Cicadelles, phytoplasme et maladie de la fausse fleur de la canneberge : ÉTAT DES CONNAISSANCES

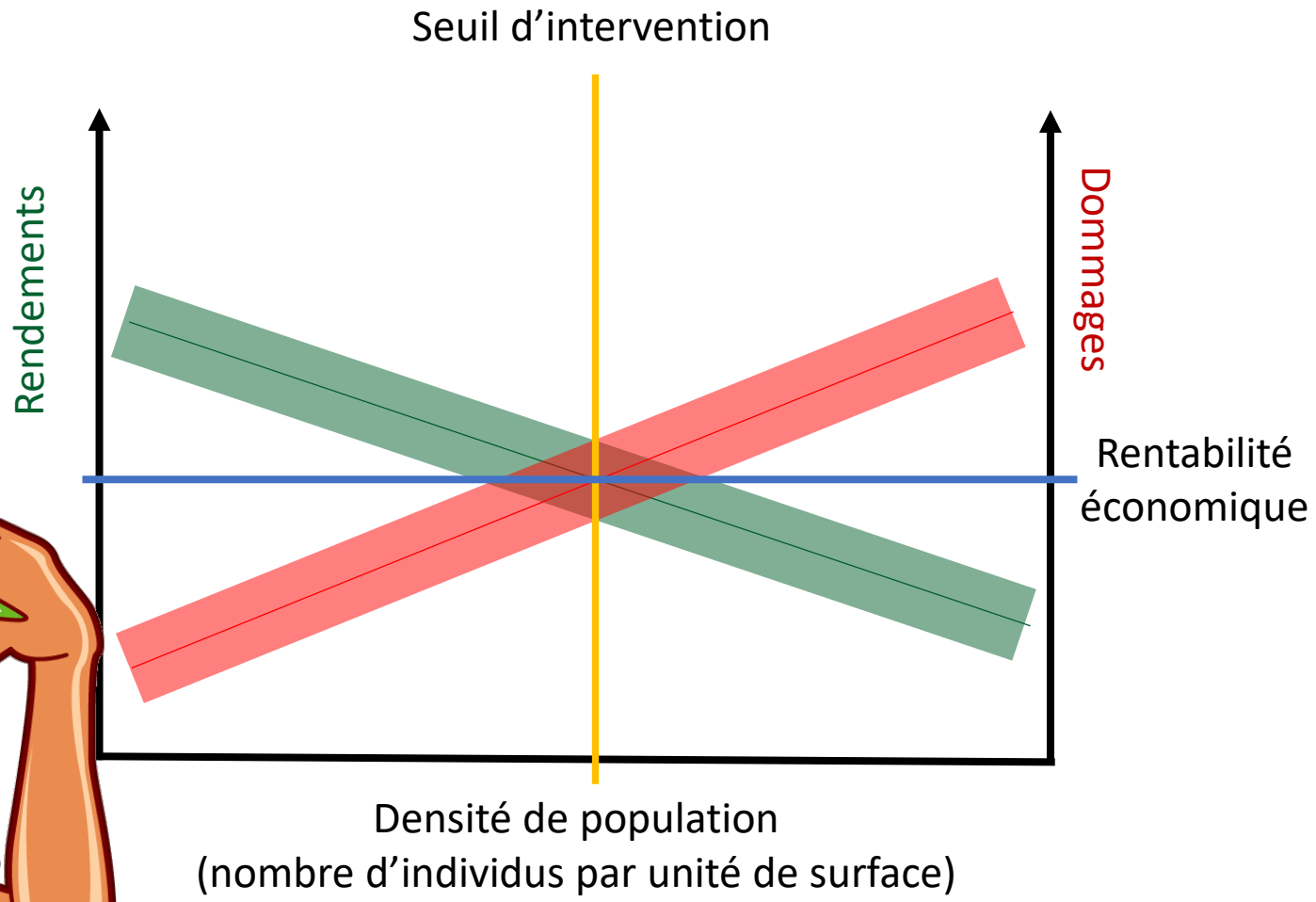
Didier Labarre
dlabarre@notrecanneberge.com

CRIC

Les hémiptères et leurs dommages

Averill et Sylvia, 2022

La lutte aux hémiptères



Gervais, 2025

Initiatives en cours

2023

- Défrichage de méthodes de dépistage

- Premiers essais de pesticides (produits déjà disponibles)

