early Jersey Giant
10871 to 11003—1503×Brandywine.
11004 to 11065—3653×Early Jersey Giant
11066 to 11152—1503×Gold Dollar.
11153 to 11206—John H. Cook×1855
11207 to 11260—1855×Gold Dollar.
11261 to 11273—Cape Suckling×Early Jersey Giant.
11274 to 11298—3653×Brandywine.
11299 to 11320—5062×Gold Dollar.
11321 to 11334—John H. Cook×3653.
11335 to 11348—Brandywine×5389.
11349 to 11357—8112×8037.
11358 to 11379—8348×8192.
11380 to 11399—5389×Early Jersey Giant
11400 to 11434—Early Jersey Giant×3653.
11435 to 11455—8037×Gold Dollar.
11456 to 11475—8092×Early Jersey Giant.
11476 to 11479—Early Jersey Giant×8037.
11480 to 11544—5389×Early Jersey Giant.
11545 to 11562—8192×8037.
11563 to 11581—Brandywine×5389.
11582 to 11614—John H. Cook×3653.

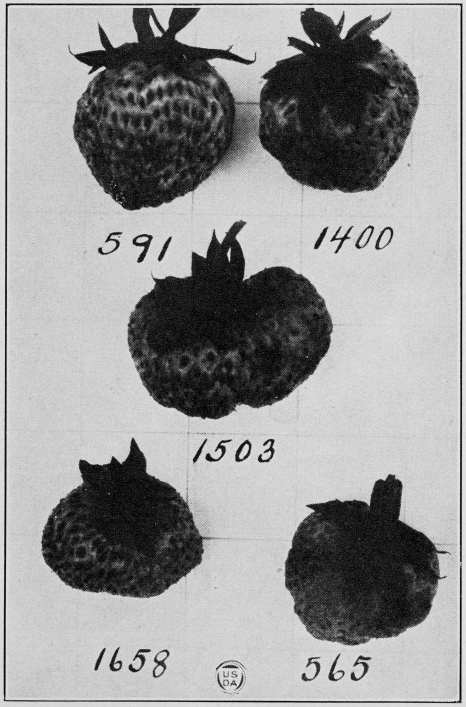
SUCCESSFUL STRAWBERRY CULTURE IN THE INTERIOR.

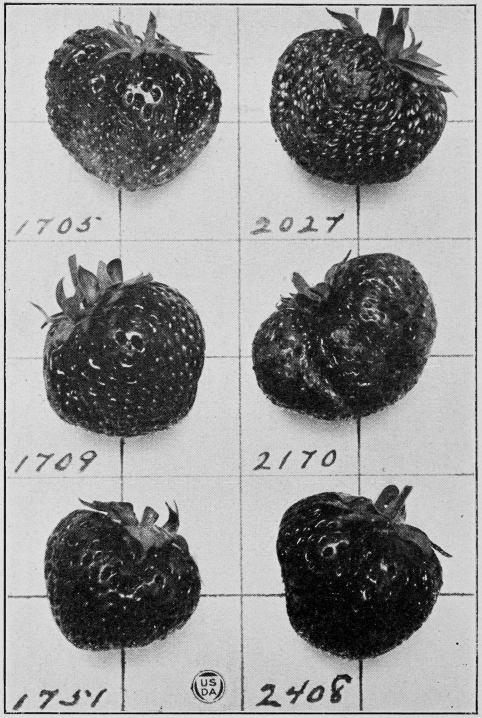
Although repeated efforts had been made to grow strawberries in interior Alaska, for which purpose plants were imported from Puget Sound where they were taken from the varieties in common culture in the States, it was not until the Sitka hybrids were introduced at the Rampart Station that strawberry culture in the interior became possible. Hybrid No. 275 has been an especially valuable strawberry to the settlers of the interior owing to its hardiness and the size and quality of its berries (Pl. IV, fig. 1). These hybrids, however, behave differently in the different regions, producing shorter leaf petioles and fruiting peduncles in the interior than in the coast region. In short, they resemble the strawberry in common cultivation and do not attain such large size as in Sitka.



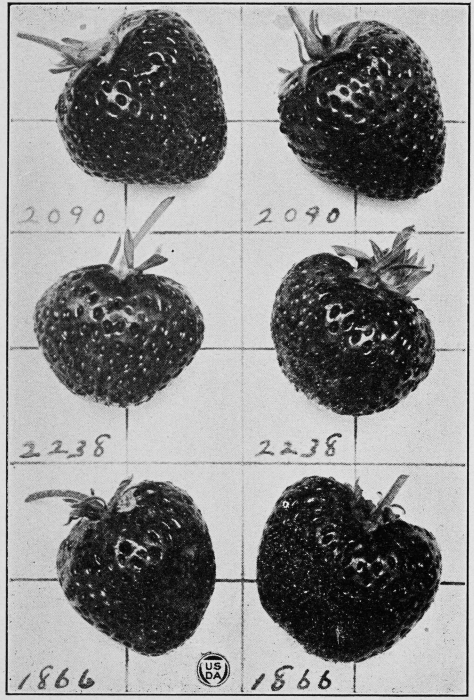


SOME TYPES OF STRAWBERRIES. SPACES BETWEEN LINES REPRESENT 1 INCH. FOR PARENTAGE OF HYBRIDS, SEE LIST, PAGE 10.





