UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
WASHINGTON, D. C.

OFFICE OF
TAXONOMIC INVESTIGATIONS.

Notes on Blueberries.

1907-1908

UNITED STATES DEPARTMENT OF AGRICULTURE,
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In the summer of 1906 some fresh blue-berries from Greenfield picked by Katharine were turned over to Mr. G. W. Oliver, who successfully grew seedlings from them, which were potted and finally sent to the Arlington Farm. A few of the potted plants were ~~Plants were~~ sent to Greenfield late in the summer of 1907 by Mr. Beattie and set out on the farm. The other plants at the Arlington were finally thrown out.

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Ithaca N.Y., June 1907

L. H. Bailey once got a bushel of blueberries, ~~kept~~ stratified them, and failed to make a single seed ~~them germi-~~ ~~gate~~ grow.

~~Conversation~~ at Ithaca ~~in June 1907~~

UNITED STATES DEPARTMENT OF AGRICULTURE,
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OFFICE OF THE BOTANIST.

Washington August 6, 1907.

Largest blueberry from the Greenfield bush

$\frac{46}{100}$ inch in diameter largest
$\frac{42}{100}$ " " " smallest

Blossom half of berry 6 seeds
Stem half of berry 34 "

[Seeds were sowed August 10, 1907. See
allusion to date in +28,
^ note of May 27, ^ 1908.]

UNITED STATES DEPARTMENT OF AGRICULTURE,
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Dec. 30, 1907.

Vaccinium ~~corymbosum~~ atrococcum (Coville 2305) roots dug yesterday at Lanham and brought in in moist earth have very little new growth. There are no root hairs. The ultimate rootlets are 30 to 50 μ in diameter. Applied to the surface of the rootlets are frequent threads of some fungus mycelium, varying from 2 to 4 μ in diameter. The larger threads are light brown in color, the smaller ones nearly colorless. The larger ones are identical in size and appearance with those found by Mr. Ricker a few weeks ago when he examined a seedling of *Vaccinium corymbosum* from the greenhouse.

Vaccinium *vacillans* (Coville 2302) roots procured at Lanham with those of *corymbosum* show the same general features and similar mycelial threads.

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Dec. 30, 1907.

One of the greenhouse seedlings (of Vaccinium corymbosum) from Greenfield was examined to-day for mycorhiza. The plant used was about 7.5 cm. high, with a vigorous lateral shoot about 3 cm long. The taproot is about 15 cm. long, and the well developed lateral roots from 3 to 6 $\overset{?\ \text{mm}}{\text{cm}}$ long. The ultimate rootlets are about 70 μ in diameter and white. On the rootlets are occasional superficial hyphae similar to those found on the wild plant from Lanham, but slightly fuscous rather than brownish. On one rootlet these hyphae formed a network closely applied to the root surface but with an open mesh about the size of the surface cells of the root.

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Jan. 9, 1908.

Mycorhiza in Vaccinium

An account of the mycorhizas of the Ericaceae and related families was given by Frank in 1887 (Ueber neue Mycorhiza-Formen [Ber. Deutsch. Bot. Gesell. 5: 395-409. pl. 19]), with references to the earlier imperfect observations on these mycorhizas.

The ~~ecto~~ endotrophic mycorhiza of Andromeda polifolia, which superficially resembles exactly that found by me in Vaccinium corymbosum and V. vacillans is illustrated by five figures. One figure is given of a similar mycorhiza in Oxycoccus oxycoccus. Frank found the mycorhiza also on Vaccinium uliginosum, ~~and~~ Vaccinium myrtillus, and Vaccinium vitisidaea.

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[? Jan. 9, 1908]

Frank in his original article on mycorhiza, entitled "Ueber die auf Wurzelsymbiose ~~[illegible]~~ beruhende Ernährung gewisser Bäume durch unterirdische Pilze" (Bericht. Deutsch. Bot. Gesell. 3: 128-145. t. 10. 1885) in which he dealt only with the external, coralliform, or as he later called them ectotrophic, kind, concluded "Wir müssen daher den Wurzelpilz als das alleinige das Wasser und die Bodennahrung aufnehmende Organ der Eiche, Buche etc. betrachten."

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January 9, 1907.

To-day after reading Frank's article containing an account of the endotrophic mycorhiza of *Andromeda polifolia* (Ber. ~~d.~~ Deutsch. Bot. Gesell. 5: 400 to 404. 1887), and noting the development of that portion of the mycelium which lies within the epidermal cells to a degree vastly in excess of any requirement of the plant for absorption purposes, the idea that this internal development of mycelium furnished a mass of food for the host plant was impressed upon me.

The following appears to be a rational statement ~~of~~ the relation of the mycorhiza ~~parasitic [illegible] [illegible] on~~ to the health of the ~~host~~ in *Vaccinium corymbosum*.

1. *Vaccinium corymbosum* like the bog Ericaceae grows in very wet acid soils which contain various substances poisonous to plants.

2. As a protection against the absorption of amounts of these poisons

great enough to kill them these plants are devoid of root hairs, ~~and~~ and consequently have a ~~to compensate for their consequent~~ low capacity for absorbing soil moisture. ~~They~~ In accord with their low absorptive capacity they have various adaptations for retarding transpiration and in fact their transpiration is small in comparison with that of ordinary plants like garden vegetables.

~~3. By reason of the low absorptive capacity of their roots these plants require a more [illegible] the soil moisture [illegible] a wet soil in order not to perish from insufficient moisture, or relative drought.~~

This paragraph need not be interpolated here.

3. ~~4.~~ The special danger to which these plants are exposed by reason of their low transpiration and reduced capacity for absorption is insufficient nutrition, so far as those food elements are concerned which are ordinarily absorbed ~~[illegible] up~~ by the plant from the soil, especially nitrogen.

4. Ⅲ Some bog plants similarly threatened with insufficient nutrition, such as Drosera, Utricularia, and Sarracenia, possess means of securing the requisite nutrition by catching insects, and digesting and absorbing their nutritive parts.

5. Ⅲ In Vaccinium corymbosum and various Ericaceous plants, the required nutrition is secured in a different way. The enormous mycelial masses developed by the mycorhiza within the epidermal cells furnish, certainly after their death, possibly before, a large supply of nutritive material, which is already within the living tissue of the host.

6. Ⅲ To grow Vaccinium corymbosum successfully, one must primarily furnish the conditions ne-

cessary for an abundant growth of its mycorhiza.

7. ~~5.~~ The fundamental condition ~~requisite~~ for an abundant ~~growth of the~~ mycorhiza of Vaccinium corymbosum is believed to be an undisturbed surface layer of humus, a matrix for the suitable growth of the mycorhiza.

8. ~~6.~~ The ~~profound~~ humus layer believed to be required can be probably secured by suitable mulching, ~~and~~ would be destroyed by cultivation.

~~To summarize the requirements of growing Vaccinium corymbosum success-fully~~

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OFFICE OF THE BOTANIST.

Jan. 10, 1908.

In his experiments on the "Physiological Properties of Bog Waters" (Bot. Gaz. 39: 348-355. 1905) B. E. Livingston found "that ~~many~~ bog waters act upon the plant [Stigeoclonium] like poisoned solutions".

~~The water from Oconomo~~

Vaccinium corymbosum grew in one of the bogs, near Oconomowoc, Wis., from which water was tested and found to have a very marked poison-like effect.

The (active) ~~(poison-like)~~ ~~Roughly speaking the poison-like~~ substances were found to be "roughly proportional to the xerophilous character exhibited by the swamp vegetation".

The active ~~poison-like~~ substances are not directly related to the acidity of the water".

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Jan. 10, 1908.

Experiment on Vaccinium.

To ascertain whether a bog soil is really essential to the successful growth of Vaccinium corymbosum, or whether the plant requires merely some soil, such as a humus soil, which will furnish a matrix for the abundant outside growth of the mycorhiza, try a series of pot cultures with seedlings in these two types of soils.

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Jan. 10, 1908.

Experiment on Vaccinium

To ascertain the effect of an ordinary soil on the growth of *Vaccinium corymbosum*, pot a few of the plants in such soil, not in a boglike soil and watch the result.

UNITED STATES DEPARTMENT OF AGRICULTURE,
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Jan. 10, 1908.

Experiment on Vaccinium.

To ascertain whether a plant of Vaccinium corymbosum, having no root hairs, can absorb water and nutritive substances without the aid of mycorhiza, grow water cultures from seed, keeping one series free from mycorhiza and supplying the other series with it.

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Jan. 11, 1908.

W. M. Munson in 1905, Maine Agr. Exp. Sta. Bull. 113: 27, ~~1905.~~ said that systematic experiments on the domestication and improvement of blueberries were in progress at the Station, the most promising species being *Vaccinium corymbosum*.

~~No reports of successful cultivation,~~

~~that is the actu~~

~~Apparently no exp~~

I find no report that any plants have yet been brought to fruit by Munson.

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~~3~~

January 11, 1908.

From 1898 to 1903 F. W. Card carried on experiments to determine the practicability of domesticating ~~the~~ *Vaccinium corymbosum*

His conclusion, published in Bulletin No. 91 of the Rhode Island Agricultural Station, page 116, 1903, was

"Attempts to propagate the swamp blueberry (*Vaccinium corymbosum*) by means of root-cuttings, stem-cuttings, and root-grafts have not thus far proved really successful. Plants removed from the wild are slow in becoming established, but thrive better as time goes on"

In the Sixteenth Annual Report, for 1902-3, part 2, page 217, [1904], Card says ~~the~~ ~~say~~ "Seeds [of *Vaccinium corymbosum*] germinate readily, and with proper care it is easy to grow plants in this way, but it takes a long time"

Apparently no plants either from seeds or by propagation were ever brought to fruit by Card.

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Jan. 11, 1908.

Vaccinium corymbosum fruits in four to six years from the seed.

W. M. Munson, Maine Agr. Exp. Sta. Bull. 76: 122. 1901.

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Jan. 11, 1908

Benj. G. Smith, of Cambridge, Mass., who experimented with highbush blueberries for about twenty years ~~so~~ reported that of the seeds he planted ~~"Except some of the largest~~ "a few... vegetated the first year and more the second", ~~and~~ that "in three or four years they fruited and in a year or two more abundantly." ~~and that the fruit of the seedlings was [illegible], few of them being equal in size to the berries from the~~

Abstracted from W. M. Munson, Fourteenth Ann. Rep. Maine Agr. Exp. Sta. 1898, part 2. 171. 1899.

[Smith is now dead. March, 1909.]

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Jan. 11, 1908.

Experiment bearing on Vaccinium culture

To ascertain whether the retarding effect of bog water on the growth of an ordinary plant like wheat is due to poisons absorbed by the roots or whether it is due to brought about by limited ~~[illegible]~~ absorption, ~~and~~ ~~consequent~~ lack of nutrition ~~brought~~ this ~~[illegible]~~ due in turn to adverse osmotic tendencies caused by the more concentrated solution of the bog water; measure the transpiration of wheat plants in bog water cultures compared with their transpiration in ordinary nutritive water cultures. Measure also directly the osmotic pull of the bog water as compared with that of an ordinary nutritive solution.

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about Jan. 11, 1908

R. E. B. McKenney

Zopf, Die Pilze. Look up.

Acid media favor the growth of fungi, ~~but~~ ~~kill or~~ retard bacteria

~~[illegible]~~

Ternetz, Charlotte

Nitrogen gathering by fungi

1 - Prelim. paper - Berichte der Deutschen Botanischen Gesellschaft 1902 or 3 or 4 - (22: 267-274 1904)

2 - Larger Paper - Pringsheim's Jahrbücher für wissenschaftliche Botanik 1905-6 or 7. (44: 353-408. 1907)

1 ut 5-0 par

Jan. 11, 1908

Cultures 73 + 77, alfalfa (some but evidently not planted)

Plants in 73 27, purple stemmed and dark green, unifoliate leaflet expanded in all but one, trifoliolate leaflet appearing in 17 but fully expanded in none, tallest plant 3.5 cm., average about 2.5, rootlets not well developed, in some withering and the root hairs ~~[illegible]~~ [illegible]

In 77 20 plants, stems faintly or not at all purplish, plants pale green, unifoliolate leaflet expanded in all but three, trifoliolate leaflet appearing in 16 fully expanded in 6, tallest plant 5.5 cm, average about 3.5; roots strong, healthy and covered with root hairs.

Culture 43. Plants with withered tips as follows A2, B3, D4, E2, H1, 2, 4 J4 M4, these each with foliage leaves (in addition to the cotyledons) as follows.

A2, 14, branches 4.5 + 4 cm., from cotyledon axil.

B3, 12, branch 3 mm. from cotyledon axil, a stunted plant.

D4, 12, branches 2.1 & 2.2 cm., from cotyledon and first axils.

E2, 17, branch 3 cm. from the 4th axil.

H1, 20, branches 1.8, 2.5 + 2.7 cm., from cotyledons and first axils. (over)

H_2, 17, branch 1.5 cm, from the lowest axil.

H_4, 13, branch 4 cm. from second axil

J_4, 18, branches 2 cm. + 5 cm., from cotyledon and first axil.

M_4, 16, branches .7 + 1.1 cm, from 2nd + third axil.

Jan. 12

Culture 43. Additional tips withered badly

K_2, 16, branch 1 cm. from first axil

M_5, 14, branch 4.2 cm, from second axil

Plants all with branches cut off $H_{3,5}$ I_1 L_2 O_2. Of these only H_3, I_1, + O_2 show no basal buds.

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Jan. 12, 1908.

In 1904 Charlotte Ternetz published a paper entitled "Assimilation des atmosphärischen Stickstoffs durch einen torfbewohnenden Pilz" (Bericht. Deutsch. Bot. Gesell. 22: 267-274), in which she made a preliminary announcement that a fungus isolated from the roots of Oxycoccus oxycoccus ~~in a pure culture~~ had produced pycnidia and that the mycelium produced from spores from ~~in pure culture~~ these pycnidia, when grown in a nitrogen-free nutritive solution, showed upon analysis that it had assimilated free nitrogen, to the extent of .6% of the dry weight of the mycelium. (over)

Similar but not identical pycnidia-bearing fungi were isolated from Calluna vulgaris, Erica carnea, Andromeda polifolia, Vaccinium myrtillus and V. vitisidaea.

The fungus consumed only one-eighth as much dextrose in producing a given amount of nitrogen as is consumed by <u>Clostridium pastorianum</u>.

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TAXONOMIC INVESTIGATIONS.

[? Jan. 12, 1908]

In 1907 in a more detailed ~~paper~~ ~~Miss Ternetz entitled~~ account of her investigations, entitled "Ueber die Assimilation des atmosphärischen Stickstoffes durch Pilze" (Jahrb. Wiss. Bot. 44: 353-408) Miss Ternetz described in detail five pycnidia-bearing fungi bred from the roots of Oxycoccus oxycoccus, Andromeda polifolia, Erica tetralix, Erica carnea, and Vaccinium vitis-idaea as new species of Phoma.

The author was unable to demonstrate absolutely ~~that~~ these fungi were identical with the endotrophic mycorhiza of the hosts (1) because of the extreme difficulty of watching the mycelial threads grow from the mycorhiza through the cell wall, ~~and~~ into the culture medium without, and (2)

because when she proposed to inoculate micorhiza-free seedlings of the hosts with spores from the pycnidia that formed in her cultures, she was unable to grow any seedling which could be kept free from mycorhiza.

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Jan. 15, 1907.

Vaccinium corymbosum

Some seedlings photographed to-day by Doyle, four plants on two negatives. Specimens pressed.

Other seedlings preserved to-day at 11:40 A.M. in (1) 70% alcohol and (2) a chromic acid preparation and turned over to Mr. Stockberger for mounting. The chromic acid preparation is to go into (1) water, (2) alcohol, (3) xylol, (4) paraffin, and then be sectioned. The alcohol preparation is to be mounted without sectioning

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Jan. 15, 1908.

In 1887 Frank published ~~the~~ an account of ~~the~~ discovery of intracellular mycorhiza, which he named *endotrophic* mycorhiza (Bericht. Deutsch. Bot. Gesell. 5: 395-408, t.19 "Ueber neue Mycorhiza-Formen"). He found these mycorhizas in the Ericaceae and in the humus-inhabiting Orchidaceae.

The endotrophic mycorhiza of *Andromeda polifolia* was described in detail, and illustrated. Similar endotrophic mycorhiza were found also in *Oxycoccus oxycoccus*, *Oxycoccus macrocarpus*, *Ledum palustre*, *Calluna vulgaris*, *Rhododendron ponticum*, *Azalea indica*, *Vaccinium uliginosum*, *Vaccinium myrtillus*, and *Vaccinium vitisidaea*

Frank attributed to these mycorhizas the same function as the ectotrophic mycorhizas of the Fagaceae, namely to replace the root hairs in the absorption of water and mineral food from the soil.