2024

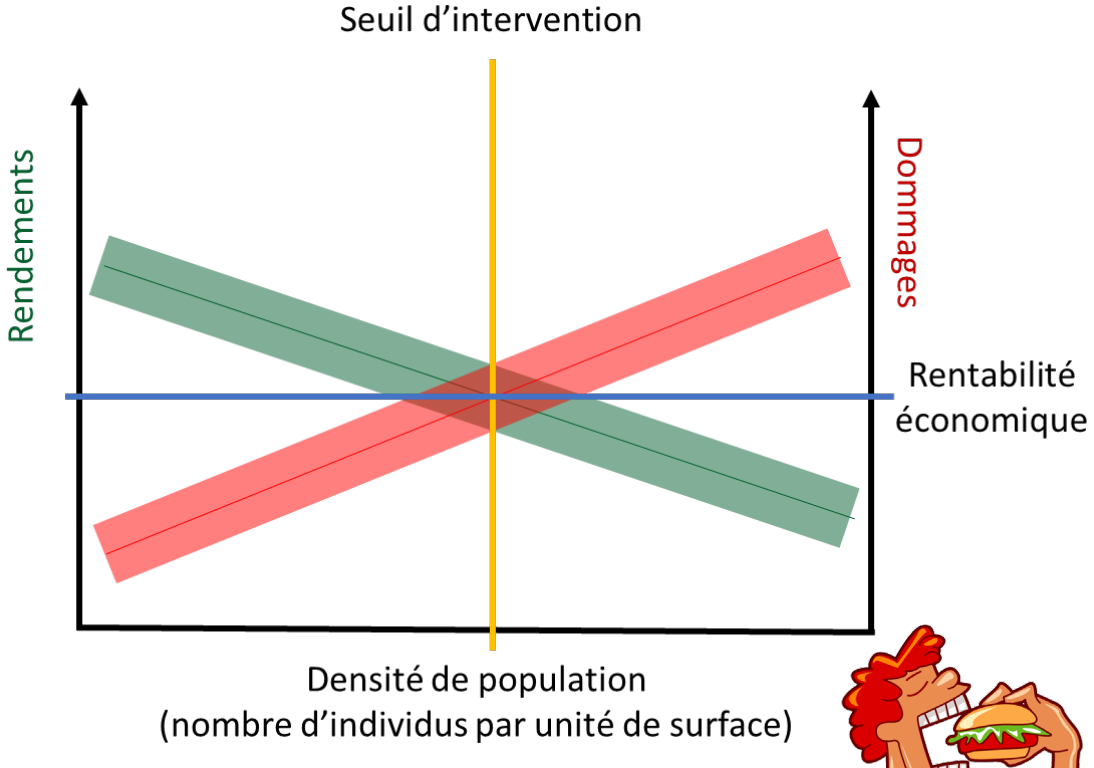
- Dépistage à grande échelle

- Essais de pesticides (9 produits)

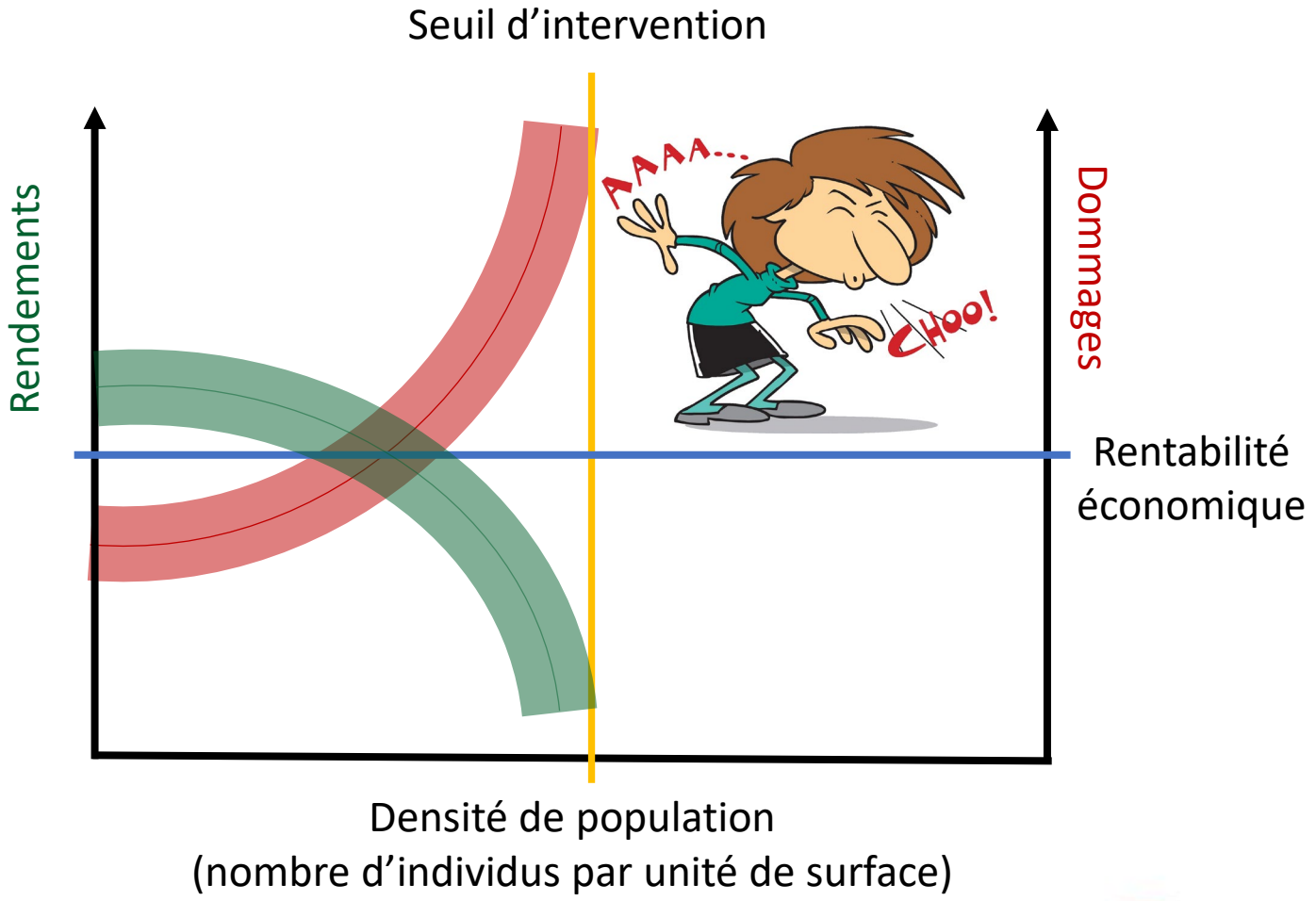
2025

- Projet déposé au programme d'Innovation bioalimentaire (PIB) – en attente de réponse