SOME TYPES OF STRAWBERRIES. SPACES BETWEEN LINES REPRESENT 1 INCH. FOR PARENTAGE OF HYBRIDS, SEE LIST, PAGE 10.



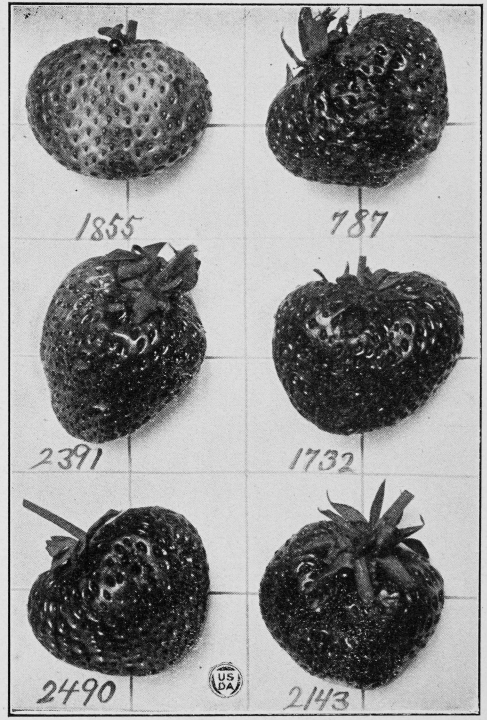


PLATE IX.

SOME TYPES OF STRAWBERRIES. SPACES BETWEEN LINES REPRESENT 1 INCH. FOR PARENTAGE OF HYBRIDS, SEE LIST, PAGE 10.

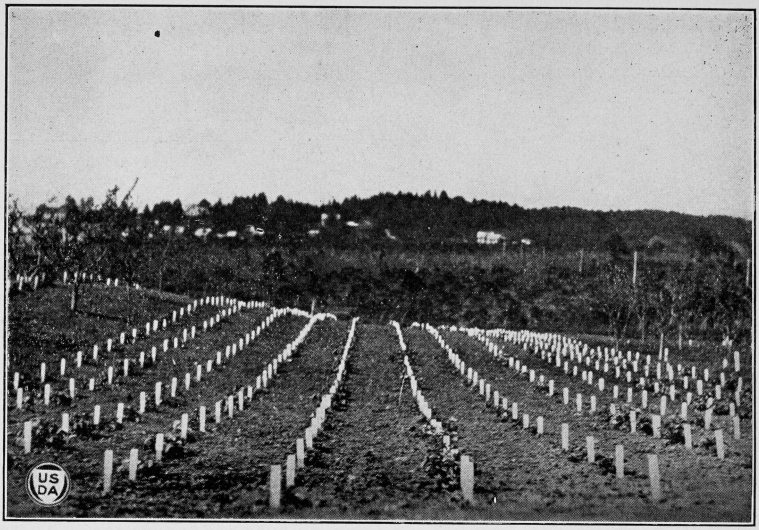


FIG. 1.—VIEW OF A PART OF STRAWBERRY NURSERY AT SITKA STATION. A HYBRID PLANT AT EACH STAKE.

FIG. 2.—HYBRID STRAWBERRIES GROWING IN ROWS FOR PROPAGATION OF RUNNERS AT SITKA STATION.

Hybrid No. 1503 (Enhance × Yakutat) produces a large, usually rounded, berry in the coast region and a medium-sized berry of conical shape in the interior (Pl. VI, fig. 2), and the plants do not show such prodigious vigor as they do at Sitka. This hybrid with many others of earlier numbers has been propagated at both the Rampart and Fairbanks Stations for distribution among the interior settlers.

Very few of the later grown hybrids have been tried in the interior owing to the length of time it required for them to reach their destination. Now that the Government railway has been completed, however, they can be sent to Fairbanks without likelihood of their dying en route. Many of the hybrids will be tested at that station in the near future.

CULTURE OF THE HYBRID STRAWBERRIES.