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Jan. 22, 1908.

"W. J. Scott, of Bridgewater, Oneida county, N. Y. gives another instance of success. He says: About fifteen years ago I planted a quantity of huckleberry bushes on my farm, taking them from a cold wet swamp. My soil is dry and gravelly — good corn land. The plants were of both the high-bush and the low kind. They have borne abundantly, and we now have huckleberries by the bushel a good part of the season. The bushes grow taller and better than those in the swamp, and the berries are a great deal ~~taller and better~~ larger on both the high and low bushes."

Card, Bush Fruits ed. 2. 496. 1901.

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Jan. 22, 1905

"The heavy clay soil upon which our small fruits are grown at this Station [the Geneva Experiment Station, New York] does not appear to be at all favorable ~~too~~ to the huckleberry. None of the plants which are mentioned in the reports of 1882-3-5 are now alive. We have made several attempts to grow this fruit from seed and from rooted plants, but so far the results have not been ~~satis~~ ~~too~~ encouraging."

Letter of S. A. Beach August 16, 1896, quoted from Card, Bush Fruits ed. 2. 496. 1901.

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Jan. 22, 1908

"Mr. Huntington, of Lynn, has now more than a dozen well-marked varieties of good size, some being one-half to three-quarters of an inch in diameter. Mr. Hervey, of Hingham, Mass., has also been growing blueberries as garden-fruits for several years... Benjamin Smith, of Cambridge, secretary of the Pomological Society, has grown them a number of years, and says a few bushes give his family plenty of fresh berries during their season" Jackson Dawson, in
Verify in American Garden 13:287, 1892.

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Jan. 23, 1908.

To-day when told of Charlotte Ternetz inability to secure mycorhiza-free plants of any of the five species with which she worked (*Calluna vulgaris*, (over)) from sterilized seeds grown in sterilized soil, C.S. Scofield suggested that the mycorhiza infection might be like that of the seed-fungus of *Lolium temulentum*. In 1903 E.M. Freeman published the results of his investigations on that subject (The Seed-Fungus of *Lolium temulentum*, L., the Darnel. Phil. Trans. Roy. Soc. Lond. ser. B. 196: 1-27. pl. 1-3) in which he showed that the ~~fungus~~ infection was internal throughout, the hyphae within the seed pushing out into the delicate tissues of the plantlet, and following the thin-walled cells of the growing point of the plant throughout its life, finally reaching the new embryos by way of the flowering axes. Experiment.

Oxycoccus oxycoccus, Andromeda polifolia, Vaccinium vitisidaea, Vaccinium myrtillus, Vaccinium myrtillus)

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OFFICE OF
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Jan. 23, 1908

"When small they [plants of *Vaccinium corymbosum*) are easily transplanted from the woods and pastures if taken up with a ball of earth attached to each root. Larger plants should not be used unless well cut back. In white cedar swamps thousands of young plants from three to five inches high might be collected. If carefully handled for a year, these can be reset at any time. In fact, if *V. corymbosum* is grown in a deep sandy soil, it is one of the easiest shrubs to transplant, for it can be removed when in or out of bloom. I have lifted hundreds in full bloom and transplanted them without loss".

Jackson Dawson, American Gardening 13: 237. 1892.

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Jan. 23, 1908.

Azotobacter chroococcum

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In 1901 Beyerinck published his discovery of Azotobacter ~~pasteurianum~~ chroococcum, which like Clostridium pasteurianum, has been ~~shown~~ to assimilate ~~free~~ atmospheric nitrogen.

~~Gerlach and Vogel~~

~~as well as~~

It was later shown by Hugo Fischer and by H. R. Christensen 1906, that Azotobacter developed abundantly ~~[illegible]~~ in soils containing an abundance of ~~[illegible] in accordance with the pres-ence of~~ carbonate of lime (kohlensaurer Kalk)

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[? Jan. 23, 1908]

In 1895 Winogradsky published [illegible] a paper (Archiv. Sci. Biol. 1) [illegible] in which he announced the discovery of a soil bacterium, *Clostridium pasteurianum*, shown by his experiments to be possessed of the power of assimilating atmospheric nitrogen. ~~[illegible]~~

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BUREAU OF PLANT INDUSTRY,
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OFFICE OF THE BOTANIST.

Jan. 27, 1906.

"These lands [the cranberry lands of Wisconsin] being formed mostly of peat and muck on sand subsoil the water which is stored is free from lime, and there is a popular belief among cranberry growers that lime is detrimental to the growth of the plants and to production of fruit."

Whitson and others Wisc. Agr. Exp. Sta. Bull. 119: 18. 1905.

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OFFICE OF THE BOTANIST.

January 27, 1908.

"With a view to determining the practicability of using hard water [that is, water containing lime] in cranberry culture when none other is attainable, two plots were treated in the early summer of 1904. Plot 3, Section D, newly planted to McFarlin vines [a variety of the American cranberry, *Oxycoccus macrocarpus*], having an area of about 8 sq. rods was given a coating of marl (lime carbonate), 2,100 lbs. of wet marl being used. Plot 4, Section D, newly planted to McFarlin vines, [p.29] also having an area of about 8 sq. rods, was treated with air slacked lime, 500 lbs. being used. During the season of 1904, the vines on these plots seemed to grow fully as well as on the adjacent plots of new planting. However, in the spring of 1905, when

the vines on the untreated plots took on their green color, those on the treated plots remained red, and have so remained through the summer, showing no growth whatever, and many dying out entirely. While this experiment does not prove entirely that hard water would be fatal to the growth of the cranberry, it is considered good evidence that this plant is not well adopted to regions in which the soil contains much lime carbonate and the water is hard."

Whitson, Haskins, and Malde, Ann. Rep. Agr. Exp. Sta. Univ. Wisc. 22: 290-291. 1905.

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[January 27 1907]

"This higher temperature of soil [produced by weeding and sanding], together with good drainage, and aeration causes a more rapid decay of the peat, thus furnishing more nourishment for the growing plant*[~~[illegible]~~ the cranberry]," *Oxycoccus macrocarpus*].

Whitson, Haskins, & Malde, Ann. Rep. Agr. Exp. Sta. Univ. Wisc. 22: 283. 1905

I would explain the increased growth of the cranberry plants, under the conditions of increased warmth and aeration during the growing season, as due not to greater nourishment from the more rapid decay of the peat but to greater nourishment brought about by a more vigorous development of mycorhizas.

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Jan. 30, 1908.

Roots of insectivorous plants examined to-day, from Mr. Oliver's greenhouse, as follows:

1 *Chrysamphora* Root hairs none; mycorhiza apparently none.

2 *Utricularia subulata*. Root hairs none; mycorhiza apparently none; interior of rootlet filled with air.

3 *Drosera intermedia*. Root hairs long and slender; mycorhiza apparently none.

4 *Dionaea* Root hairs present on the older parts of roots, long and slender; no mycorhiza seen.

Note. For a published statement these plants should be examined again as the material is scanty, especially of 1, 3 & 4.

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OFFICE OF
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March 21, 1908

Vaccinium corymbosum

A vigorous, robust plant from the greenhouse, potted in lot No. 3 (Kalmia soil and loam, equal parts) and with many rootlets at the margin of the pot, shows no mycorhiza.

No mycorhiza found on a plant from lot no 5 (loam, 2 parts, manure 1 part). The plant had made little growth either of root or top.

Mycorhiza found very sparingly on a plant of lot no. 2 (chopped sphagnum 1 part, sand 1 part, loam, 1 part) although the root development was good.

Mycorhiza found, though sparingly on a plant from lot no. 1 (coconut fiber, 1 part, sand 1 part, loam 1 part) with abundant root development, but, like the plant from lot no 2, with yellowish green color in the leaves

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Vaccinium corymbosum April 17, 1908.

Roots from one of the main stock plants in 3-inch pots were examined to-day. One fragment contained many cells full of hyphal knots. The superficial surfaces of these cells ~~usually~~ often bore ~~a faint and slender hyphal~~ slender and faintly visible hyphae. An examination with an immersion lens will be made tomorrow. Slide marked A. Other roots from the same plant showed no mycorhiza. Occasionally a root showed a large dark colored superficial hypha little branched, but similar in size to those of *Kalmia*. The two kinds of hyphae could not be associated.

April 20, 1908.

From about half the cells minute slightly branched hyphae have pushed out into the surrounding water.

April 22, 1908

Slide has dried out.

28

Lanham, Md. April 21, 1908.

Pruned Vaccinium corymbosum bushes as follows.

Bush 1. On Beckett's land, south of Cooks pine woods. ~~Bush~~ Two and a half feet ½ from Cook-Beckett fence, about 30 paces east of Cooks swamp, 3 paces south and 1 pace east of a 3-inch persimmon tree on Cooks land, Bush 6 ft high, ~~also~~ stalks 1/3 to 3/4 inch cut to the ground. just coming into flower.

Bush 2 Same. Seven feet from Cook-Beckett fence, about 58 paces ~~east~~ of Cooks swamp, four feet ~~south~~ of ~~north~~ east side of 15-inch oak tree. Bush 5 feet high, just coming into flower. Two stems 1/2 and 1 inch, both cut to ground.

Bush 3 Same. One foot from fence, one pace farther from swamp than Bush 2. Same height, stems, and cut.

Bush 4 Three feet ~~south~~ of Bush 3, 2 stems 3/4 in. cut to ground. Same condition.

Bush 5. Ten paces south of Bush 5, 4 paces east, in gulley, ~~one~~ One stem cut (1 in), one (3/4 in) left, 6 ft high, same condition

United States Department of Agriculture,

OFFICE OF CHIEF CLERK.

WASHINGTON, D. C. ______________________, 1895.

MERCHANTS' DELIVERY CO.,
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Washington, D. C.

Gentlemen :

Please call at ______________________________

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for ____

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and deliver the same at _____________________

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Very respectfully,

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Chief Clerk.

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April 22, 1908.

Mitchella repens.

Plants growing in a mycorhiza formation in Piney Branch, collected April 20, with *Kalmia latifolia*, *Epigaea repens*, *Vaccinium corymbosum*, and *Vaccinium vacillans*, are found to have stout rootlets, without root hairs, but with a an abundance of superficial hyphae of the open net work sort. The penetration of the hyphae cannot be observed, as in our material the rootlets are not sufficiently transparent.

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April 22, 1908.

Ilex opaca.

Plants from Lanham, Md., collected yesterday, show large rootlets without ~~root~~ hairs. They have superficial hyphae of the open net work kind. The roots in this material are so opaque as to make it impracticable without sectioning to see the cell contents.

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April 22, 1908.

Vaccinium corymbosum

Specimens of the rootlets definitely traced to the plant, in the fine humus on Mr. Beckett's farm at Lanham, Md., show the fairly frequent occurrence of the brown mycorhiza hyphae on last years rootlets. The later last years growth and the transparent growth, apparently of this year, has most of the epidermal cells gorged with granular matter, only occasional superficial hyphae, and these transparent, are visible with a 1/6 objective.

Will be examined with immersion.

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May 5, 1908

Vaccinium corymbosum

Plant in No. 5 soil (loam 2/3, manure 1/3) with very feeble root development. Root branches very short, new growth insignificant, no evidence of disease. Lack of root growth not due to lack of aeration, because there is a similar lack of ~~aeration~~ root formation at the wall of the pot, even in cases in which the original humus ball containing the roots of the plant touched the wall of the pot and some of the rootlets lay against the wall from the first.

The

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May 5, 1908

Vaccinium corymbosum

The roots in a plant from no 5 soil (loam 2/3, manure 1/3), described in general on the other sheet, differ from all other roots of this species heretofore examined in having in the epidermal cells frequent large spherical bodies presenting an appearance like this:

An outer sphere, an inner sphere, with 6 to 10 ~~scallops~~ pits or depressions (in optical section) between the two, the contents of the inner sphere granular. Diameter of the spheres .4 to .6 mm, with a 1/6 objective and a 1/2 eyepiece

These bodies are not recognized by Mr. Cobb or Mrs. Patterson as spores. They are probably eggs. I believe they have no special significance.

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May 14, 1908.

Examined to-day the roots of five pot cultures of Vaccinium corymbosum, as follows:

Culture 1 (Sand ~~sphagnum~~ coconut fiber loam) Plant evidently starved but root development extensive. ~~Th~~ Roots from near the top and the bottom of the surface of the ball were examined. External light brown hyphae were found on only one out of several preparations, and then sparingly. On a few rootlets occasional [illegible] cells containing internal hypha knots were found associated with hyaline superficial hyphae. Root ~~[illegible]~~ nodes on which terminal growth had ceased, as evidenced by the browning of the end tissues, had their subepidermal cells abundantly supplied with globoid-like bodies about half the diameter of the cell, often crowded and presenting a roughly two-rowed mosaic. Growing nodes hyaline throughout.

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May 4 1905 co.

Culture 3

Root development very full and vigorous. Plant strong and healthy, now resting, like the others ~~having been~~ having been in a cold frame.

Root nodes containing internal ~~of the~~ mycorhiza frequent, the individual cells containing mycorhiza frequent on these nodes and associated with rather slender, external ~~mycorhizal~~ pale brown or white hyphae Globoid-like bodies present, but most of them smaller than in Culture 1.

In some rootlets, mycorhiza-filled cells were abundant, and hyphae the connecting the internal hyphae with enlargements ~~[illegible]~~ of the ~~external~~ hyphae, ~~are~~ plainly traceable ~~[illegible]~~ by downward focusing. The enlargements with which the connection is made are usually terminal on lateral branches, but they ~~may be~~ are sometimes in the body of a hyphha as well.

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May 15, 1908

Vaccinium corymbosum

Culture 2

~~Little~~ Condition of plant exactly similar to ~~[illegible]~~ that of plants of Culture 1. ~~Clo~~ Gray day.

Carefully examined several roots. No characteristic superficial hyphae found, only occasional loose stray hyphae of uncertain relationship.

Only two cells seen that appear to contain internal mycorhiza.

The absence of mycorhiza on these plants in a soil whose only humus supply is ~~containing plenty of~~ chopped sphagnum, and the abundance of mycorhiza in ~~to~~ ~~a plants~~ Vaccinium roots growing in sphagnum at Lanham, suggests that the function of the ~~live~~ sphagnum in bogs may be ~~that~~ not that of furnishing food for the mycorhiza, but merely that of a well aerated matrix for bog water containing a solution of humus nutrients derived from decaying plants other than sphagnum.

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May 16, 1908.

Culture 4

Plant examined to-day. Dense root development. Good growth of plant, now resting.

Several roots examined. Only one small group of about half a dozen mycorhiza cells found, these with dense and apparently old contents filling about half the cell, still connecting distinctly with external hyphae.

There is little humus left in this soil apparently. Probably will be repotted.

In places the egg-like bodies described on May were found in the root cells of this plant. In other cells were spherical bodies of similar size, but not pitted, and with a much thinner single wall, which had put forth hyphal tubes, two or three to each body. Some of the bodies, with short tubes had granular contents, some with longer tubes and apparently older than the others ~~had~~ were hyaline.

Globoid-like bodies present. (over)

The growth of this plant had been good in height, but the leaves were small.

This plant was repotted as Culture 31, May 16, 1908.

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May 16, 1908.

Vaccinium corymbosum
Culture 51

examined to-day.

Plant has made very little growth.

Root growth almost none. New growth very sparse.

No mycorhiza, external or internal found.

Globoid like bodies present

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May 18, 1908.

Vaccinium corymbosum.

As suggestive of the possibility that ~~chopped~~ sphagnum may contain some substance positively deleterious to plants may be cited the fact that in Cultures 1 and 2, containing no leaf mold, but coconut fiber and chopped sphagnum respectively, there is no green surface growth (presumably algae or moss protonema) such as occurs on all the other cultures, 3 to 5. Of course, the lack of humus in cultures 1 and 2 may explain the lack of green growth

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May 20, 1908

Vaccinium corymbosum

Mr. Kellerman and Mr. Robinson took to-day a representative potted plant from Cultures 1, 3, 4, and 5, and of the potted plants in the rose house, called X.