Alimentation vs pathogènes



Relation proportionnelle

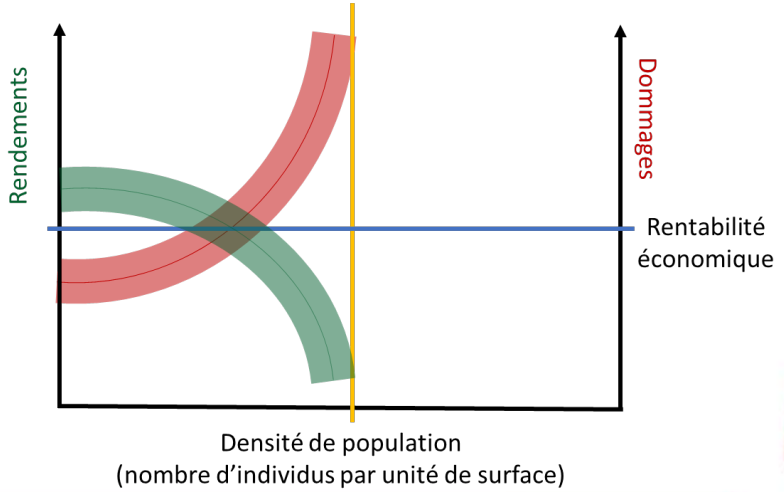


Relation exponentielle (logarithmique)

La cicadelle de l’atocas

Blunt-nosed leafhopper (*Limotettix vaccinii*)

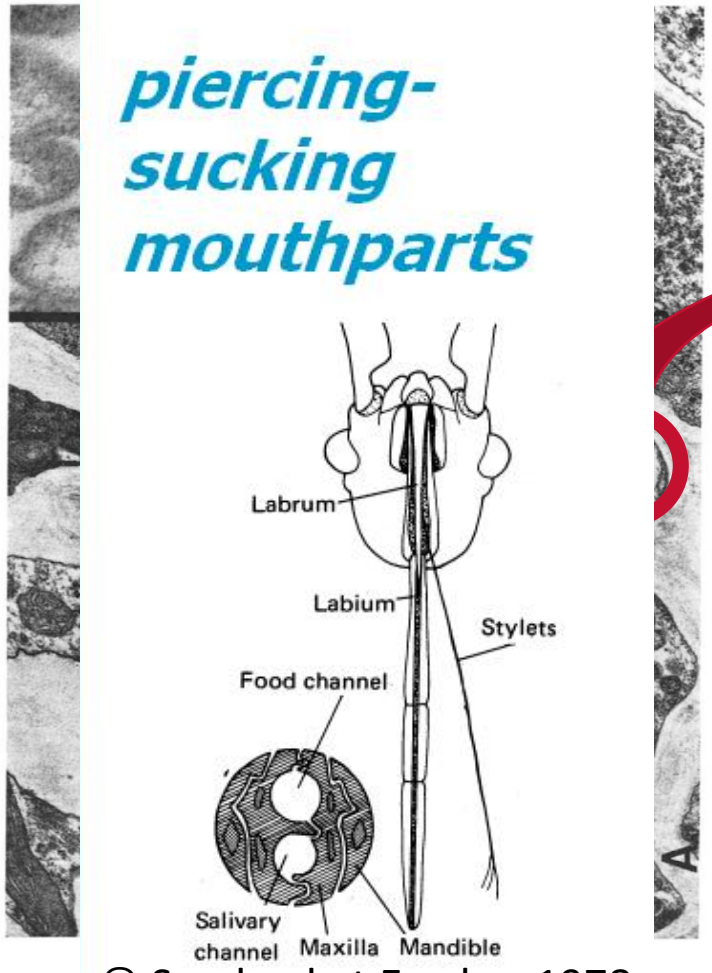
Hemiptera: Cicadellidae



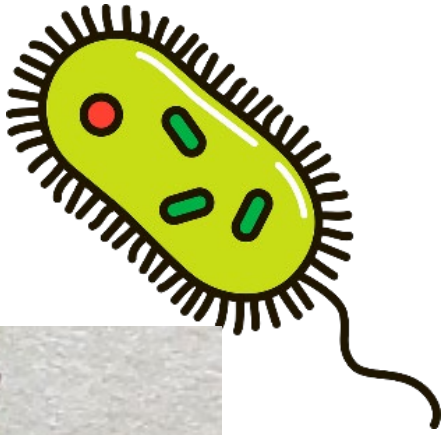
Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

Morphologie



© Sandved et Emsley, 1978



XYLEM AND PHLOEM

©https://www.vecteezy.com/free-vector/xylem"

Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

Propagation

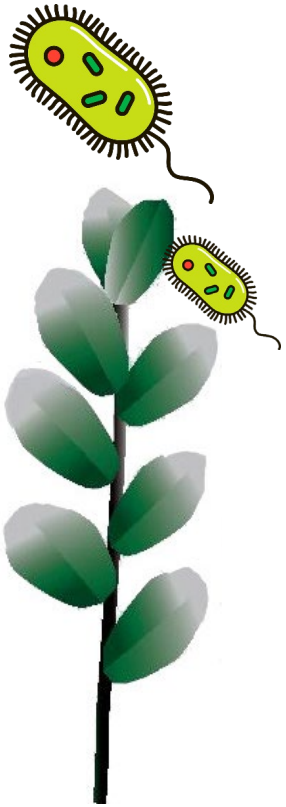
1.

2.

Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

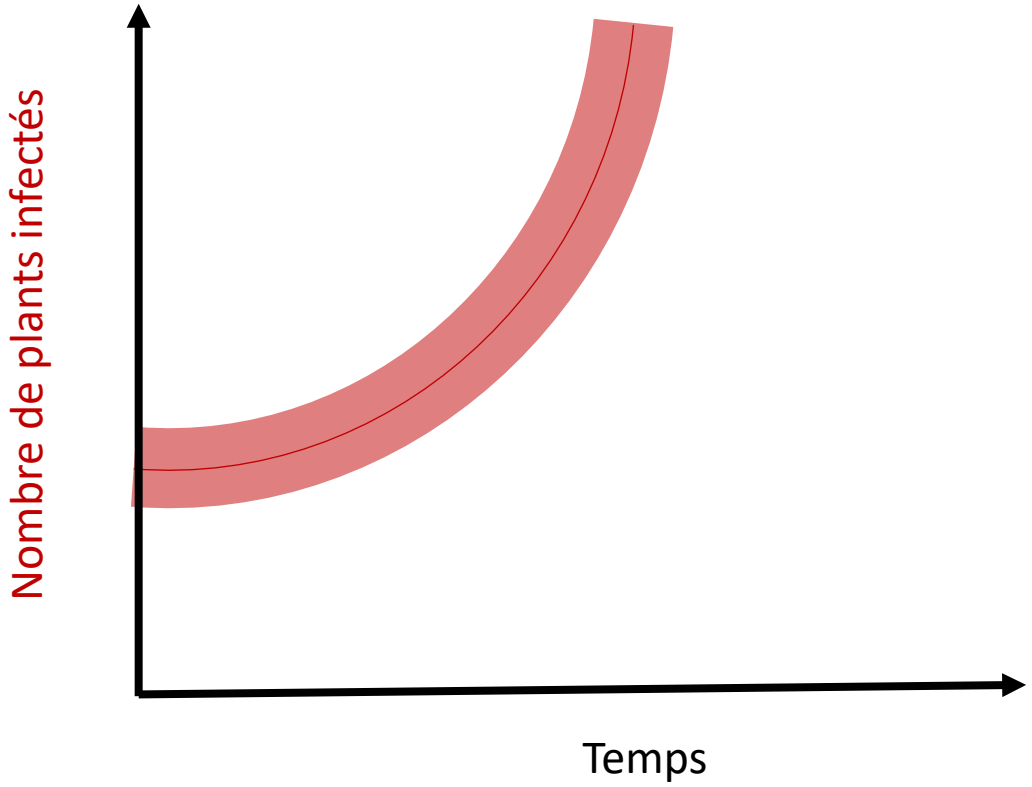
Propagation: cicadelle



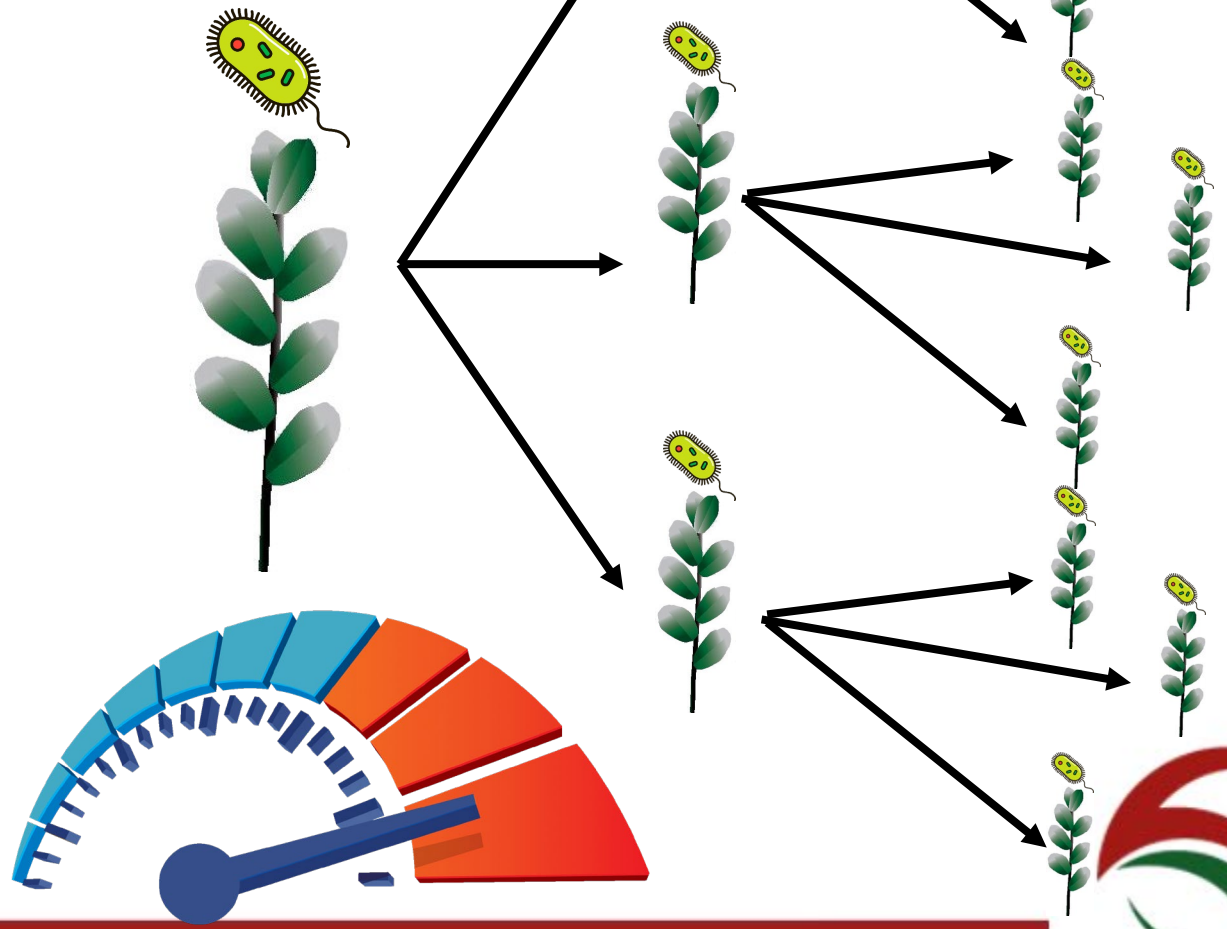
Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