The first requisite in the culture of the hybrid strawberries in Alaska, and particularly in the coast region, is plenty of space for growing. The plants have been grown singly and also in matted rows at the station. They soon become a tangled mass of leaves and runners and produce very little fruit when grown in matted rows, and the leaves are too abundant and so large that they shade the fruit, causing it to lack color and firmness and inducing early decay.

When grown as single plants the hybrids should be set 3 feet apart each way, or better still, if one has the space, 4 feet apart each way. Under this system the runners should be removed unless they are to be used for propagation purposes. In any case, runners from adjoining plants should not be allowed to intermingle. Each plant should be fully exposed to all the sunshine it can get. In the hill system of culture the berries are not hidden by the leaves which for the most part lie in a wreath about the plant. The peduncles are bent down by the weight of the fruit, but they are exposed to the full effect of the air and the sun. The hill system of culture is, of course, the only one permitting each plant to receive a careful study, and it has been followed by the station in the production of its hybrid strawberries.

In some instances where a strawberry bed was located on poor soil concentrated fertilizer of some kind was scattered about the plants in the spring and worked into the surface of the soil by hand. In other instances it was found necessary to mulch the plants with straw or similar material to keep the berries from becoming muddy from contact with the soil.

YOUNG SEEDLING PLANTS.

Cross-fertilization work at the station is now carried on under glass where the plants are grown in boxes or pots. The blossoms are watched and studied, some are selected for pollination, and others are removed to prevent crowding. The anthers are removed from each selected flower as soon as it expands, and the pistils upon reaching the desired degree of maturity are dusted with pollen from the staminate flower. If there is likelihood of contamination by pollen from some other source, the fertilized blossoms are inclosed in thin paper bags until the berries begin to ripen. Each peduncle is marked with a label giving the name of the staminate parent.

The berries are allowed to become overripe and the seed is washed from them and immediately sown in flats, which are then properly labeled. Weeks and sometimes months pass before the young plants appear. When large enough to be handled the seedlings are transplanted to other flats and set 2 inches apart, where they remain until they can be planted outdoors, or until they can be transferred to larger flats. When the plants are large enough they are transferred to coldframes to be hardened gradually. In early summer the plants are set in the open 18 inches apart in rows 2 feet apart, and the following spring they are placed 3 feet apart each way and each one is marked with a white-painted stake (Pl. X, fig. 1.)

When a seedling hybrid has fruited it is given a number and detailed records are kept as to its parentage, date of blooming, character of flower, date of first and last ripening of berries, size and quality of berries, prolificacy and vigor of plant. During the berry season each plant is examined almost daily, and when there are thousands of plants the task becomes an arduous one. Plants that are very prolific, or which produce superior berries or possess any other desirable characteristics, are selected for further experimentation. These are marked with a stake bearing a yellow-painted label. The inferior and mediocre plants are not marked with any distinctive label and after being tried for two years and found wanting they are discarded. The yellow-labeled plants are permitted to set runners for further propagation purposes, remaining attached to the mother plant until the following spring when they are separated and placed in beds by themselves. (Pl. X, fig. 2.)

Comparatively few of the seedlings bear fruit the first summer they are in their permanent beds, but they should all show fruit the second summer. Those producing fruit of a superior quality retain their original number but are given a yellow label in order that they may readily be located. Those producing no fruit the second year, or small and inferior berries, and those which are not manifestly prolific are discarded.

WINTER PROTECTION FOR HYBRIDS.

In order to protect young plants that have not fully established themselves, they are covered with litter early in winter when the ground is first frozen. This litter consists of spruce branches on the top of which is scattered a thin layer of seaweed. Such a covering would not be sufficient to protect the plants against severe cold, but it will prevent the ground from freezing and thawing as it repeatedly does in the coast region. The hybrids are extremely hardy, measured by their ability to withstand low temperatures, but the winter climate is nevertheless trying to all young plants. Repeated freezing heaves the surface soil and in the process tears the roots to such an extent that they seldom do well when replanted. In many instances the young plants are found dead on the surface in the spring with their roots exposed.

In late fall, usually about the middle of November, runner plants are taken up and heeled in closely in the open so that they may be available for distribution in the spring. These plants are also covered with litter to hold the snow and keep the soil from thawing until spring.

Residents of Alaska are supplied with a limited number of these hybrid strawberry plants for the double purpose of having the plants tested and to introduce them into various sections for culture.

It does not seem likely that any of the Alaska hybrid strawberries will be suitable for culture in a warm and dry climate, such as is found in the States. They have been tried in a few instances only, but without marked success. They certainly will not grow in hot, dry sections of the country; nor is it believed that they will thrive under irrigation. Having been born and bred under climatic conditions peculiar to Alaska, they can scarcely be expected to be of much value in a more southern latitude where the weather is hotter and at times drier than it is in that Territory.

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