May 21, 1908

The acidity test (with litmus paper in petrie dishes) comes out as follows:

1 Neutral (subacid).
3 Distinctly acid
4 "
5 Distinctly alkaline.
X Distinctly acid.

These tests confirm our expectations that the deleterious manured soil (5) was alkaline, and that the soils producing the best growth (3, 4, and X) was acid. Culture 1 made good rootgrowth, but little stem growth. In all five the growth is proportional to the acidity and also proportional to the amount of acid humus

Flowerbeds

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May 22, 1908

Vaccinium

Finished the planting and watering of the aquarium bog culture to-day

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May 23, 1908.
Washington.

Vaccinium

Huckleberries from North Carolina in wholesale market to-day sold by the box at 12½ ¢ per quart.

May 25, 1908.

Huckleberries retailing at 18¢ per quart. Poor quality.

May 25, 1908.

Vaccinium corymbosum

Of the seven plants potted and placed in my window on May 16 1908, the following notes may be made.

Culture 29 (plant a) shows new root growth up from the surface of the sand and, to some extent in the air spaces in the sand, the longest growth being about 3 mm.

Culture 29 b. No new root growth visible. Ultimate bud of old stem growing nicely.

Culture 30a. New root growth in the humus layer above the sand and in air spaces. Rootlets 6 mm. long.

Culture 30b. Slight new root growth into humus from sand.

Culture 2a. Various buds starting nicely

Culture 2b. No leaf growth yet.

Culture 31. Slight new root growth in airspaces of sand, and into humus.

Sphagnum growing nicely in all pots, but sunburned in 30b and more so in 30a

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May 26, 1908

Vaccinium corymbosum.

To-day made up soil mixtures for Cultures 6 to 28, and 32. Mr. Padgett did the potting.

Watered the pots sufficiently to moisten the soil well.

The "leaf mold" used was kalmia soil from the greenhouse.

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May 27, 1908

Vaccinium corymbosum

Examined fat bud on an~~other~~ Aug 10 seedling today. Bud third below ultimate, now opening, on a first basal offshoot. Bud below this has developed a short leafy branch. First five brown empty bracts. Next an empty green bract. Then eight bracts with unopened flowers in their axils (each bibracteolate). Then an empty bract then the filiform rudiment of the continuation of the axis. On this and other stems there appear to be seven additional flowering buds.

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May 27, 1908

Vaccinium corymbosum.

Examined one of several fat buds on an August 10, 1907, seedling to-day. Bud first below ultimate on the first basal offshoot, about 5 mm. long, decidedly swelling. First, four empty bracts, of graduated sizes, all brown-tipped. Next nine bracts, each subtending a flower bud. Each flower bud has two lanceolate bractlets. After the flowering bracts a single empty bract.

Two new branches, 1½ in long, on this stem picked off so as to force the remaining seven flowering buds to open if practicable.

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May 27, 1908

Vaccinium corymbosum

Culture 29a. Root formation going on at many points, especially at the surface, and extending up in the moist spaces toward the sphagnum, the longest now 7 mm. long. ~~apparently~~.

Culture 29b. No root formation visible. Growing bud formed bracts and two leaves and then terminal bud withered.

Culture 30a Rootlets, longest about 10 mm. Ultimate bud of the new shoot that stopped growing an lost its tip about the time of transplanting is enlarging and is now about 4 mm. long.

Culture 30b. Longest rootlets seen about 5 mm. long. Ultimate bud on old shoot swelling. ultimate bud on new shoot (which shed its tip about the time of transplanting) about 2 mm. long.

Culture 2a. Buds continuing growth.

Culture 2b. Buds not starting.

Culture 31. Buds not starting.

5.27 (=28)

May 28

Remaining two new branches, of about 1 and 1/2 inches removed, and the upper half of the mature green leaves on the remaining branches cut away, the idea being to force the flowering buds to flower if possible. On most of the plants the ~~bu~~ flowers drop off before opening.

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May 28, 1908.

Vaccinium corymbosum

Fat-budded plant of Aug 10 seeding examined. Three fat buds on one stem, one (the ultimate on another stem, both stems being secondary shoots. ~~F~~ Lowest of the three buds examined.

First four empty brown tipped bracts. Next four brown-tipped bracts each with a prophyllate flower in its axil. Then four green bracts each with a flower. Last an empty bract.

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May 28, 1908.

Vaccinium corymbosum.

Plant of Aug 10, 1907, seedlings, with a single fat bud terminating a stout secondary branch. Bud examined.

Four empty brown bracts. Then eight bracts with flower buds, the three lowest bracts brown-tipped. Then an empty terminal bract, with *no* filamentary rudiment of the axis.

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May 28, 1908.

Vaccinium corymbosum

Out of 153 plants potted in 3 inch pots from one of the flats of the August 10, 1907, seedlings, 18 show at this date unmistakable fat buds. Single buds examined on four of these plants contained flower buds.

These 153 plants, potted during the winter, were all taken from the greenhouse in April, where they had been since seeding, August 10, 1907, and placed in a cold frame. For two or three weeks there was much cold weather, but no frost.

Plants from one of the flats potted at the same time the others were placed in the cold frame, were placed in the rose house. These continued to grow, much more vigorously than those in the cold frame, and only 2 out of 80 ~~not one~~ of them has produced fat buds.

The treatment in the coldframe, which included lower temperature and less systematic watering (greater dryness at times) apparently induced the development of flower buds

(over)

This observation is liable to a misinterpretation. Probably the rose house plants should be compared in their bud production not with the plants that were potted earlier but with the plants in the flats. The plants in flats, placed in the cold frame, produced flowering buds very sparingly, like those in the rose house.

May 29, 1908.

Got sphagnum at Lanham and covered Cultures 26, 27, and 28.

May 29, 1908

One of the plants in the two remaining flats bore a flower to-day, 1 cm. long. The bud was 9 mm. long yesterday.

Plant placed under cover and protected from rain and spraying.

June 1, 1908.

The corolla has begun to wither. The stigma bears pollen, probably self fertilized. Another bud will be ready to open in a few days.

$ 250 Monthly Salary

$ 125 Less Semi-monthly

$ 125 Balance due

Department of Agriculture

No. 3

F.V.Coville.

June 4, 1908.

6
8
10
12
13
18 Vental

~~June 6, 1908~~

~~7~~
~~11~~
~~14~~
~~15~~
~~17~~
~~25~~

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June 1, '08

Vaccinium corymbosum

Culture 6 One plant with leaves on the shoot stem brown & withered ~~[illegible]~~, other plants all right. Soil beneath moist, with alga colonies and fungus hyphae. Three dry on top and with no algae evident, three moist, with slight development of algae.

Culture 7 Plants all right. Conditions similar to ~~6~~ 6, but only two plants moist and greenish on the surface

Culture 8. Plants all right. Same as 6, two moist on top and greenish

Culture 9. Plants all right. Same as 6, 4 moist on top and greenish.

Culture 10. Plants all with leaves withered (brown, fallen) ~~discolored~~, the stems also in part withered and discolored. ~~No algae~~ All dry on top, ~~No algae~~ but moist below. No algae any-where, but plenty of hyphae inside. No seedling roots & stem

Culture 11. Plants all right, One moist and green on top. Soil beneath moist, with algae and hyphae.

~~Culture 12.~~

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June [illegible]

Vaccinium corymbosum.

Culture 12. Leaves all withered, either brown or green. Soil of all moist on top and with some slight green growth. Below with no algae, but some hyphae.

Culture 13. Most of the leaves brown, but the stem and some of the buds seemingly alive. All moist and green on top. Hyphae ~~but no~~ ~~algae~~ below. Algae not very far from surface, plenty of ~~visible~~ water below.

Culture 14. One plant with leaves mostly brown, others all right. Brown leaved plant dry on top, others moist. Brown leaved plant with many algae below, others with visible water and fewer algae. Few hyphae in any.

Culture 15. Plants all right. All moist on top. Below with few hyphae, those with visible water having fewer algae.

Culture 16. Same.

Culture 17. Plants all right, all moist and green on Top. Algae and some hyphae below

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June 1, 1908.

Vaccinium corymbosum

Culture 18. Plants all right. All moist. Hyphae, few algae.

Culture 19. Plants all right, all dry on top, plenty of algae, some hyphae.

Culture 20. Plants with nearly all leaves withered, either brown or green, all moist on top. Few algae above or below.

Culture 21. Same as 13.

Culture 22. Plants all right, two dry on top four moist. Algae abundant, hyphae few.

Culture 23. Plants all right. Algae and hyphae scarce.

Culture 24. Same as 17.

Culture 25. Same as 18.

Culture 26. }
" 27. } Late
28. }

Culture 32. Looks same as 23.

Gave each pot 35 cc. of water, the first since the wetting they had after potting.

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June 1, 1908.

Vaccinium corymbosum,

Culture 29a. Longest root growth 15 mm. One of lower buds growing, now 15 mm. long.

Culture 29b. Slight root growth visible. Ultimate bud of the new shoot that stopped growing about the time of transplanting now 6 mm. long and enlarging

Culture 30a. Bud recorded as enlarging on May 27 now growing and 25 mm. long. Root formation extending, especially into the humus.

Culture 30b Bud on old shoot 7 mm. long. Bud on new shoot 8 mm. long.

Culture 2a Longest of five new growths from buds 40 mm., but all slender.

Culture 2b. Buds not started.

Culture 31. Basal shoot beginning to grow. Ultimate bud on the larger shoot swelling, now 3 mm. long. Excellent root growth into the humus.

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June 11, 1908.

Vaccinium corymbosum

Put the leaf mulch covering on Cultures 19 to 25 this afternoon. About half inch thick when packed down, about 1½ inches when lightly laid on.

The material was brown, oak- and Kalmia-rooted peat from Lanham, rubbed through a half inch screen, leaving the roots behind.

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June 2, 1908.

Vaccinium corymbosum

Culture 10. Only one weed seed has sprouted in this lot, that a grass, not at the glass.

Culture 12. ~~Five~~ Ten weeds have sprouted, only one at the glass. This one has the customary root hairs

Culture 20. Mulching yesterday covered up the weeds, of which however two were at the glass.

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June 2, 1908

Vaccinium corymbosum

Culture 10. There seem to be no algae whatever in this soil although 6 7 8 & 9, all of similar texture but without lime, have plenty of algal growth.

Culture 12, also with lime has, only an occasional colony, and

Culture 20 seems to have none at all.

Aquarium. One of the plants has grown a new shoot, which at the height of four inches began to produce bracts instead of leaves, with bracted flower buds in the axils. There are eight of these bracts, with one empty one. The bud in the next leaf axil below is growing vigorously, and these buds below are shooting. In forming the flower buds there was no interruption of growth in the shoot, and they came on the main axis.

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June 2, 1908

Vaccinium corymbosum

Culture 26 Plants all right. Algae abundant.

Culture 27. Four of the plants with all or part of the leaves browned. Algae few except toward the surface.

Culture 28. Plants all right. Algae little developed but apparently abundant.

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June 2, 1908

Vaccinium corymbosum

Aquarium. Basal shoots differ from ~~[illegible]~~ new growth from ~~[illegible]~~ axillary buds in their stouter growth, more purplish color and much greater development of glanduliferous hairs.

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June 2, 1908

Vaccinium corymbosum

Aquarium (North plant). Broke off the shooting buds on the new flowering shoot, a shooting bud on the older shoot with flowering buds, and removed the whole of a branching flowerless shoot, in an attempt to force the flowers.

June 3, 1908

Aquarium (middle plant). The three flowering buds on one of the old shoots have stood still for about ten days, three leafy buds lower down on the same shoot having grown out meanwhile. These are broken off today.

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June 3 1906.

Vaccinium corymbosum.

Culture 6. Two plants with roots (grass?) at the glass, no growth.
Culture 7. No roots at the glass.
Culture 8 No roots at glass.
Culture 9. One plant with roots at glass (grass?), no new growth.
Culture 10. No roots at glass.
Culture 11. Three plants with roots at glass, one showing 1 to 2 mm. of growth.
Culture 12. One plant with roots (grass?) at the glass. No growth.
Culture 13. No roots at glass
Culture 14 " "
Culture 15. One plant with roots at glass. New growth of about 2 mm.
Culture 16 No roots at glass
Culture 17. One plant with roots at glass. No new growth
Culture 18. No plant with roots at glass
Culture 19 No roots at glass
Culture 20 Two with roots at glass. No growth
Culture 21, 22 No roots at glass
Culture 23. Two with roots at glass one with 3 mm. new growth
Culture 24, 25 No roots at glass
Culture 26 One with roots at glass, No growth
Culture 27. No roots at glass.
Culture 28. One at glass 2 mm growth.
Culture 32. One at glass, 1 mm. growth.

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OFFICE OF
TAXONOMIC INVESTIGATIONS.

Vaccinium corymbosum June 3, 1908

Culture 10. A grass seed has germinated in one of the holes of the glass. It is slender, but with a long root well supplied with root hairs.

Culture 12. One [illegible] at the glass, with abundant root hairs.

The lime did not therefore prevent the pushing of the roots of seedlings.

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June 3, 1908.

Vaccinium corymbosum

Flowering plant in flat. Corolla of first flower fallen off. Second flower opened. It was slightly open last ~~night~~ evening. Pollen abundantly discharged from the stamens, much of it on the style, a few grains on the margins of the stigma. Pollen from the stamens placed artificially on the stigma.

No other flower buds are developing from this flowering bud.

June 4, 1908

Last night, some animal, apparently a snail, ate the new flower, including about half its ovary. The older ovary is slightly injured on its upper surface.

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June 4, 1908.

Vaccinium corymbosum

29a. Rootlets marked day before yesterday have grown, in the maximum case, 2 mm. Four other rootlets marked to-day, the former lined

31. Maximum growth in two days 3 mm., another 2 mm. Three new roots marked to-day, the others lined.

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June 6, 1908.

Vaccinium corymbosum

Mr. Robinson made acidity tests of the following, one each:

	June 6	June [illegible]
Cultures 9	Acid, distinctly	acid, distinctly.
11	Acid, slightly	acid, distinctly.
14	Acid, slightly	acid, moderately
15	Neutral	Neutral
17	Subacid	Neutral subacid
28	~~Neutral~~	Neutral

It is to be noted that the culture containing manure, no. 9, does not give an alkaline reaction, although it might have been expected to do so. The character of this manure must be considered. It was old ~~leached~~ manure, black, leached, and so far decomposed as to resemble humus. Well rotted manure, new and not leached might give quite different results.

The sand and the loam cultures gave neutral results.

June 6, 1906.

Vaccinium corymbosum

To-day gave 35 cc. water to the cultures as follows

Cultures 6-11, 14-16, 18-28, 32.

Did not water

Cultures 12, 13, 17.

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June 8, 1908

Vaccinium corymbosum

Cutting 6. Root growth in two pots, up to 9 mm.
Algae abundant.

Cutting 7. R. g. in one pot, up to 3 mm. Algae on sides abundant

8 " " " " " 8 " " "

9 " " 2 pots " 7 " "

10 Root growth none Algae on sides almost none

11 " " in " pots, up to 6 mm. Algae on sides abundant

12 " " none Algae abundant in spots, seemingly on glass where the soil has shrunk away.

13 Root growth none Algae abundant

14 " " " A " "

15

Vaccinium corymbosum June 10, 1908

Went to Lanham this morning with Robinson. Got material of mycorhizae for cultures, and tested several blueberry soils; all distinctly acid. Sphagnum water acid; fresh manure not acid; dried manure not acid.

Gave the glass pots 35 cc. of water each to-day.

United States Department of Agriculture,

OFFICE OF CHIEF CLERK.

WASHINGTON, D. C. ____________________, 1895.

MERCHANTS' DELIVERY CO.,
912 Pennsylvania Ave., N. W.,
Washington, D. C.

Gentlemen:

Please call at ____________________

____

for ____________________

____

and deliver the same at ____________________

____

Very respectfully,

____

Chief Clerk.

UNITED STATES DEPARTMENT OF AGRICULTURE,
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TAXONOMIC INVESTIGATIONS.

June 14, 1906

Vaccinium corymbosum

Occasional corollas still remaining white and fresh, many brown and still hanging on

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TAXONOMIC INVESTIGATIONS.

Greenfield, N. H.,
June 23, 1908

Mr. Byrnes,
Superintendent of Gardens and Grounds,
Department of Agriculture.

Dear Mr. Byrnes:

Will you have shipped to me ~~, preferably by mail,~~ ~~some of~~ the seedling blueberry plants in the Department greenhouses as follows:

Lot 1. The ~~potted~~ blueberries in the rose house in 3-~~inch~~ pots, except the half dozen plants that were photographed. These photographed plants should be kept ~~to be fe~~ by Mr. Quinn till my return. ~~in the~~ ~~at Washington, still in the rose house.~~

over 7 Lot 3. ~~2~~ The ~~potted~~ blueberries in greenhouse no. 3 ~~part~~ in ~~those~~ 3-inch pots, ~~part in 2-inch pots,~~ all potted last winter. Those in

Lot 2. Same as Lot 1, but in ~~two~~ 2-inch pots.