Propagation: cicadelle



Relation exponentielle

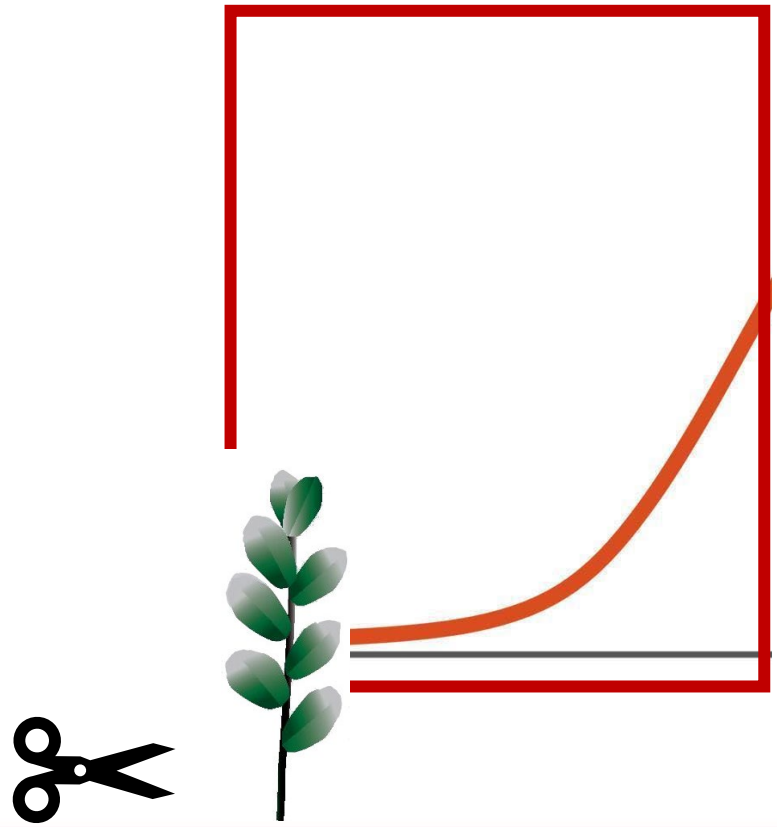


Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

Propagation: cicadelle

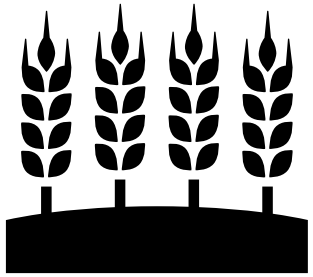
Un plant infecté n’en guérit jamais!!!



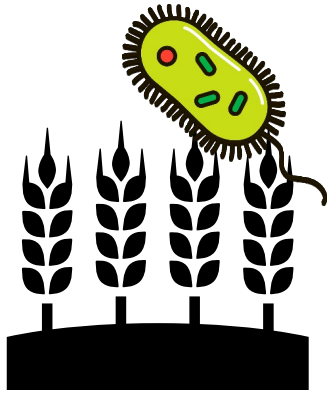
Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

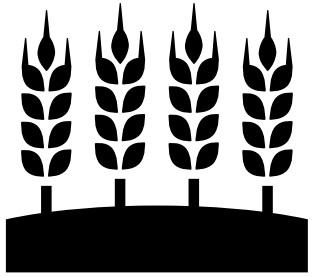
Propagation: boutures



Ferme 2



Ferme 1



Ferme 3

Ferme 4

Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

Symptômes

Lee et al., 2014

© Rutgers University

© Holland Lab, UW-Madison

Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

Symptômes

©Sylvia et Averill, 2023

Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

Symptômes

©Lindsay Wells-Hansen

Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

Symptômes

Un plant infecté n’en guérit jamais!!!

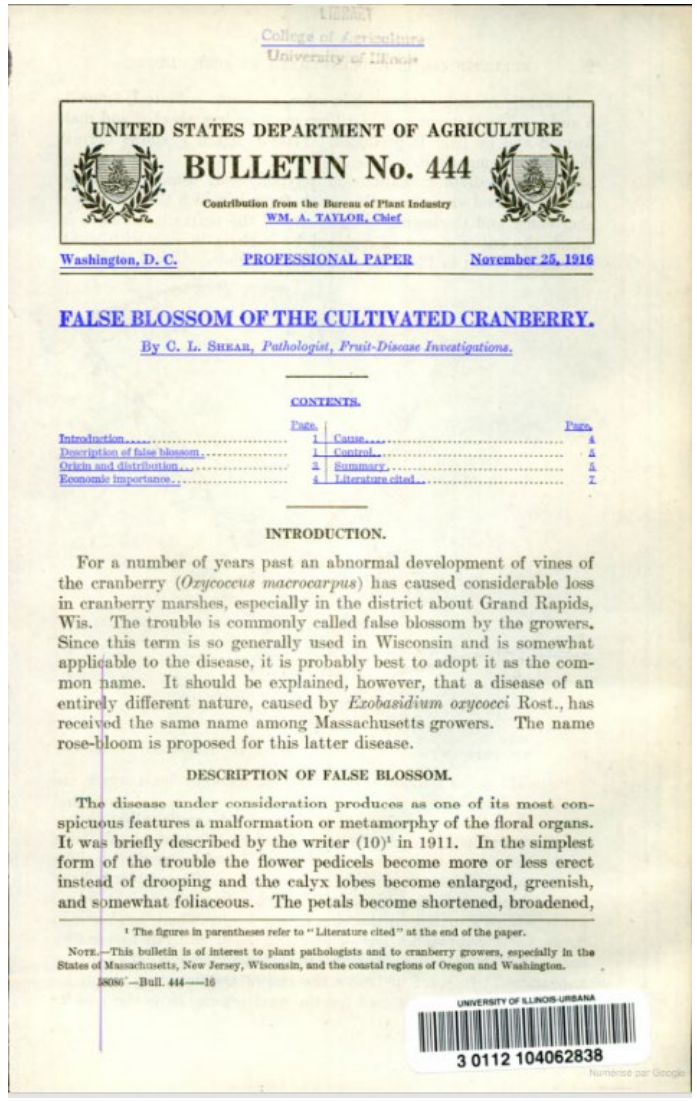
Un plant infecté ne produira plus jamais!!!

Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

Origines

Première mention écrite:
Shear 1908!



College of Agriculture
University of Illinois

UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 444

Contribution from the Bureau of Plant Industry
WM. A. TAYLOR, Chief

Washington, D. C. PROFESSIONAL PAPER November 25, 1916

FALSE BLOSSOM OF THE CULTIVATED CRANBERRY.

By C. L. Shear, *Pathologist, Fruit-Disease Investigations.*

CONTENTS.

INTRODUCTION.

For a number of years past an abnormal development of vines of the cranberry (*Oxycoccus macrocarpus*) has caused considerable loss in cranberry marshes, especially in the district about Grand Rapids, Wis. The trouble is commonly called false blossom by the growers. Since this term is so generally used in Wisconsin and is somewhat applicable to the disease, it is probably best to adopt it as the common name. It should be explained, however, that a disease of an entirely different nature, caused by *Exobasidium oxycocci* Rost., has received the same name among Massachusetts growers. The name rose-bloom is proposed for this latter disease.

DESCRIPTION OF FALSE BLOSSOM.

The disease under consideration produces as one of its most conspicuous features a malformation or metamorphy of the floral organs. It was briefly described by the writer (10)[1] in 1911. In the simplest form of the trouble the flower pedicels become more or less erect instead of drooping and the calyx lobes become enlarged, greenish, and somewhat foliaceous. The petals become shortened, broadened,

[1] The figures in parentheses refer to "Literature cited" at the end of the paper.

NOTE.—This bulletin is of interest to plant pathologists and to cranberry growers, especially in the States of Massachusetts, New Jersey, Wisconsin, and the coastal regions of Oregon and Washington.

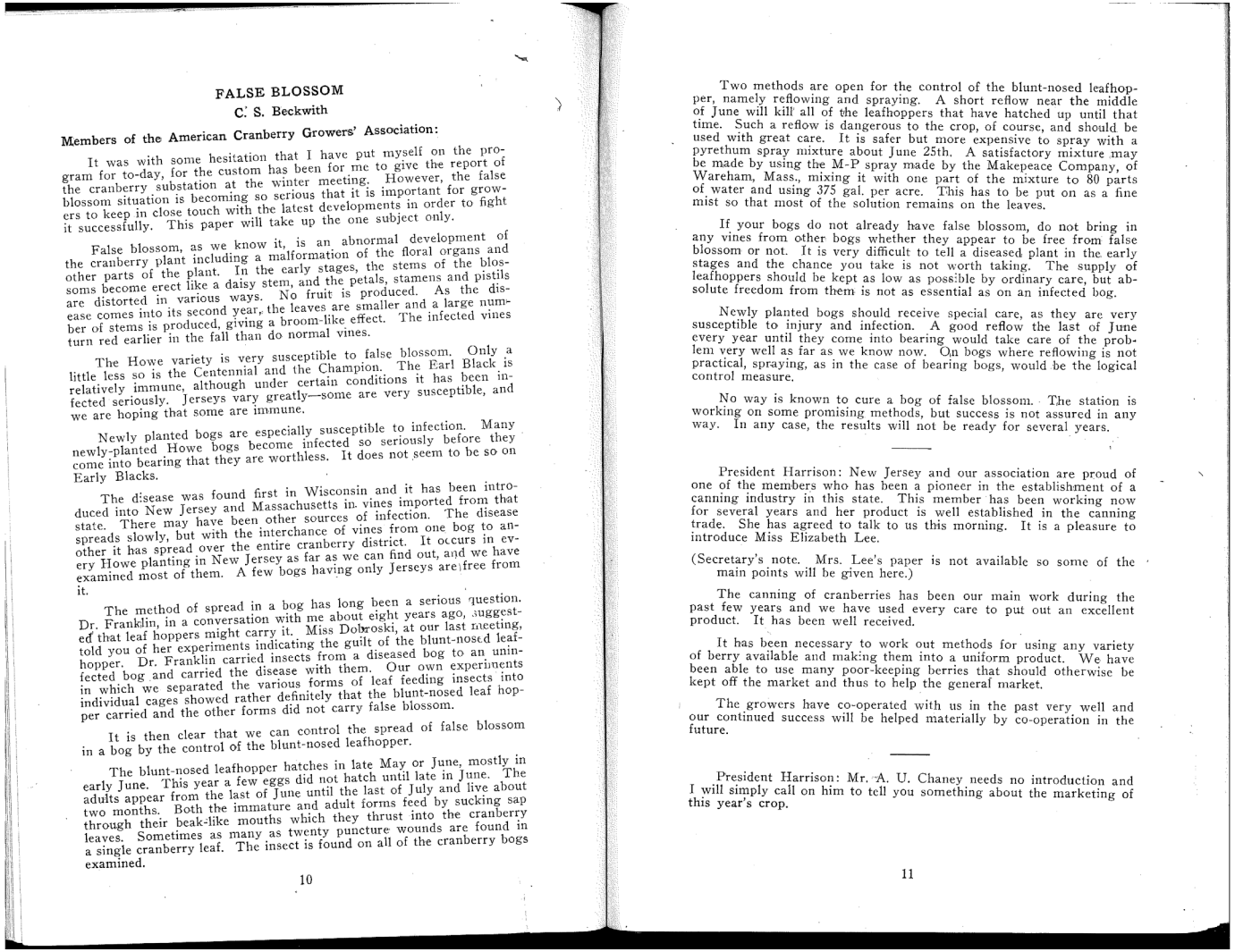
58086°—Bull. 444—16

Shear, 1916

Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

Origines



FALSE BLOSSOM

C. S. Beckwith

Members of the American Cranberry Growers' Association:

It was with some hesitation that I have put myself on the program for to-day, for the custom has been for me to give the report of the cranberry substation at the winter meeting. However, the false blossom situation is becoming so serious that it is important for growers to keep in close touch with the latest developments in order to fight it successfully. This paper will take up the one subject only.

False blossom, as we know it, is an abnormal development of the cranberry plant including a malformation of the floral organs and other parts of the plant. In the early stages, the stems of the blossoms become erect like a daisy stem, and the petals, stamens and pistils are distorted in various ways. No fruit is produced. As the disease comes into its second year, the leaves are smaller and a large number of stems is produced, giving a broom-like effect. The infected vines turn red earlier in the fall than do normal vines.

The Howe variety is very susceptible to false blossom. Only a little less so is the Centennial and the Champion. The Earl Black is relatively immune, although under certain conditions it has been infected seriously. Jerseys vary greatly—some are very susceptible, and we are hoping that some are immune.

Newly planted bogs are especially susceptible to infection. Many newly-planted Howe bogs become infected so seriously before they come into bearing that they are worthless. It does not seem to be so on Early Blacks.

The disease was found first in Wisconsin and it has been introduced into New Jersey and Massachusetts in vines imported from that state. There may have been other sources of infection. The disease spreads slowly, but with the interchance of vines from one bog to another it has spread over the entire cranberry district. It occurs in every Howe planting in New Jersey as far as we can find out, and we have examined most of them. A few bogs having only Jerseys are free from it.

The method of spread in a bog has long been a serious question. Dr. Franklin, in a conversation with me about eight years ago, suggested that leaf hoppers might carry it. Miss Dobroski, at our last meeting, told you of her experiments indicating the guilt of the blunt-nosed leafhopper. Dr. Franklin carried insects from a diseased bog to an uninfected bog and carried the disease with them. Our own experiments in which we separated the various forms of leaf feeding insects into individual cages showed rather definitely that the blunt-nosed leaf hopper carried and the other forms did not carry false blossom.

It is then clear that we can control the spread of false blossom in a bog by the control of the blunt-nosed leafhopper.

The blunt-nosed leafhopper hatches in late May or June, mostly in early June. This year a few eggs did not hatch until late in June. The adults appear from the last of June until the last of July and live about two months. Both the immature and adult forms feed by sucking sap through their beak-like mouths which they thrust into the cranberry leaves. Sometimes as many as twenty puncture wounds are found in a single cranberry leaf. The insect is found on all of the cranberry bogs examined.

10

Two methods are open for the control of the blunt-nosed leafhopper, namely reflowing and spraying. A short reflow near the middle of June will kill all of the leafhoppers that have hatched up until that time. Such a reflow is dangerous to the crop, of course, and should be used with great care. It is safer but more expensive to spray with a pyrethum spray mixture about June 25th. A satisfactory mixture may be made by using the M-P spray made by the Makepeace Company, of Wareham, Mass., mixing it with one part of the mixture to 80 parts of water and using 375 gal. per acre. This has to be put on as a fine mist so that most of the solution remains on the leaves.

If your bogs do not already have false blossom, do not bring in any vines from other bogs whether they appear to be free from false blossom or not. It is very difficult to tell a diseased plant in the early stages and the chance you take is not worth taking. The supply of leafhoppers should be kept as low as possible by ordinary care, but absolute freedom from them is not as essential as on an infected bog.

Newly planted bogs should receive special care, as they are very susceptible to injury and infection. A good reflow the last of June every year until they come into bearing would take care of the problem very well as far as we know now. On bogs where reflowing is not practical, spraying, as in the case of bearing bogs, would be the logical control measure.

No way is known to cure a bog of false blossom. The station is working on some promising methods, but success is not assured in any way. In any case, the results will not be ready for several years.

President Harrison: New Jersey and our association are proud of one of the members who has been a pioneer in the establishment of a canning industry in this state. This member has been working now for several years and her product is well established in the canning trade. She has agreed to talk to us this morning. It is a pleasure to introduce Miss Elizabeth Lee.

(Secretary's note. Mrs. Lee's paper is not available so some of the main points will be given here.)

The canning of cranberries has been our main work during the past few years and we have used every care to put out an excellent product. It has been well received.

It has been necessary to work out methods for using any variety of berry available and making them into a uniform product. We have been able to use many poor-keeping berries that should otherwise be kept off the market and thus to help the general market.

The growers have co-operated with us in the past very well and our continued success will be helped materially by co-operation in the future.

President Harrison: Mr. A. U. Chaney needs no introduction and I will simply call on him to tell you something about the marketing of this year's crop.

11

« The Howe variety is very susceptible to infection. Many newly-planted Howe bogs become infected so seriously before they come into bearing that they are worthless. »

Un plant infecté:

- Ne produira plus jamais de fruit
- Devient une source d'infestation

Beckwith, 1928

Phytoplasme de la canneberge

Cranberry false blossom disease (CFBD)

Origines

Seule la cicadelle de l'atoca peut le transmettre!!!

sufficient to take care of the various State educational enterprises which in the past have been supported from this source. The only remedy that has been suggested by anyone is a small tax, equivalent to that levied for the Institutions and Agencies. This would mean only a nickel on $100.00 of assessment, but it would build a worthy University for the State of New Jersey. We are all opposed to taxes on general principles, but we are not opposed to the investment of $1.00 to bring back $100.00, and that has been the demonstrated actual yield of money invested in the land grant colleges of the United States.