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TAXONOMIC INVESTIGATIONS.

glass pots, those potted recently in 3-inch pots, and about two dozen vigorous plants that were set aside for further study ~~in the middle bench to be kept at Washington,~~ should not be sent.

Lot 5.- ~~3~~ The blueberries in two flats in ~~the~~ one of the cold frames. ~~when I left.~~

Mr. Oliver knows where all the plants are and will show you just what ones ~~I mean.~~ make up the different lots.

Each lot should be kept distinct, as I am using them for experimental plantings, ~~It would be convenient to see if the lots could be shipped~~ either by shipping in separate sacks, each marked with the lot number, or by having each small package marked on the outside with its lot number, or both.

Lot 4. Same as ~~Lot~~ 3, but in 2-inch pots.

I would like to get the plants just as soon as you can have them shipped, ~~and in the order~~ beginning, with Lot ~~no~~ 1.

Very sincerely yours,
Frederick V. Coville.

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TAXONOMIC INVESTIGATIONS.

Greenfield, N. H.,
June 28, 1908.

Vaccinium pennsylvanicum

The drouth has affected Vaccinium pennsylvanicum by an early ripening of individual~~ly~~ berries and on thin, ledge soils by the small size of the ripened berries and by the withering of the smaller ones while still green.

Vaccinium canadense

Individual berries ripe.

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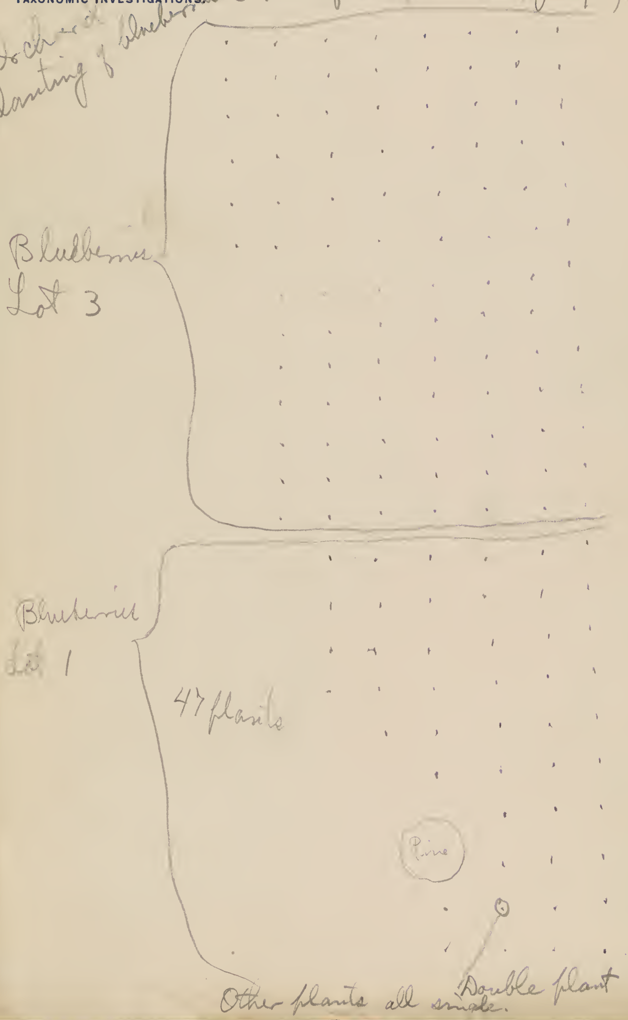
TAXONOMIC INVESTIGATIONS.

Greenfield, N. H., July 1, 1908

Orchard planting of blueberries



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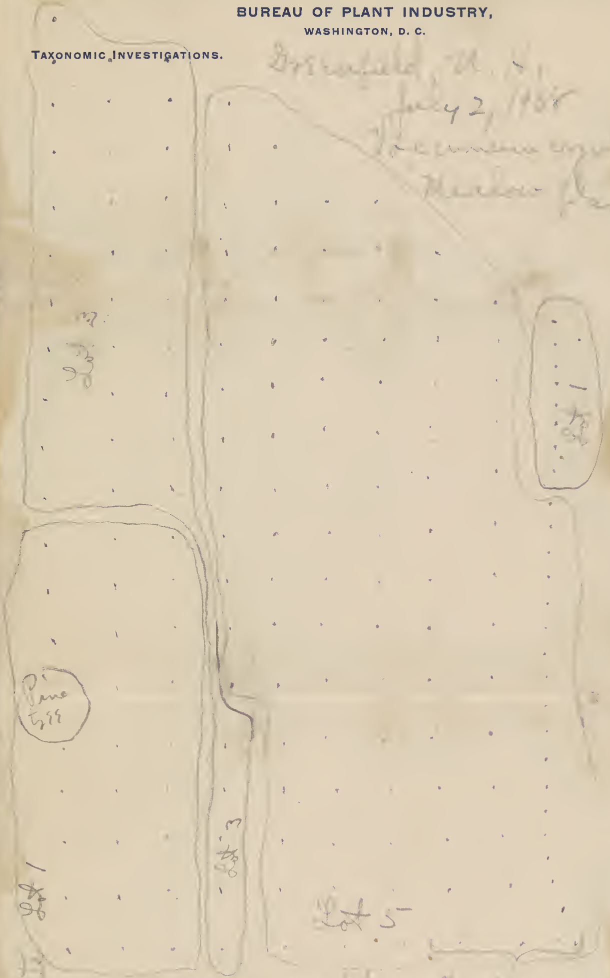
TAXONOMIC INVESTIGATIONS.

Greenfield, N. H.,
July 2, 1908
[illegible]
Meadow [illegible]



These four left hand rows of Lot [illegible] set out in sunny weather, not watered, wilted.

These three rows of Lot 5 set out [illegible] sunny [illegible] not wilted.

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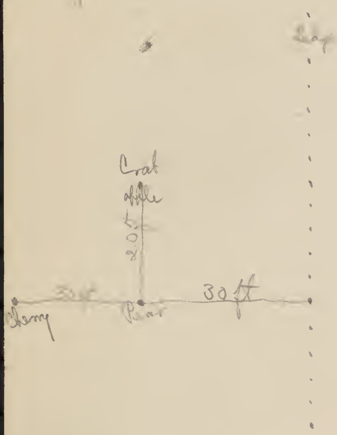
TAXONOMIC INVESTIGATIONS.

Greenfield, N. H. July 2, 1908.

This afternoon, in cloudy weather, set out nineteen plants of Vaccinium corymbosum, Lot 2, in the thin dry area in the south corner of the garden field



Plants 4 feet apart, skipping one place for the thin soil over a ledge

Plants all watered but not shaded.

Cloudy nearly day

July 3.

Soil dry and powdery

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TAXONOMIC INVESTIGATIONS.

Vaccinium corymbosum
July 3, 1908 Greenfield, N.H.

Added Lot 4 plants to wilted Lot 5 plants as follows, on the north side of the stake, except where noted.

Fourth row from west seventh plant from south
twelfth
Fifth " " " fifteenth
thirteenth
(south side of stake) seventh
fifth
Sixth " " " second
third
fourth
ninth
tenth
eleventh
Seventh " " " seventh
fifth
third
second
Eighth " " " eighth
Ninth eleventh
tenth
fifth
fourth
third
second
Tenth - - - - - - - - fourth
tenth

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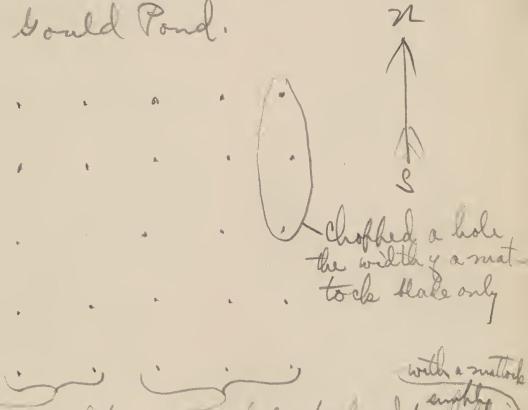
TAXONOMIC INVESTIGATIONS.

Greenfield, N. H. July 3, '06

This morning set out 25 holes of Vaccinium corymbosum plants Lot 4, on the sand plain, at a point just west of the sand bank at the northwest corner of Gould Pond.



Chopped a hole the width of a mattock blade only

These holes prepared by removing with a mattock the root layer of 2 to 3 inches, scooping off the underlying humus layer, digging out about 3 inches of yellow gravel, replacing the humus soil, the shakings from the sods and mulching with roots and dead leaves.

These holes prepared by simply chopping with a mattock the same area as before, & about 12 in diam.

Area cleared with a brush hook, chiefly Comptonia, Vacc. vacillans, and Populus deltoides, all making their fifth year's growth since the last fire.

Soil dry and plants all watered and shaded.

Vaccinium corymbosum.

11 }
16 } Watered with solutions
32 }

Others watered with tap water

Watered

June 15, all with clear water 35 cc.

18, water and solutions "

22 " " "

26 " " "

30 " " "

July 3 " " "

7 " " "

By Coville
July 6 " " "

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OFFICE OF
SEED AND PLANT INTRODUCTION
AND DISTRIBUTION.

Washington, D. C.,

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July 6/1908

Vaccinium corymbosum

Watered the aquarium with a 2-gallon sprinkler of water. This is the only watering since that following the setting out of the plants.

There is a slight growth of rootlets, probably of the Vaccinium plants, into the sphagnum covering ~~[illegible]~~ about the plants.

July 11, '08

The cuttings were looked at [illegible] infections in the [illegible] as I had to [illegible] the first watering

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July 13, 1908

Vaccinium corymbosum,

The general condition of the glass pot experiments is as follows:

1. There is much inequality in the moisture requirements of different specimens in each lot, a uniform watering apparently ~~keeping~~ tending to keep some too dry, some too moist. My impression is that the plants have been kept too dry.

2. The plants really need individual attention as to watering, if these continuous glass pots are used.

3. The roots are slow in covering the surface of the soil. It is believed that in potting they should be set much shallower especially if mulches are to be used.

4. The lack of uniformity of growth in individuals of the same lot is considerable, no- due largely, no doubt, to differences in the extent of root injury when the plants were taken from the flats, and differences in the amount of moisture and damaging to the roots when potted. In new experiments plants previously potted in two-inch ~~pots~~ and of uniform growth should be used. (over)

5. There is considerable difference in the amount of soil in the various pots. This should be made uniform in later experiments.

6. Manure with plenty of mineral salts in its juice should be used, instead of the old, leached, and almost humus manure used in Lots 6 and 9, if the supposed deleterious effect of manure is to be tested.

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July 18, 1908.

Vaccinium corymbosum.

The condition of the various lots with reference to their growth is as follows:

Lots 6 7 [illegible] + 9. Growth good, except as to individual pots ~~[illegible]~~

Lot 8. Growth good in 2 pots, fair in 2, poor in 2. The manure used was old and almost in the condition of humus.

Lot 10. The plants are all dead from

Lot 11. Growth good.

Lot 12. Plants all dead but one, that leafless but with a live bud at the base.

Lot 13. Plants all alive and making a feeble growth.

Lot 14. Growth good.

Lot 15. Growth fair

Lot 16. Growth fair to feeble, the new leaves on growing shoots often browning. Surface growth of algae very heavy and dark green.

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July 10 [illegible]

Lot 17. Growth fair to feeble, but new leaves show good condition.

Lot 18 + 19. Growth good, distinctly better than 6.

Lot 20. Two dead, 2 with green stems but leafless, 2 very feebly growing.

Lot 21. One with green stems but no leaves, the others maintaining a feeble growth.

Lot 22 + 23 Growth good, 23 distinctly better than 15,

Lot 24. Growth fair to good, better than 17. Mulch stays moist on this on 20 and on 21, while it is dry or nearly so on the 19, 22, and 23.

Lot 25. Growth fair to good.

Lot 26. Growth good, better than 6.

Lot 27. Growth feeble to fair, one without leaves, distinctly better than 13.

Lot 28. Growth fair to good, distinctly better than 15.

Lot 32. Growth fair in amount, but new leaves yellowish and tending to become brown blotched. Surface growth of algae on some of the pots heavy and dark green.

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Vaccinium corymbosum July 11, 1908

Watered all the greenhouse glass potted plants ep 16 and 32, with 55 cc each

July 13, 1908

Watered all the plants except 10, 12, 13, 17

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Lanham Md. July 3

Vaccinium corymbosum

All new twigs ~~of~~ have stopped their apical growth, the short twigs long since, the shoots more recently. The shoots are dried back from the tips, sometimes two or three inches, perhaps on account of the drouth.

The shoots of the trimmed plants have made a maximum growth of about two feet.

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July 11, 1908
Greenfield, N. H.

Vaccinium corymbosum

Cabot and I to-day picked one and a half quarts of berries from the 1907 seed bush ~~of 1907~~ on my place. This is the first picking this year.

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July 21, 1908

Vaccinium corymbosum
Largest berrys from the Brooks bush
.552

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Greenfield, N.H.,
July 2, 1908.

In the southerly end of Miss Peavey's pasture were some bushes of *Vaccinium corymbosum* that had fruited sparingly in the third season after cutting back, that is, the berries were borne on wood of the second year's growth from the stump. The bushes must have been cut back in the spring of 1906 or the fall of 1905.

Usually 4 or 5 years are required for a bush to fruit in fair abundance, and even then the mass of the bush is small, and its product relatively small

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July 22, 1908
Greenfield, N. H.

Berries less than 10 cm. in diameter from the Brooks seed bush of July 21, 1908, examined to-day showed fertile seeds as follows:

6
19

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Greenfield, N. H.
July 23, 1908.

Made bottled specimens of berries from two plants of Vaccinium (stenophyllum) on Peterboro Mountain to-day. The larger had 11 to 13 mm. berries, mostly 11 & 12, the smaller 11 + 12, mostly 11. Both are black, with ~~very~~ sweet mild flavor. The calyx of the smaller one is objectionable.

George D. Gould, Greenfield, N.H.

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Shipments of blueberries

Lowell

1905	Quarts	Net cents per box
July 11	44	12 1/2
12	32	8
13	24	12
14	64	12
15	78	12
18	111	12
19	120 ~~144~~	12
20	117	12
22	96 ~~128~~	11
26	112	11
27	64	10
28	148	10
31	124	10
Aug. 3	224	12
4	189	11
7	144	11
8	176	10
10	80	8
11	156	8
14	130	9

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1906

		Quarts	Net cents per box
July	17	31	15
	18	64	14
	19	96	13
	20	64	10
	21	144	10
	24	192	10
	25	186	10
	26	85	10
	28	216	9
	30	96	9
	31	144	9
Aug.	1	176	9
	2	201 ~~201~~	9
	6	224	8
	7	192	8
	9	218	8
	10	32	8
	11	80	8
	13	87	8
	14	143	9
	15	85	9

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1907

	Quarts	Net cents per pound
July 20	32	14 1/3
22	32	14 1/3
23	55	14 1/3
24	121	14 1/3
25	121	14 1/3
26 ?	64	14 1/3
29	128	13 1/5
30	160	13 1/5
31	128	13 1/5
Aug 1	160	12 1/4
2	89	12 1/4
3	160	12 1/3
5	155	12 1/3
6	213	11 1/3
7	129	11
8	152	11
9	192	11
12	180	11
14	160	11
15	107	11

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1908

	Quarts	Net cents per pound
June 29	25	16
July 2	28	16
3	43	14
6	83	14
7	24	14
8	32	14
9	64	14
10	95	11
11	50	13
13	117	12
14	87	12
16	107	12
18	48	12
20	89	12
21	151	12
23	139	12

etc.

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Greenfield, N.H.
July 26, 1908.

Picked from Stanley's bush a bottle of 11, 12, and 13 mm. berries.

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Greenfield, N.H.
July 26, 1908.

To-day picked slightly more than one quart of berries from the 1907 seed bush. With the one and a half quarts picked a week ago to-day this makes two and a half quarts from this bush this year.

Pouring off a handful of berries from the top of the pail they gaged as follows

8 mm	11 berries
9 "	106 "
10 "	8 "

Boston Wholesale Market Quotations on Blueberries,
~~1905~~
(Quotations in cents per quart)

1905

	No. C.	Penn.	Jersey	York state	Mass & N.H.	
June 1	14-15					
2	"					
5 (Mond.)	10-12					"North Carolina blueberries in light supply but rarely good enough to bring over 10-12 ¢".
6	"					
8	"					
9	"					
12 (Mond.)	"					
13	12-15					
15	10-15					"North Carolina blueberries sell well when choice large and dry".
16	"					
19 (Mond.)	"					
20	10-12					
22	"					"Good dry blueberries wanted and would exceed quotations".
23	10-13					
26 (Mond.)	8-10	10-15				
27	"	10-13				
29	"	8-12	8-10			
30	"	10-14		12-15	20-23 Rarities	"Blueberries are increasing and present prices will not be long sustained".

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1905

	No C.	Penn.	York State	Mass. N.H.
July 3	8-10	10-14	12-15	18-20
6	"	12-14	12-14	15-18
7	"	10-13	12-13	"
10(M.)	—	10-12	11-13	12-15
11		"	"	"
13	10-11	10-12	10-13	
14	10-12	10-12	10-13	
17(M.)	"	"	11-14	
18	"	"	"	
20	10-11	10-11	10-12	
21	"	"	"	
24(M.)	9-11	9-11	10-12	
25	10-12	9-11	12-14	
27	"	"	11-13	
28	"	"	"	
31(M.)	9-11	"	"	

"Blueberries in light supply on account of rain and choice dry berries ruling higher"

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1905

August	Penn.	York State	Mass + N.H.	Maine	N.S. + N.B.	
1	12-13	12-13	13-15			"Good dry blueberries in demand at 15¢"
2	"	"	"			
3	"	"	"		13-15	"Light in supply on account of rainy weather."
4	10-12	10-11	11-14		15-15	"Only very choice dry berries bringing full quotations."
(M.) 7	9-10	9-11	~~Mas~~ ~~11-13 11-13~~ 9-12	11-13	11-13	
8	8-10	8-10	8-11	10-12	11-12	
10	"	"	"	9-12	10-12	
11	7-9	7-9	7-10	8-11	9-11	"Blueberries coming in freely and only a few fancy large and dry exceed 9¢"
14 (M.)	7-8	7-8	7-10	8-10	9-10	
15	7-9	7-9	8-10	9-11	9-11	"Blueberries cleaned up well yesterday"
17	"	"	9-11 ~~10-12~~	10-12	10-12	
18	—	—	9-11	10-12	10-12	Blueberries were quite plenty early in the week with most sales at 7-9¢ but since Monday have been in light supply on account of rain, and at the close are selling well at 10-12¢ good to choice berries
21			"	"	"	
22			8-11	"	"	
24			8-10	"	"	
25			"	"	"	
28			8-10	9-12	9-12	
29			"	"	"	
31			"	9-11	9-11	

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1905

	Mass + N.H.	Maine	N.S. + N.B.
Sept. 1	8-10	9-11	9-11
5	"	"	"
7	"	"	"
8	—	10-12	10-12
11 (Monday)		"	"
12		"	"
14		"	"
15		"	"
18 (M.)		"	"
19		"	"
21		"	"
22		—	"
25 (M.)			"
26			"
28			"
29			"

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June 1906

	Penn.	Mass & N.H.
28	20-	
29	15-17	~~20-23~~

July

	Penn.	Mass & N.H.	York State	New Brunswick ~~and N~~ and Nova Scotia
2 (Mond.)	15-17	20-23		
3	13-15	20-22		
5	11-13	18-		
6	10-12	15-18		
9	"	14-16		
10	12-15	15-18	12-15	
12	"	15-17	"	
13	12-14	13-16	12-14	
16	12-13	14-15	12-13	
17	12-	12-15	10-12	
19	"	"	"	
20	"	"	"	
23 (Mond.)	11-12	12-15	10-12	
24	12-	14-15	12-	
26	10-11	10-12	10-11	
27	9-10	9-11	9-10	
30	8-10	8-11	8-10	10-11-
31	—	"	—	10-11

"Blue

"Receipts of blueberries increased slowly and choice dry berries are in good demand"

"Blueberries more plenty and lower"

"Blueberries in moderate supply and some fancy dry lots exceed quotations"

"Receipts of blueberries are still moderate and choice dry berries in good demand".

"Blueberries scarce on account of rain but most lots too [illegible] to bring any advance in prices."

"Blueberries were in light supply until yesterday but late receipts liberal and prices lower.

"Blueberries in heavy supply, lower, and weak"

"Blueberries in heavy supply and generally dull and weak, but few N. E. berries good enough to exceed 10¢"

UNITED STATES DEPARTMENT OF AGRICULTURE,
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WASHINGTON, D. C.

OFFICE OF THE BOTANIST.

1906

	Mass & N.H.	Maine	N.B. & N.S.		
August 2	9-11	9-11	10-11		
3	9-12	9-12	10-12		"Blueberries in moderate supply; today and choice dry berries, when they can be found, sell easily at 12 ¢
6 (Mon.)	"	"	"		
7	"	"	"		
9	8-12	9-13	9-13		"Blueberries coming generally soft and wet
10	"	10-13	10-13		"Receipts of blueberries are moderate and choice dry berries in good demand
13 Mon.	7-10	8-11	8-11		"Blueberries a little more plenty:
14	"	"	"		Blueberries in full supply".
16	6-10	8-11	8-11		Blueberries have been in good supply but only a few choice and dry".
17	"	"	"		
20	"	"	"		Blueberries plenty but irregular in quality and condition
21	"	"	"		
23	6-10	8-12	8-12		Receipts of blueberries have been light of late and choice dry berries exceed quotations".
24	"	"	"		
			New Brunswick	Nova Scotia	
27	6-12	8-12	8-12	10-13	
28	6-12	9-13	9-13	10-14	
30	6-12	10-14	10-14	10-15	"Choice dry berries scarce at 14-15 ¢"
31	"	"	"	"	"Blueberries scarce and high"

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1906.

	Mass & N.H.	Maine	New Br.	Nova Scotia	
Sept 4	6-12	10-14	10-14	10-15	"Blueberries scarce but selling steady at the high prices"
6	"	"	"	"	
7	"	"	"	"	"Very few blue- berries coming"
10 (Mond.)	——	"	"	"	"Blueberries about done"
11		"	"	"	
13		10-12	10-12	10-13	"Few blueberries good enough to bring over 10-12¢
14		"	"	"	
17		"	"	"	
18		"	"	"	

Highest priced apples

Gravenstein
Wolf River
Mackintosh red

UNITED STATES DEPARTMENT OF AGRICULTURE,
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~~Boston Produce Market Report~~

~~July~~ 1907

July

8	Southern	18-20
9	Penn	20-
	South	17-20
11	Mass & N.H.	20-23
	Penn	14-16
12	Mass & N.H.	18-20
	Penn	14-17
15		18-20
		14-16
16		18-20
		14-16
18		15-18
		12-14
19		15-[illegible]
		13-[illegible]
22		13-[illegible]
		13-15
23		14-16
		13-15
25		13-17
		12-14
26		12-15
		12-13
29		13-15
		12-13
30		13-15
		13-14

(Cont'd)

U. S. Department of Agriculture.
Official Business.
PENALTY FOR PRIVATE USE, $300.

WASHINGTON, D.C. JUL 20 1908

Monday

Friday

Monday

Mr. Frederick V. Coville,
Greenfield,
Hillsboro County,
New Hampshire.

August, 1907

	Mass. & N. H.	Penn.	Maine	New Brunswick	Nova Scotia
1	11-14	10-11	11-12		
2 (Friday)	10-12	10-	10-12		
5 (Monday)	11-13	10-11	11-13		
6	12-15		12-15		
8	12-15		12-15		
9	12-15		12-15		
12 (Monday)	11-13		11-13	10-11	
13	10-12		11-13	10-11	11-13

		Maine	New Brunswick	Nova Scotia
15	10-12	10-12	10-12	11-12
16 (Friday)	9-12	9-12	9-12	10-12
19 (Monday)	9-12	9-12	9-12	10-12
20	8-11	8-11	8-11	9-11
22	8-11	8-11	8-11	10-12
23 (Friday)	10-12	10-12	10-12	10-12
26 (Monday)	10-12	10-12	10-12	10-12
27	10-12	10-12	10-12	10-12
29	10-12	10-12	10-12	10-12
30	"	"	"	"

Sept, 1907

	Mass + N.H.	Maine	New Brunswick	Nova Scotia
3	10-12	10-12	8-12	8-12
5	"	"	8-10	"
6	10-11	10-11	9-11	10-11
9 (Monday)	"	"	"	"
10	"	"	"	12-15
12	—	—	10-12	12-15
13	—	—	"	"
16 (Monday)			8-10	10-11
17			8-10	9-11
19			8-9	9-11
20			"	"
23 (Monday)			"	"
24			8-9	8-11

26 "Blueberries practically a thing of the past and hardly quotable"

1908

June 12 No. Carolina 12-15 "North Carolina blueberries straggle in in small lots but have run, so far this season, poor in quality."

15 (Mond.) 12-18 "Blueberries when sound and firm bring good returns".

16 "

18 " — "Practically no blueberries offering"

19 "

22 (Mond.) 12-15 "Blueberries are lower"

23 "

25 10-12 Penn. 16-18 — "Blueberries continue mostly very poor in quality"

26 No. Car. 10-12 Penn. 12-13 Jer. State 16-18 Mass. + N.H. 20-22 "Blueberries are coming quite freely"

29 — 12-13 12-14 18-20

30 " " 16-18 "It takes choice big berries to bring full quotations".

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1908

	Jersey ~~Mass N.H.~~	Penn.	York State	Mass & N.H.	
July 2	10-12	12-13	12-14	12-16	
3	"	"	"	"	
6 (Mon.)	"	"	"	"	"Blueberries are still limited in supply and all good colored dry berries hold well sustained in price".
7	—	10-12	10-12	12-15	"Fancy blueberries still bring good returns but this grade is limited.

	Penn	York State	Mass & N.H.	Nova Scotia	
9	10-12	10-12	12-15		
10	"	"	11-15		
13 (Mon)	10-11	10-11	11-13		
14	9-11	—	10-13		
16	10-12		10-14		"Blueberries in lighter supply to-day and bring firmer prices"
17	"		"		
20	10-11		10-14		
21	"		"		
23	—		"	14-18	
24			"	14-16	
27 (Monday)			"	12-15	
28			9-12	12-14	

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Cherryfield Me. July 30, 1908.

Owner gets ?? 16¢ per bushel Wilson Wrong company 96¢
Lessee gets 24¢ per bushel ~~for~~ (hauling)
Picker~~s~~ gets about 5-6¢ " " (1 3/4¢ per quart).

Pickers average about 4 bushels per day, 3 to 5 bushels. A man can make about $2.00 per day

Biggest crop 1900 bushels on 9 square miles

Smooth plains, Narraguagus River

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Cherryfield, Me., July 30, 1908
G. G. Freeman

Highest picking 12 bushels
Ordinary picking 3 to 5 "
Ordinary price 2 cts per quart
Old hand picking ~~[illegible]~~
100 quarts, ~~best~~ extraordinary pickers.
Ordinarily 4 quarts per hour now hand picking for crating
Canning begins about August 5

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Cherryfield, Me., July 30, 1908

A. M. Mathews

Ships crated blueberries, hand picked.

Blueberry factorys

2 at Cherryfield
2 at Columbia Falls
1 at Columbia
1 at Harrington
3 Ayers Junction
1 at Machias
All in Washington Co.

1 at Surrey
Hancock County.

Began paying 11¢ this year, buying outright; will have to pay about 2¢ more per qt. ~~than~~ for hand picked berries than the factories pay for raked berries, 6 to 8 ¢

Pays this year about 8¢ to pickers, himself running the stumpage.
Markets mostly in Maine

Ships 30 crates per day? (24 to-day)

Began shipping this year July 1, usually about July 15, Continues till Sept 15, sometimes to Oct 1. Early berries from Tunk Mountain:

~~Frt~~ express to Boston. 60 cents per crate

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Cherryfield, Me. July 30, 1908

Mostly from Mr. Stewart

Wyman factory

Maximum year 12000 bushels canned
Lowest 2500 "

Stewart factory

Maximum about 5000 bushels.

When factories buy berries outright, they pay from 6 to (last year) 8 cents per quart

~~Canadian tariff~~

Tariff on Canadian berries 1¢ per quart, on canned berries 40% ad valorem. Condition has led to establishment of canneries on American side of border.

One 80-acre has produced in good years nearly 1000 bushels, this year will produce about 600 bushels

---

First blueberry ~~in~~ cannery in this region, started by A. L. Stuart in 1861 at Cherryfield.

Stumpage 3¢ per quart

---

2 pound cans $1.20 a case, gallons $5.00 a case

Pot Number	Litmus Reaction		Pot Number	Litmus Reaction	
1	4	4	25	1	1
3	2	2	26	1	1
4	3	3	27	3	3
5	4	4	28	2½	2½
6	2	2	32	3	3
7	2	2			
8	2	2			
9	2	2			
10	5	5			
11	1	1			
12	4	4			
13	3	2½			
14	2	2			
15	4	4			
16	4	4			
17	3	3			
18	1½	2			
19	1	1			
20	2½	2½			
21	1½	2½			
22	2½	2½			
23	1½	1½			
24	1	1			

Key to litmus reaction

1 - acid
2 - mildly acid
3 - neutral
4 - mildly alkaline
5 - alkaline

Tested Aug 1 '08

oct 15

Pot	reaction
no 10.	# 5
no. 12	# 4
no. 16	# 4
no. 32	# 3-2.

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Greenfield, N.H.
August 1, 1906

Blueberries in new boxes.

All alive and growing (~~many~~ most of them strongly making new growth), except the following:

Second from north in third row from west, making ~~—~~ feeble spindling growth, the leaves small. ~~Same row~~

Fourth row from west. Ninth plant from north dead

Fifth " " . First plant from north (small but growing nicely) accidentally pulled up. Replanted. Second plant from north end partly dead, but making feeble new growth.

Ninth row from west Seventh plant from north partly dead but one stem making feeble new growth from base

Tenth row from west Third plant from north partly dead, but with sprouting leaf buds.

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Greenfield, N.H.
August 1, 1905

Blueberries in garden field.

Plants 6, ~~&~~ 7, 9, 13, from east end nearly dead.

The plants growing best are 1, 2 & 3, shaded early in the day by the woods,

5, 8, & 14.

These plants were never shaded, and they suffered from that fact,

Plants 1, 3, 5, 7, 9, 11, 13, 15, 17, and 19, were mulched with half rotten leaves about July, by Mr. Coville.

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Greenfield, N. H.
Aug. 2, 1908.

The row of blueberry plants north west of the driveway

Of the Lot ~~four~~ 4 plants (northwest end) forty ~~[illegible]~~ are alive, — most of them still making new growth, while five are dead

Of the Lot 25 plants twenty-six are alive and growing, none (apparently) dead.

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Greenfield, N.H.
August 2, 1908

Number of berries of various sizes in a pint of berries from the Brooks seed bush, picked to-day. This pint was measured out of a clean picking of the bush amounting to a little more than a pint and a half.

7-8 mm.	2	berries
8-9 "	50	"
9-10 "	191	
10-11 "	278	
11-12 "	137	
12-13 "	10	
13-14 "	3	

Only the berries 10-11 or larger were saved for seed. From a quart of berries a little less than 3/4 of a quart were of the requisite size.

From the whole picking of to-day ~~were~~ a little more than a quart were of the requisite size.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
SEED AND PLANT INTRODUCTION AND DISTRIBUTION:

August 6 '08

Culture 6. Growing well but one ~~two~~ of the plants with and watery bullate leaves.

7. Growing well

8. Plants now feebler and yellower than no. 7.

9. Better than 8, but two with yellowish leaves.

10. Dead

11. Best of any so far

12. All dead but one, that with no leaves [illegible] green [illegible] bud at the base

13. Two dead, others feeble and yellow

14. Growing fairly well, but leaves brownish scalded.

15. Growth fair, but leaves small & light colored

16. Leaves all dead, stalks of four green below

17. Growth feeble.

18. Growth excellent like that of no. 11.

19. Growth excellent.

20. Four dead, two leafless, Two [illegible]

21. All feeble, one leafless.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
SEED AND PLANT INTRODUCTION AND DISTRIBUTION.

Aug 6, 1905. Exam

22. Growth, except in one ja
23. Growth excellent.
24. Growth fair.
25. Excellent
26. excellent
27. One leafless, two feeble, thre
good
28. Fair to good
29. Five dead, one feeble an
yellow.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
SEED AND PLANT INTRODUCTION AND DISTRIBUTION.

Aug. 6, 1908

Brooks bush cuttings planted in cutting bed July 27, 1908.
Gould bush set in July 28/08

No calluses formed on either cuttings.

Brooks bush yellowing and dropping its leaves,

~~[illegible]~~

GREE FL

Hersey

Hingham,

Mass.

Albree Bressy Ind. Cat. 2 or 3 years ago.

Soil for blueberries

Sand	2 pts.	
Peat	1 pt.	
Leaf mold	1 pt.	Leaves and humus, two years rotted
Loam	1 pt	Sod, rotted.

Jackson Dawson
Brookline, Mass

August 1908

Aug 12, 1908

Dry seed from two quarts berries, Brooks bush, measures this morning 23 cc.

1 cc. taken out for examination. Remainder sowed today by Mr. Goucher in the following mixture:

Peat (kalmia)	8 parts
Sand (coarse)	2 "
Live sphagnum	2 "
Loam	1 "
	13

August 12, 1908

Plants of the 1907 seeding, main potting, belonging to those planted at Springfield as Lots 1 and 3 repotted in the following mixture, 5 inch pots

Peat (kalmia) 2 parts
Sand (coarse) 1 "
Loam 1 "

Soil 1½ inches below top of pot.

Tallest plants of ~~the~~ Lot 3 one foot in height, with stem 4 mm. diam. Stems mostly 3 or less.

Tallest plant of Lot 1 16 inches high, 5 mm. diam.

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TAXONOMIC INVESTIGATIONS.

Beth writes that she made blueberry pie September [illegible] 9th, 1908, probably the last of the season.

Culture 40 Vaccinium membranaceum ~~scoparium~~
Four Mile Creek, near Pelican Bay,
Klamath County, Oregon, September
1908. Seeds sowed 1908, in Leaf mold 2 parts, sand 1 part,
loam 1 part. Seeds

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TAXONOMIC INVESTIGATIONS.

October 7, 1908.

After reading Fred W. Morse's statements (Humus in New Hampshire Soils [Bull. 138 N. H. Agr. Exp. Sta.] ~~B~~ regarding the poverty of sandy soils in humus and their consequent poverty.

In a sandy soil the soluble nitrates, such as exist in nitrified humus, apparently are leached away by rain leaving only the raw humus. In measuring humus in soils a distinction should be made between raw humus and nitrified humus. I suspect it may then appear that in sandy soils raw humus either is in quantitative excess of that in clayey soils ~~or~~ at least ~~that~~ its influence must preponderate over that of the nitrified humus.

(over)

(over)

October 8

It appears that the word _humus_ as used by chemists applies only to ~~the~~ decomposed vegetable matter which has lost its cellular (or vegetal) structure, and that to the chemists what I have called raw humus is not known as humus at all, but ~~is known~~ is covered by the term _organic matter_. ~~[illegible] included in the~~

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Washington, October 8, 1908.

Vaccinium corymbosum.

Pots on office window sill.

Watered by Mr. Flannery August 12 to ~~Sept~~ Oct. 1.

No. 2a. Plant. 21 cm. high. Ripening its wood and dropping its leaves.

No. 2b. Plant 14 cm. high. Ripening its wood and dropping its leaves.

No. 29a. Plant 21 cm. high from surface of moss. Wood ripening, leaves purpling. Root growth in the old soil has been almost none, in the live sphagnum layer above it is conspicuous and luxuriant. Roots to be photographed.

No. 29b Plant 22 cm. Same condition as to wood leaves and roots. Roots to be photographed.

No. 30a Died in August.

No. 30b. Plant 32 cm. high from surface of moss. Wood on the two early shoots ripening. In addition there are four recent shoots 1 to ~~4~~ 13 cm. long, (?) one still growing. ~~I believe that~~ This plant may have been kept too wet. It certainly was too wet on the day of my return, as were also nos. 19 + 25. Roots well developed through ~~Nos~~ the leaf mould, hardly any more conspicuously developed in the moss layer. Sphagnum not growing well, other mosses growing on it.

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Washington, October 9, 1908.

Purchased to-day, of the Alphonso Young Co., for 20 ¢ a can (tin) of blueberries. Weight 24 ounces. Can 5-5/8 inches high 4 3/8 inches in diameter.

On one face the following:

Robin Hood
Brand

[Vignette of
Robin Hood]

Canada
Blueberries

On the other face this:

Robin Hood

[Vignette of
blueberry twig
in fruit &

Canada
Blueberries

On the remaining space this, in small letters:

R. C. Williams & Co
Selling Agents
Hudson & Thomas streets
New York

Label preserved

Robin Hood

CANADA

Blueberries

R C WILLIAMS & CO.
SELLING AGENTS,
HUDSON & THOMAS STS,
NEW YORK.

Robin Hood
Brand

CANADA

Blueberries

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OFFICE OF
TAXONOMIC INVESTIGATIONS.

Washington, Oct. 9, 1908.

Bought at Cornwell's to-day a can of blueberries put up by Coffin at Columbia Falls Maine. Can same size as that of the other blueberries bought of Alphonso Youngs Co. to-day. Label soaked off and saved.

Price 25¢ per can, or $\$1^{\underline{75}}$ per dozen.

Berries poor, with many stems and some leaves.

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TAXONOMIC INVESTIGATIONS.

Washington, October 10/1908
(Continuation of Oct. 8 observations)

No. 31 Plant 33.5 cm. high, four stems, one 2-branched. Ripening its wood but leaves not yet shedding. Root development in the leaf mold luxuriant, in the old soil practically none. Roots not tending to remain at the surface, but penetrating the leaf mold to the bottom of the glass. Roots to be photographed.

No. 6. Plant 21 cm. high, five stems all ripening their wood but not shedding their leaves yet. Root development uniform to base of pot, fairly luxuriant, with no tendency to be superficial.

No. 15. Plant 13 cm. high 5 stems, all ripening wood, the older smaller stems beginning to shed. Leaves small 12 to 21 mm. long. Roots moderately developed, most abundant toward the bottom of the glass, largely dark or black, possibly from an alga. Roots to be photographed.

No. 17. Plant 16 cm., 3 stems, wood ripening, leaves not yet shedding. Roots hardly discernible, no superficial tendency. Largest leaf 30 mm. long.

Washington, October 10 (Con.)

No. 19. Plant 23 cm. high, 12 stems, of these 3 recent and 2 of the these still growing at the tip. This plant was much too wet when I came. Root development going to the bottom of the glass, but ~~[illegible]~~ more robust and abundant in the surface layer of leaf mold.

No. 22. Plant 18 cm. high, 3 stems, one 2-branched, one 3-branched. Root development much more conspicuous in the surface leaf mold, hardly any roots toward base of pot.

No. 23. Plant 19 cm. high., 6 stems, the largest 3-branched toward the tip and two of the branches terminated by a flowering bud. Root development extensive through the sand, but especially abundant and conspicuous in the surface layer of leaf mold. To be photographed.

No. 24. Plant 14.5 cm. high, original shoot dead, the second one 4-branched. Root development very feeble in the loam, though some new root tips even now visible; no roots at all seen in the surface leaf-mold. Roots to be photographed.

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TAXONOMIC INVESTIGATIONS.

Washington, October 10

No. 25 – Plant 15.5 cm. high, 6-branched, two of the branches 2-branched. Wood mostly ripening, but subterminal buds on two of the branches growing. The plant was much too wet when I came. Roots fairly well developed throughout the pot, with no tendency to be superficial, but with greater development in the upper half of the pot.

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TAXONOMIC INVESTIGATIONS.

Washington Oct. 10, 1908.

Vaccinium corymbosum

Greenhouse glass cultures

No. 6. Growth good. Root development generally fair to good.

No. 7 Plants not distinguishable from No. 6 in tops or roots.

No. 8. Plants of rather poor growth. Root development generally distributed but scanty and resembling that in the loam or loam and manure soils.

No. 9. Intermediate in tops and roots between No. 6 & No. 8.

No. 10. Long since dead.

No. 11. Plants about equal in top growth to No. 6. Root development rather better.

No. 12. Plants long since dead except one that barely alive (a bud expanded at the base of a previous leafless stem)

No. 13. Two plants long since dead, four alive and growing but with almost no roots and with feeble tops.

No. 14. Tops of fair growth, the leaves badly reddened. Roots growth fair to scant.

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[illegible]

No. 15. Tops scant, of a little less growth than No. 14, leaves also reddened. Root growth fair to good, better than No. 14.

No. 16. Plants long since dead.

No. 17. Growth of tops about like No. 15, but leaves still green. Root development almost indiscernible.

No. 18. Top growth excellent, probably a little better than No. 6. Root growth profuse, much exceeding that of any from No. 6 to No. 17, ~~but~~ ~~[illegible]~~ generally distributed (even to the bottom of the glass) ~~but~~ except for the top half inch; this failure probably due to dryness of the surface soil.

No. 19. Tops of good growth, equal to No. 6. Root development good, but the roots in the watered mulch not at all or only in the lower layers; this doubtless due to dryness of this top layer.

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WASHINGTON, D. C.

Oct 10, [illegible]

OFFICE OF
TAXONOMIC INVESTIGATIONS.

No. 20. Four plants long since dead, two small alive, but leafless or nearly so.

No. 21. Plants all alive but in only a little better condition than no. ~~3~~ 13. In the (two best) plants the roots have found ~~this~~ mulch and made some growth in it notwithstanding the probable dryness of the mulch.

No. 22. Tops of fair growth but the leaves not reddened. Root growth fair, but in the mulch developed only in the lower layers. With more moisture the roots promise to develop extensively there.

No. 23. Tops fair, distinctly better than no. 18, the leaves green or purple, not bright red. Roots fair to good; in the mulch developed ~~little~~ not at all or only in the lower layers.

No. 24. Tops a little better than no. 17. Roots none visible in the clay, in the best plants considerably developed in the mulch.

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(D.S. 19/1908 (con.)

No. 25 – Same condition as no. 18, but roots have penetrated little into the mulch ~~layer~~ doubtless from lack of moisture.

No. 26. Tops good, perhaps a little better than no. 6–7. Roots good, but not developed as much in the sphagnum as in the soil below. The sphagnum looks as if it had been mostly dry at times.

No. 27. Four of the plants distinctly better than no. 13, ~~and~~ with evident root development in the sphagnum.

No. 28. Tops of about the same growth as no. 15, but the flowers not so bright red; not so well developed as no. 23. Roots extensively developed in the sphagnum.

No. 32. Plants long since dead.

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Washington, October 12, 1908

Vaccinium corymbosum.

The cuttings of the Gould and Brooks bushes made in July and sent to the Department ~~for~~ to be rooted are still alive though mostly leafless and with ~~wholly~~ stems partly blackened. The cuttings have developed a good-sized callus, but have made no roots.

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Washington Oct. 13 1908

Brooks blueberry, sowed August 2, 1908.
Began to germinate (i.e. show above ground), vide Mr. Gonger, Sept. 18, 1908.

To-day the ~~germination~~ plants are abundant over all the four flats ~~&~~ germination still going on in abundance. The largest plants, about 1 cm. high, have four leaves besides the cotyledons.

Washington Oct 19 1908

Nicotiana angustifolium

Glass cultures 10, 12, 16, and 32 were closed up to-day a sample of each being kept for chemical test. In these four cultures only one plant (a no 12) is alive. This will be repotted.

Additional dead plants were discarded as follows:

No. 13, two plants
12, four plants

One plant of nos. 18, 24, & 25 taken out to be photographed

Washington,
Oct. 15, 1908

This morning denuded, of its leaves, one of the thrifty plants in the rose house, to see if that would have a beneficial effect on the production of flowers from the flowering buds.

The denuded plant has three stems, the oldest and smallest with no flowering buds, the next (3-branched) with 10 flowering buds, the largest with 13. Wood all ripened.

A similar plant not denuded also has three stems, the smallest with no flowering buds, the next with four buds, the largest with eight. Wood all ripened.

Denuded also a much-branched plant in the rose house and cut off the two smallest branches (they bore no flowering buds). Six branches are left, three with ripened wood, three with wood not quite ripe. Of the three with ripened wood, the lowest (3-branched) has 4 buds, the next (simple) 1 bud, the next (the uppermost on the plant) and 3-branched 16 buds. Of the three new branches (all simple) the lowest has 2 buds, the next (the largest) 5 buds, and the uppermost 2 buds.
(over)

The plant nearest like this second denuded one, but larger, is the many branched one taken out of the asparagus bed.

Denuded one of the these plants in the aquarium, except two growing ~~[illegible]~~ shoots, one of these already showing ~~flower~~ buds, apparently flower buds, in the near-terminal scales.)

The large plant, not denuded, has few flowering buds. The middle plant is to be used for cuttings.

Photographs
(October 14 to 16) 1908

Half size whole plant and glass pot

29a
29b
31
15
23
24
from window sill

18
24
25
From green-house.

Natural size, glass pot and roots

All the above except the no 24 from the window sill, which was replaced by the 24 from the greenhouse.

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Washington Oct. 13, 1908

Vaccinium

Layered three branches in the aquarium to-day, one a root stock on the denuded plant, two branches on the large bush.

Placed a leaf mold mulch (from the greenhouse stocks) of a glass pot full on each of the 35 1907 seedling plants now in the rose house. The mulch is about an inch deep.

Cultures 33 to 36 are from cuttings made from some of the smaller potted plants (1907 seedlings) grown for the past few months in the rose house. The cuttings were made by Mr. Oliver and were potted by him and by me today (October 19, 1908). The sand is the same as that used in the ordinary propagating work in the Department greenhouses. Kalmia peat was procured yesterday from underneath some Kalmia bushes on the Virginia side of the Potomac, opposite Plummer's Island.

Culture 37. These cuttings were made from various plants, all, however, of 1907 seedlings. An attempt is being made by Mr. Gage to root them in the ordinary way, in damp sand in the propagating house, using a bell jar to retain the moisture. They were started on October

Washington Oct. 20, 1908

The following moved to-day from the greenhouse to a covered cold frame open at the sides

Cultures 6, 7, 8, 9, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28,

Also 38, 41, and 42.

Oct. 23, 1908.

Sparrows ate some of the buds of the five blueberry plants in the rose house. They were then covered with cheese cloth.

Layered one of the new shoots on the denuded plant in the aquarium.

Oct. 24, 1908

Seeds of the Brooks plant sowed on August 12 (Culture 39) still germinating.

Culture 43. Washington, Oct. 24, 1908

Pricked out 80 plants (No. 39) from the flats in which the Brooks seedlings were sowed on August 12 and reset them at a distance of 2 inches apart in a flat containing a depth of two inches of the following soil mixture

	Parts
Kalmia peat (several months under a shed; rubbed through a quarter-inch sieve)	8
Sand (rough-grained silver, washed)	1
Loam (common clay, sifted)	1

These were thoroughly rubbed together and trodden hard into the flat

The plants, ~~are~~ the largest in the flats, were 15 to 20 mm. high and had 3 to 6 leaves besides the cotyledons.

Oct. 29/1908

Culture 37. Some of the youngest cuttings with tender leaves dropping their leaves. Buds generally starting.

Washington Oct. 25 1908

Vaccinium corymbosum

The ~~[illegible]~~ rootstock ~~of~~ layered in the aquarium plant a few days has withered leaves. The stem has turned brown for an inch above the point where it emerges from the ground. The end toward the plant is alive.

Leafbuds on the denuded plants sti

ing, and flowering buds also.

Buds on some of the cuttings in each of Cultures 33, 34, 35, & 36 starting

Leaves all green still. In No. 35 the cut ends of the stem are a little swollen, me fungi. In no. 36 there is an abundant growth of fungus mycelium in the hollow at the base of the cutting.

Culture 43. Plants all in good condition, none flagged.

Culture 39. Seeds still germinating.

Washington, Oct. 27, 1908

Layered two plants of <u>Vaccinium corymbosum</u> at Lanham to-day, one of 3 suckers in the ravine, one an old bush (1/2 inch). The young branches are brittle, with a ~~heavy~~ large pith gorged with stored food and with little wood.

Brought in some blueberry mold, containing a small amount of rotted pine leaf and considerable sand. Put it through a fine screen.

Culture 45. Consists of twelve pots of Culture 44 with a very thin mulch of the blueberry mold brought from Lanham to-day, Oct. 27, 1908

Washington October 28, 1908

Culture 46. Twenty four seedlings from Culture 39 (with 4 to 6 leaves besides the cotyledons, and about 15 mm high) potted in thumb pots in blueberry mold brought yesterday from Lanham

Washington Oct. 26, 1908

Culture 39 ——— Seeds still germinating

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Washington, Oct. 24, 1908.

Culture 47

To-day potted a flat (56 pots) of thumb pots from Culture 34, making the same soil mixture as Culture 44, and packing loosely a small amount of the same between the pots.

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Washington Oct 31, 1906

Culture 35. The cuttings ~~are~~ show~~ing~~ clearly that the brown start-ers at the ~~bottom~~ lower end, previously noted, is really a callus. In no 36 no callus can be seen.

Culture 37. Two cuttings taken out of the sand and replaced had large well developed calluses

Culture 40. Vaccinium membranaceum Two seedlings, apparently of the Vaccinium, noted to-day. Sowed on September 23.

Culture 37. Seeds still sprouting

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Washington, Nov. 2, 1908

Culture 39. Seeds still germinating.

[Nov., 1908]

Observation

When ~~peat~~ formation of kalmia peat is going on ~~in~~ what happens if the layer of rotten leaves becomes dry throughout

United States Department of Agriculture,

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WASHINGTON, D. C. ...., 1895.

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Washington, Nov. 2, 1908.

Culture 37. The flowering buds on some of the cuttings, which were noted some days ago as having started, are now well opened and the flower buds themselves white. One is even in flower, 9 mm. long, oblong cylindrical in outline.

Culture 6 One plant with flowering buds, 6
7 One plant with 5 flowering buds
" " " 4 " "
" " " 4 "
" " " 3 "
8 Plants with 2, ~~3~~ 1, and 1 flowering buds
9 Plants with 1 $_2$ and 1 flowering buds.
~~12~~ 11 " " 2 & 8 " "
12 Plant with no " "
13 Plants " " " "
14 Plants with 3, 1, 3,
15 " " no " "
17 " " " " "
18 " " 4 & 5$_2$ " "
19 " " 1, 2, 4,$_2$ 3. " "
20 " " no " "

~~7,22~~ Nov. 2, 1908 (con)

Culture 20 Plants with no flowering buds.
23 " " 1, 4 " "
24 " " 1, 5, 5 " "
25 " " 9, 13 " "
26 " " 3, 7, 4, 1 " "
27 " " 1, 1, " "
28 " " no " "

Culture 40. Vaccinium membranaceum.
Six seedlings believed to be those of the
Vaccinium are up in the flat to [illegible]

29 Plants with no flowering buds
30 b Plant with 1 " "
31 " " no " "
2 a " " " " "
2 b " " " " "

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Washington, Nov 3, 1908

Cultures 40. ~~Eight~~ Eleven seedlings up to-day, three erect and ~~five~~ eight bowed.

Aquarium plant. The tips of all the layered branches except one were dead some days ago, blackening upward from the point at which they were sliced. One, on the large plant is still in condition and two more branches are put down to-day.

Both the plant which was denuded of its leaves and the one from which cuttings were made have put out new growth. On the denuded plant, the flowering buds that have started have not produced flowers but the flower buds have withered and the bracts fallen off

Ordinarily a flowering bud is at once distinguishable from a leaf bud by its size and shape, but a leaf bud that is swelling preparatority to unfolding often has the size and dimensions of a rather narrow flowering bud. The number of brown-tipped bracts, however, on a leaf bud rarely exceeds 4, while on a flowering

(over)

but it is usually 7 to 10.

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Washington Nov 3, 1908.

Culture 48. One of the flats of seedlings (Culture 39) was moved to the south end of the greenhouse to-day, in order to subject it to the greater heat and sunlight of midday. This will give a greater <u>alternation</u> of <u>temperatures</u>, which is expected to make the plants grow better. Culture 47, which is now exactly comparable with Culture was moved to the same situation as Culture 48

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Washington D.C. Nov. 7 1908

Culture 41. These plants have produced flowering buds as follows.

One plant 2 buds.
" " 6 "
" " 6 "
" " 7 "

Culture 42. The plants not used for cuttings have produced (flower buds) as follows.

One plant 0 buds
" " 1 bud
" " (Cult. 5) 0 "
" " 23 buds
" " 9 "
" " (Cult. 5) 14 "
" " 2 "
" " 1 "
" " (Cult. 4) 1 "
" " 2 "
" " (Cult 1) 2 "

One plant (Cult 1) 3 buds
" " (Cult. 4) 2 buds
" " (Cult. 3) 6 buds
" " (rose house) 12 "
" " (denuded, rose house) 23 "
" " (rose house 15 "

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Washington, Nov. 4, 1908

Culture 42. ~~Of~~ On the plants from which cuttings were taken (and flowering buds therefore probably removed), the following remaining flowering buds are counted

One plant (Cult. 3) ~~Two~~ 2 buds
" " 2 "
" " 1 "
" " 0 "
" " (Cult. 1) 2 "
" " 5 "
" " 3 "
" " 3 "
" " (Cult. 4) 4 "
" " 2 "
" " (Cult. 3) 1 "
" " (Bermuda, rose house) 20 "
" " (rose house) 5 "

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Washington, Nov. 6, 1908

Culture 63. Ay Plant of no 42 with flowering shoot. Bud 10mm long, beginning to open.

[Some of the flowers or buds on this shoot were pulled off later by a sparrow]

Washington, Nov. 7, 1908.

Culture 49. a flat of 56 plants from Culture 39, potted in old kalmia leaf peat 8 parts, coarse sand from Rock Creek 1 part, clay loam one part. Plants with 4 to 6 leaves, 1 to 1.5 cm high.

Washington, Nov. 9, 1908

Culture 50. 32 thumb pots of plants from Culture 39. Pricked out with a tooth pick by Mr. Padgett and potted by him. Same soil mixture as 49. Placed in flat with Culture 46, the pots plunged in Kalmia peat.

Culture 51. 56 plants in thumb pots. Same preparation, potting, soil and plunging as 50.

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Washington, Nov. 9/'08.

Culture 40 Germination poor. Only 6 plants erect and with cotyledons expanded. Several of the bowed seedlings have turned brown in some part and died.

Culture 37. Eight flowers have opened thus far on these cuttings.

Culture 35. No roots on the calluses. Cultures 33 to 36 have been dried off slightly for about a week and some of the leaves have yellowed.

Cultures 39 + Seeds still germinating.

Culture 43. Plants with seven leaves at most expanded, and barely more than 2 cm. high, leaves up to 6 mm. wide.

Nov. 11, 1908

With Mr Kellerman planted seedlings from Culture 39 in agar made from the soil in which Culture 51 was planted (8 parts kalmia peat, 1 part coarse Rock Creek sand, 1 part clay loam)

One set 3 to 5 leafed plants
" " 2 leafed "
" " old cotyledon plants
" " new " "

All sterilized 5 minutes in about a 5% solution of hydrogen peroxide.

One set new cotyledon plants
Not sterilized.

Culture 52 Four plants from Culture 39 sterilized in 5% peroxide of hydrogen five minutes and potted in the same soil as 51.

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Nov. 13, 1908

Vaccinium membranaceum. Bottled specimens

Check a. Mold growing, aerial
Check b. Mold or bacteria on surface of agar.
Single root a. Mold or bacteria on surface of agar

Four leaves a. " " " " " " "
Small roots a " " " " " " "
Small roots b. " " " " " " "

All the last four infections are from the stem or leaves, not from the root.

Nov. 14, 1905.

Bottled seedlings
Checks. Organisms on all four
Single root b. Mold or bacteria on surface of agar
Too [illegible] to examine others.

Washington, Nov. 16, 1908.

Culture 37. Several plants were dug out of the sand to-day. All had large callusses. Three had developed roots, 5 to 10 cm. long. All were replaced.

Washington, Nov. 16 1908

Culture 47

One of the plants for several days past has had its leaves reddened. Two of them have now dropped off, leaving the two cotyledons and another old leaf reddened and two new uppermost leaves not reddened. The three other pots ~~#~~ in the same line were each sprinkled with air slaked lime to-day, about a sphere 5 mm. in diameter each.

Bottle cultures

All the bottles have ~~fungi~~ organisms growing on the agar. They appear to be of two kinds, a ~~felt~~ gray diffusely growing mold with a mass aerial hyphae 2 to 3 mm high, and a white organism growing in spots, with a hemispherical mass of aerial hyphae

All the blueberry seedlings are alive. The larger plants (with 4 leaves, 2 leaves, and old cotyledons) are making new leaves The youngest seedlings have their cotyledons enlarged and ~~green~~ darker green.

~~Green~~ algal growth is visible on the roots of one of the 4 leaved plants, marked b.

No new growth of roots is discernible on any of the plants

Washington Nov. 16, 1908.

Aquarium plants.

The new shoot that was growing on the denuded plant when I returned to Washington early in October, terminated in a non-resting flowering tip. The flower buds on this flowering tip are now enlarging ~~[illegible]~~, in fact have been visibly enlarging for the past 3 days

Culture 35 No roots on the calluses yet. All the stems healthy and all with some leaves yet.

Culture 36. Leaves all dropped off. No calluses nor roots formed. Two of the five cuttings brown and dead at the base though still alive at the top.

Culture 63 ~~47~~ (rose house flowering specimen) Self pollinated a second flower to-day. The resting flowering buds on the leafy old wood of this plant are bursting to-day, four of them, on one branch. The leaf buds also are starting.

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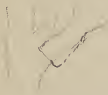
Washington, Nov. 16, 1908

Vaccinium corymbosum

The leaf of this plant is jointed to the stem from ~~its earl~~ the beginning; thus:



When the leaf is preparing to fall it turns red and finally breaks away at the joint.

The comparative vigor of a leaf may be judged by the amount of the "bulge" or overhang of that portion of the petiole just above the joint, the dotted line above showing the extent in some cases.

Cultures 41 & 42 (Exposed coldframe)

These ~~plants~~ pots were again frozen through (as near as can be judged from a superficial examination) last night and the night before, like all the other cultures in the cold frame. The leaves are slowly shedding, like those on my window sill. The reddening of the leaves, except in certain cultures that were reddened while still in the greenhouse, ~~came~~ began with the first frost and deepened with succeeding ones.

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Nov. 17, 1908.

Culture 40, Vaccinium membranaceum.
About 55 seedlings up to-day. Only one has begun to develop a leaf above the cotyledons.

Culture 39. Seedlings still germinating in abundance.

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Nov. 17, 1908

Vaccinium corymbosum

Mr. Kellerman to day made some pure cultures in test tubes of the two or more fungi and the algae, in the bottle plant cultures.

Nov. 16, 1908.

Vaccinium corymbosum

Bottle cultures.

Check C. Plant (a 1-rooter), overgrown by fungi, and evidently dead, the cotyledons an stems ~~[illegible]~~ blackening.

Check d. Plant darkening and overgrown by fungi.

Small roots a. Plant with cotyledons darkening, root and stems submerged in fungi, but two minute new leaves green and lively.

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Nov 26/1906

Bottle cultures

4-leaves. All alive and growing. Both b showing a filamentous alga in the center of the unicellular patch.

2-leaves. All alive and growing.

Small roots. Plants a & b barely alive in the tip leaves. Other two growing.

1-root. All alive and evidently functioning. Plants a & b with white dots on the cotyledons.

Check. Plant a alive and clean, b alive but cotyledons dotted with white, c and d dead.

Aquarium cultures

This ~~plant~~ soil was newly top dressed with two kinds of sphagnum from Lanham a few weeks ago. Sphagnum cymbifolium is full colored and ~~[illegible]~~ seems to be barely growing, while the other, of the acutifolium type is growing well. This agrees with the wild condition, cymbifolium growing with its base in standing water, acutifolium on rotting leaves when these are moist enough. This points to acutifolium as the best for topping seed beds.

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Nov 21, 1908

Culture 36.
One of the cuttings is dead and brown for its entire length. It was taken out examined and thrown away. It had developed no callus.

Culture 34. Two dead cuttings taken out and discarded; they had made no callus. Of the twelve remaining, five have one or more leaves, partly browned, and seven have no leaves.

Culture 33. One dead cutting, without callus, taken out. Of the eleven remaining, one has no leaves, six have leaves partly brown, four have leaves all green

Culture 35. Of the eight cuttings, three have leaves partly brown, five have leaves all green.

Nov. 22, 1908

"In an acid medium (sour soils) nitrification promptly ceases; as it also does whenever the amount of base present has been fully neutralized. The bases most favorable to nitrification are lime and magnesia in the form of carbonates, an excess of which does no harm."

Hilgard 1906, Soils 146.

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Nov. 22, 1908

"It has been long known that after long-continued cultivation soils of original neutral or slightly basic reaction become acid . . . . . . Wheeler and Hartwell, of the Rhode Island Experiment Station, demonstrated the almost universal acid condition of the older lands of that State, and the excellent effects produced by neutralization with lime".

Hilgard 1906, Soils 123.

This probably explains the principal reason, their acidity, why, especially as told me at Cherryfield, Maine, old wornout grass fields make good blueberry land. Like wood-lands grass fields ~~pasture~~ are also gradually increasing their content of organic matter and humus.

Look up Wheeler, Rhode Island Reports 1895 and later for acidity.

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TAXONOMIC INVESTIGATIONS.

Nov. 23 1908

"These black soils are always characterized by the presence of a full supply of lime in the form of carbonate, under the influence of which the most deeply black humus is formed."

Hilgard 1906, Soils 283

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TAXONOMIC INVESTIGATIONS.

Nov. 23, 1908.

Aquarium culture

Bud on fall shoot of denuded plant opened on Saturday. Second bud opening to-day.

Washington, Nov. 24, 1908

Culture 53, potted the day before Culture 52, and in the same soil (same as 51) was plunged in leaf mold to-day, 48 thumb pots altogether

Culture 54. Four thumb pots, potted to-day, same soil as Culture 55, to fill out the flat containing Cultures 52 + 53.

Culture 55. Eighty five seedlings from Culture 39, transplanted into a flat 2 inches apart, in a soil made up of kalmia peat 8 parts, Rock creek coarse sand 1 part, clay loam 1 part. Plants 5 to 7-leaved 1.5 to 2.5 cm. high.

Bottle cultures. No new root growth can be observed on any of these plants.
Four leaves. Plants all alive and growing but all but a with new leaves, partly blackening.
Two leaves. Same exactly
Small root. Plants a & b barely alive, c dead, d growing and in good condition.
One-root, all alive. What appears to be a third fungus is growing on the agar ~~on~~ about the roots of two of these plants.
Check. [illegible] dead a & b alive.

Four test tube cultures of this taken from 1-root S
Cour

Washington, Nov. 25, 1908

Culture 43. A few injured plants in this and other cultures are throwing shoots from ~~the~~ a lower axil. One normal plant, C1, with eleven expanded leaves besides the cotyledons has a 2 mm. branch from the axil of a cotyledon

Culture 56. Same as Culture 55, except 1 day later.

Culture 39. Seeds still germinating, but very sparingly

Culture 48. Germination appears to have ceased

Nov. 25, 1908, by Mr Kellerman

Washington Nov. 25, 1908

Culture 57 Four plants potted in thumb pots, same soil as 55 + 56. Plants pricked out of Culture 39 and soil shaken and snapped out. Plant then submersed 5 minutes 10% aqueous solution of hydrogen peroxide (Mallinckrodt), then potted.

Culture 58. Same, but 25%

Culture 59. Same, but 50%

Culture 60. Same, but full strength peroxide.

Culture 61. Same, but Full strength, 10 minutes

Culture 62.

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Washington, D. C.,

Washington, Nov. 27, 1908.

Culture 43, plant c1. Cotyledonary shoot 4.5 mm. long.

Aquarium culture. Second and last flower on shoot withered. This was not pollinated.

Cultures 57 to 62. Plants all in good condition.

Culture 56. Plants all in good condition.

Culture 57. Plants all in good condition

Culture ~~[illegible]~~ 63, rose house flowering plant. Two flowers or buds from the lower raceme eaten open by a snail. Five other flowers set on the four upper flowering buds. Plant taken to my room ~~[illegible]~~ 63.

Culture 47, plant k1. With nine leaves has a basal branch, cotyledonary, 5 mm. long.

Cultures on the window sill (29a, 29b, 30a, 31, 2a, 2b, 6, 15, 17, 19, 22, 23, 24, 25, and other window sill plants of 18, 24, and 41) have shed their last leaves today

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Washington, D. C.,

Washington, Nov. 27, 1908

Culture 63. Uppermost flowering bud, 2 flowers out, both cross pollinated. Second bud 1 flower out, cross pollinated. Third bud, 1 flower out, cross pollinated. Fourth bud, 1 flower out, not pollinated. Flowers 9 mm. long. Lowest green fruit on non-resting shoot 5.5 mm. in diam.

On the main flowering branch, the upper four flowering buds, as already described, are flowering. The next three buds below were flowering buds also, but apparently they will not produce flowers. The uppermost of the three is small and though swollen has not opened. The other two are elongating their axis and the flower buds are not swelling, while in the axils one or two of the lowest bracts, below those subtending the flower buds, leaf buds are pushing out. It is expected that the flower buds in these lower flowering buds will wither.

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Washington, D. C.,

Washington, Nov. 28, 1908

Culture 64. Forty plants of Vaccinium corymbosum from Culture 48, pricked out and reset in a flat, at 2 by 2 1/4 inches. Soil made up as follows. Kalmia peat 7 parts, coarse Rock Creek sand 2 parts, clay loam 1 part.

Culture 65. Forty-five plants from Culture 39, planted same as Culture 64.

Bobbink + Atkins, Rutherford, N.J.,
Potted Kalmias.

Culture 63. Three more flowers out to-day, making 2 out on the uppermost, 3 on the next, 1 on the next, 2 on the fourth. All pollinated, including the two on the fourth bud.

Washington, Nov 29 '95

Culture 43, plant C1. Twelve leaves expanded; basal shoot 8 mm. long. No other normal shoots in this box.

Culture 47. Plants with normal basal shoots as follows. D7, cotyledonary, about 5 mm. (10 leaves expanded); K1, about 1 cm, cotyledonary ([illegible]); F1, from first axil above cotyledons, about 5 mm, 9 leaves expanded.

Culture 63. Third and fourth flower out on uppermost bud, second on third bud, and third on the fourth. First two pollinated not the bottom one.

Lower berry on non-fruiting shoot 5 mm. in diameter.

Five corollas dropped off to-day, and one flower on the lowest of the ~~four~~ ~~flower~~ racemes was knocked off, as well as a ~~y~~ style and ovary knocked off the third ~~flower~~ raceme from the top.

Washington, Dec. 1, 1908.

Made a rose soil mixture to-day with Mr. Quinn, as follows:

Clay loam	5	shovelfuls
Cow manure	1	"
airslaked lime	1	handful.

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WASHINGTON, D. C.
OFFICE OF
TAXONOMIC INVESTIGATIONS.

Washington, Dec. 1, 1938

Culture 37. The cuttings, 34, put in sand October 15, 1938, were taken up to-day. Fourteen were rooted, the roots being scant in number, ~~[illegible]~~ about 20 mm. to 3 mm in length. Twenty were callused only, no roots. Nineteen callused plants were reset in the sand. Eleven rooted plants were potted in thumb pots in ~~leaf~~ kalmia peat 7 parts, washed heeling in sand 2 parts, clay loam one part. ~~[illegible]~~ These are given the number Culture 67. Two rooted plants were potted in drained glasses in the same soil mixture and given the number Culture 66. Both ~~[illegible]~~ these cultures were put under a bell jar. Two cuttings, one rooted, one not, but with a big callus, taken out for photographing.

Remarks and General Order Sheet.

Washington, Dec. 2, 1908.

Culture 43, plant "A4. Buds in the axil of one of the cotyledons and the first leaf, 12 leaves expanded, 43 mm. high.

Culture 44, plant C4. Bud in axil of cotyledon, 10 leaves expanded, plant 40 mm high.

Culture 47, plant B, 1.5 mm bud in axil of second leaf, 10 leaves expanded, plant 35 mm high.

Culture 36. Two more dead and blackened, taken out, no callus. Remaining two dead and with no callus at the base, green above, each with a bud starting.

Culture 35. One has roots above the terminal callus

Culture 34. Contents knocked out of pot. Four cuttings dead, taken out. One cutting rooted, not disturbed. Contents replaced in pot

Washington, Dec. 2, 908

Culture 33. Contents knocked out. Plants all callused but two, none rooted

Culture 68 Started to-day. Two plants from Culture 35, two from Culture 33, all with good calluses but no roots. Put in a drained glass ~~with~~ in ~~B~~ Kalmia peat 7 parts coarse sand 2 parts, clay loam one part. Object to see if, having been callused, the mycorhiza soil will help them root. They are comparable with the plants in Culture 35

Washington, Dec. 2, 1908

Culture 63. Remaining flower buds, one on the second raceme one on the third opening to-day. Also one on another lower branch.

Green fruits on the shoot scant 6 mm. (lower) and full 6 mm. (upper) in diameter to-day.

All the ~~flowers~~ corollas fallen except one on the uppermost bud and the two buds that opened to-day.

Dec. 3, 1908

Culture 63. Flower on third bud pollinated to-day, that on second bud and on the lower branch not pollinated.

Washington, Dec. 3, 1908.

Culture 6. Five plants, taken into greenhouse from cold frame, where they have been thrice frozen through and have shed their leaves and repotted in 5 inch pots in a soil mixture of 7 parts kalmia peat, ~~to~~ 2 parts coarse sand, and 1 part clay loam

Culture 7 Four plants, same as Culture 6.

Culture 8 Three plants, same as Culture 6, except that the leaves are only partly shed, and that the soil was all washed off before the plants were repotted.

Cultures 41 (three plants) and 42 (26 plants) brought into the greenhouse from the coldframe to-day

Washington, Dec 3, 1908

Aramigus Fulleri Brown beetle.

Diabrotica 12-punctata Yellow, black spotted beetle

Both eating blueberries.

Culture 69. Kalmia latifolia. Seeds of this plant, collected by Meloy Nov. 25, 1908, from the big bush on his place at Lanham, Md, were sowed in a flat to-day as follows: Soil trodden into the flat about 1½ inches, in the following mixture: kalmia peat 7 parts, coarse sand 2 parts, clayloam 1 part. Over about ⅔ of the flat was scattered a layer of about half an inch of a mixture of chopped sphagnum tips from Lanham one part, and the soil described above one

(over)

post. The other third of the flat was covered to the same depth with the soil itself (no sphagnum). The whole flat was then firmed with the hand, the seed broadcasted, and the whole sprinkled.

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Kalmia peat

Richer station, Chesapeake Beach R.R.
Christ Hayes.

Washington, Dec. 4, 1908.

Culture 63. Last ~~flower~~ corolla on uppermost ~~tool~~ cluster dropped off this morning.

Washington, Dec. 5, 1908

Cultures 6, 7, & 8. Repotted on Dec. 9 in 5-inch old pots, 7 peat, 2 sand, 1 loam. Culture 6 five plants; Culture 7, four plants; Culture 8 three plants. In Cultures ~~6 & 7~~ 8 the soil was washed from the roots; in 6 & 7 left on.

Cultures 9 (5 plants), 11 (5 plants), 13 (3 plants), 14 (5 plants), 17 (4 plants), 19 (4 plants) 21 (4 plants), 22 (4 plants), and 27 (3 plants), repotted Dec. 5 in old 5-inch pots in a soil consisting of 8 peat, 2 sand, 1 loam. In cultures 9, 12, 13, 20, 21, & 27, the soil was washed from the roots; in 11, 14, 17, 19, and 22 it was left on.

Culture 38. Seventeen plants repotted to-day in old 5-inch pots in a soil composed of peat 8, sand 2, loam 1. Surface left 4 cm. below edge of pot.

Dec. 5, 1908.

Culture 63. Terminal berry on shoot 6.6 mm. in diameter. Other berry barely 6 mm.

December 7, 1908

Culture 63. Of the three flowers that opened on the afternoon of December 2, one only, the middle one, was pollinated. The corolla of the pollinated flower, which like the others was rigid on Saturday, is now loose and flaccid and was easily dislodged, while the corollas of the two flowers not pollinated are still rigid.

Washington Dec. 8, 1908

Culture 63. The two remaining corollas on the non-pollinated flowers detached themselves after the sun left them to-day. Their anthers contained an abundance of pollen. They are the uppermost flower of the four on the second bud from the top, and the flower on the bud near the base of the plant. Both of flowers were secreting an abundance of nectar. It is possible that the stigmas may have been pollinated when the corollas with the stamens were drawn over the styles.

December 10, 1908

Fourth ~~bud~~ raceme from top, lowest ~~flower~~ ovary & pedicel dropped off to-day. This is the one that was found open the day after Thanksgiving, was not pollinated that day, but was pollinated the following day. The second pedicel on this raceme, which dropped off to-day, belonged to the flower that opened and was pollinated Nov. 25, and was subsequently broken off by accident. The ovary still remaining was of the flower that opened Nov. 30 and was not pollinated.

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Washington, D. C.,

Washington, Dec. 9, 1908

Culture 70 (54) plants. This consists of Culture 38, repotted from 3-inch pots, ~~[illegible]~~ in 5-inch pots, in the following soil. Kalmia peat 8 parts, sand 1 part, loam 1 part. Repotting was done Dec. 4, 5, + 8.

Culture 71 (7 plants) The ~~[illegible]~~ few plants of Culture 38 that were potted July 11 1908, in pure leaf mold. Repotted Dec 8 + mixt in peat 5, sand 1, loam 1.

Culture 72. Two plants repotted from ~~[illegible]~~ badly ~~[illegible]~~ eaten and ~~top of~~ Culture 48 ~~[illegible]~~, which had been heavily [illegible] Soil kalmia peat 8 parts, sand 1 part, loam 1 part.

Washington, Dec. 10, 1908

Culture 42. The 14 southernmost pots were trimmed to-day. The Plan of trimming ~~[illegible]~~ was to leave all branches bearing flowering buds. Other vigorous shoots or branchlets were cut back to a few buds, and other slender & repressed ~~to~~ twigs or branches were removed altogether. The trimmed plants have their number underscored, thus 4<u>2</u>. Twelve plants of this number were left untrimmed for comparison, as well as the plants of Culture 41.

The flower buds on some of these plants as well as the plants of other numbers brought in from the cold frame at the same time are beginning to swell.

Washington, Dec. 11, 1908

~~Culture~~

Culture 66 These two cuttings were repotted to-day so as to have the roots against the glass. Soil 8 parts kalmia peat, 1 part heeling-in sand, 1 part clay loam, Placed again under bell jar.

Culture 67. Plants removed from Bell glass to-day, but kept in shade.

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Washington, Dec. 16/908

Culture 35. One cutting dead, removed. The cutting formerly rooted shows the root dead and no new growth in sight. Another cutting rooted, the plant marked by removing the leaf tip.

Culture 68. One cutting feebly rooted, marked by removing a leaf tip. All the cuttings in good condition.

Culture 34. Two more cuttings dead and removed.

Culture 66. Taller plant with robustly growing roots. Other plant with one new root just touching the glass.

Culture 67. Two plants with leaves withering. Others standing well. The four plants most vigorous and with darkest green leaves are those in which growth had ceased and the buds ~~were~~ both flower and leaf, were developed.

Washington, Dec. 16, 1908.

Culture 29a. Examined to-day for mycorhiza: Two rootlets from the moss, near the trunk show much interior mycorhiza, none superficial. Cells much injured by repeated freezing, and mycorhiza in most of the cells apparently contracting. Immersion lens not used but 12 eyepiece and 8 mm. objective.

Rootlets from the glass also abundantly supplied with internal mycorhizae. Only a fragment of dark external hyphae. External hyaline hyphae ~~not seen with this lens~~ occasional but not seen with this lens to be connected with the internal hyphae.

Culture 29b. Rootlets abundantly supplied, but less abundantly than 29a, with what appear to be the collapsed remains of internal mycorhizas. External ones not seen.

Culture 18. None of the roots examined shows internal mycorhizae

Washington, Dec. 16, 1905.

Culture 63. One of the elongated but stagnant flowering buds when dissected showed seven flower buds, an empty bract and a filiform axis tip, besides, in the bract below the lowest flower bud, a pair of withered bractlets with no flower bud developed between them.

Washington, Dec. 17, 1908

Culture 39 a Nine-leaf vigorous seedlings examined to-day for mycorhiza show an abundance of both external and internal mycorhiza.

Washington, Dec. 17, 1908

Culture 49. The three pots that were given a fragment of lime several weeks ago, without apparent effect, were given about 1 cc. of calcium carbonate each to-day, and then watered.

Dec 22/908.

Cultures 73 to 80 potted to-day.
<u>Cardinal</u> roses in 73 and 77
marked C. The others are
Mrs. Potter Palmer

Dec. 23, 1908

Culture 66. The rootlets have made
a growth of about 8 mm. since
they were and recorded
observed a few days ago. Bell jar
taken off to-day.

Culture 67 A vigorous plant knocked
out has strong roots at the bottom
and sides of the pot.

Washington, D.C., Dec 23, 1908

Culture 69. Kalmia latifolia. The seeds are germinating freely this morning, both on and off the sphagnum.

Culture 55. Many of the plants in this box have stopped growing, and several of them have their growing point withered, as.

D 2 M 2 O 3 Q 5

Similar conditions exist in cultures 56, 57-62, 64, and 65.

Culture 56. Growing points withered

F 1 G 3,4 I 5 J 1,4 K 1 L 1

Cultures 57 to 67 Growing points withered in

59, 62 1,3

Culture 64-5. Growing points withered in

B 4,5 C 4,5 D 2 F 5 I 2 K 2 L 2,3

O 3 P 1

Culture 72, both boxes acting just like 55, the box with 72 underscored having withered tips as follows.

A 5 B 3,5 C 4 D 3 E 3 F 4 G 2 H 3 I 4 J 2

K 4 L 1 M 5 N 1,5 O 3 P ~~5~~ 3,5 Q 3,5. over

The other box of 72 has withered tips as follows

B_4 $C_{1,4}$ $D_{2,3}$ E_3 $F_{3,4}$ $G_{4,5}$ $J_{2,3}$

K_4 L_3 $P_{2,3}$ S_5 -

Dec, 23 ?

Culture 88. Twelve plants of *Vaccinium membranaceum*, from Culture 40, pricked out into thumb pots to-day, soil peat 8, sand 1, loam 1, the pots plunged in peat. Plants with 2 to 6 leaves besides the cotyledons, none over 1 cm high.

Dec. 24, 1908

Cultures 73 to 80 plunged in lime sphagnum in flats to-day.

Culture 47. The three plants limed have shown no effects thus far

Culture 63. On the low branch raceme from which the first three blossoms were eaten by snails or dropped off the fourth flower bud withered, and the fifth is now starting to expand. It is 2.5 mm. long.

Washington Dec. 26, 1908.

Cultures 73 & 77. Alfalfa seeds in part germinated. Some of the rose cuttings looking rather sick.

Cultures 73 to 80. All the blueberry plants in good condition.

Culture 43. The plants in this box have all put out basal buds or shoots except as follows.

B3 C2 G3,4 H3,5 I1 J2 L2,3,

N2,5 O1,2,5 P2,4

The longest shoot is C1 with 6 leave and 3.7 cm. long.

Dec. 29, 1938.

Culture 43. Plant A1 has 18 leaves expanded (besides the cotyledons) and one nearly ready to expand.

Dec. 30, 1938

Cultures 73 + 77. In culture 73 19 alfalfa seeds have germinated (none in one of the pots), in 77 21 seeds. In the seedlings of 73 the cotyledons are notably darker green, the midrib which shows ~~[illegible]~~ ~~purple~~ on the back of the leaf, is purple the stem is purple and in a few plants the whole ~~[illegible]~~ under surface of the cotyledons is purple. In 77 the plants are notably paler green, and in only a few are the stems, and in still fewer the midribs somewhat purplish.

Vaccinium plants in 73 all showing new growth except one, and that not well against the glass. In 77 new growth discernible in only one plant.

Dec. 3/1908

Cultures 73 to 80. From the stagnation of the unexpanded ultimate leaf, it begins to appear that in some at least of these plants growth was checked at the time of transplanting, a few days. In only two, a 79 and a 77 has the leaf withered.

In one plant of 73, with 14 expanded leaves and an 8 mm. basal shoot the unexpanded leaf is smooth, pinkish and brittle, though not withered.

-0. 2. 3.

Culture 43. Plant H1 has 14 leaves expanded, and three nearly equal branches about 1 cm. long from the axils of the two cotyledons and the lowest leaf.

Plant E1, has 16 leaves expanded and the basal shoot 9-leaved and 4.8 cm. long.

Plant A_2 seems to be terminating the growth of its first axis (the only plant in the box that is). The terminal leaf (which differs from the ordinary ones in having no glandular hairs) although it has not dried up, has not increased in size as usual, being not more than a millimeter in length while the next leaf is 14 mm. A leaf bud has already begun to develop in the axil of this second leaf. The expanded leaves number 14. Each cotyledon subtends a shoot, one 2.3 cm. the other 2.5 cm long.