INSECT STUDIES IN RELATION TO CRANBERRY FALSE-BLOSSOM DISEASE

I. B. Dobrosky

False-blossom of cranberry is a serious disease that can be found wherever cranberries are grown commercially in the United States. According to the best of our knowledge, this disease originated in Wisconsin. Some of the older growers in this state believe that they can remember seeing it as far back as 1885. In Massachusetts there is a record of it in 1894. It was not until 1908, that the disease was described and named in an article by Shear (1).

Since that time there have been many theories advanced regarding the cause of false-blossom. It was soon discovered by careful scientific workers that the disease is not due to a fungus, or bacterium, or insect feeding-punctures. Some workers have held the view that the disease is due to unbalanced environmental factors such as extreme dry or wet conditions in the bog.

As early as 1915 Franklin (2) voiced a suspicion that the disease was infectious. Fracker (3) in 1920 earnestly advised that the disease should be treated as though it were infectious. In 1922 Spaeth (4) analyzed diseased plants, and came to the conclusion that the disease was probably one of faulty carbohydrate metabolism. Whether this is due to faulty nutrition or whether it is of a mosaic character he could not determine from the data available. In 1927 Stevens and Sawyer (5) published a paper in which they strongly support the view that this disease is of an infectious nature. Since false-blossom does not seem to be caused by any known organism, nor by insect feeding-punctures; and since its symptoms agree in many respects with those of some well-known virus diseases, it seems logical to conclude that the disease belongs in the group of virus diseases.

It has been proved in several cases that sucking insects transmit this type of disease from one plant to another. The virus is thought by some workers to be an ultramicroscopic particle present in the juice of diseased plants. Sucking insects pick up this virus from diseased plants and introduce it into the healthy plants on which they subsequently feed. Several mosaic diseases, such as tobacco, spinach, potato, sugar cane and cucumber mosaics, are known to be carried by aphids. Curly-leaf of sugar beets, aster yellows, corn mosaic and sugar cane streak are carried by leafhoppers. Since cranberry false-blossom is considered to be a virus disease it is probably transmitted by insects. With these facts in mind, I have been looking for an insect which may be responsible for the spread of this disease.

In October, 1924, I visited the Double Trouble Bogs, at Toms River, New Jersey. At this time, live specimens of the three species of insects which were found abundant on the bogs, were taken to the laboratory of the Boyce Thompson Institute for Plant Research at Yonkers, New York. These three species were the cranberry toad-bug, **Phylloscelis atra Germ.**, a large flat green leafhopper, **Gypona octolineata (Say)**, and a small brown sharp-nosed leafhopper, **Platymetopius magdalensis Prov.** These insects were confined in cages and used in attempts to transmit the diseases experimentally.

showing false-
sbog, for this

1926.

Some preliminary experiments were carried on in 1926 at Toms River with this insect. They have not yielded conclusive evidence of transmission and will be continued. Approximately one hundred healthy seedlings grown in Yonkers were exposed in the Double Trouble bogs from July 1926, to July 1927. This leafhopper was more numerous than any other leafhopper during the period. In the summer of 1927 most of the exposed seedlings showed symptoms of false-blossom. Though some workers hold that the plants must flower before a diagnosis of the disease can be made with certainty, I am of the opinion that it can be recognized by leaf and twig symptoms. Figure 2 shows a twig picked from a diseased plant at Whitesbog, New Jersey. The upper portion of the twig shows the typical symptoms of false blossom. Numerous upright shoots bearing small leaves are present in the axils of the leaves along the runners, and all the leaves have a characteristic reddish color. As autumn advances, diseased plants take on a deeper and more uniform red coloration than do healthy plants. Figure 3-A shows a rooted runner from one of the healthy seedlings which was exposed to insects from 1926 to 1927. Figure 3-B shows a runner from a healthy seedling of the same age which was not exposed to insects, but was kept in a greenhouse at Yonkers.

Summary

1. In a limited number of experiments carried on during 1924 and 1925, the toad-bug, **Phylloscelis atra Germ.**, the large green leafhopper, **Gypona octolineata (Say)**, and the sharp-nose leafhoppoer, **Platymetopius magdalensis Prov.**, did not transmit the false-blossom disease of cranberries.

2. Healthy cranberry seedlings grown in Yonkers became diseased in the bogs at Toms River, New Jersey.

3. Because of its presence in regions where this disease occurs, and because of its abundance and activity in the bogs in New Jersey during the season of 1926 when this disease was spreading rapidly, the blunt-nosed leafhopper, **Euscelis striatulus Fall.** is suspected of being the agent for the spread of cranberry false-blossom.

Literature

1. Shear, C. L. Cranberry diseases. Proc. Wisc. Cranberry Growers' Assoc. 21: 17-21. 1908.

2. Franklin, H. J. Report of cranberry sub-station for 1914. Mass. Agr. Exp. Sta. Bul. 160: 91-117. 1915.

3. Fracker, S. B. Varietal susceptibility to false blossom in cranberries. Phytopath. 10: 173-75. 1920.

4. Spaeth, C. P. A biochemical study of false blossom of the cranberry. Master's Thesis at Univ. of N. H. 1922.

5. Stevens, N. E. and Sawyer, W. H. Jr. The distribution of cranberry false-blossom. Phytopath, 16: 223-29. 1926.

6. Smith, J. B. The insects injuriously affecting cranberries. N. J. Agr. Exp. Sta. Special Bul. K, 43 pp. 1890.

Dobrosky, 1928

Lutte contre la maladie

Sélection variétale

La bonne vieille Stevens!

- Première génération de cultivars modernes
- Potter x McFarlin
- 1940
- « résistant » au false blossom disease

Journal American Pomological Society 55(2):66-67 2001

'Stevens' Cranberry

TERYL R. ROPER[1]

Cranberry (*Vaccinium macrocarpon* Ait.) is native to Northern areas of North America (Vander Kloet 1983). Cranberry cultivation began in Massachusetts in the 1700's as settlers began to manage native bogs to increase the productivity of the vines. As new production areas were established vines were selected from productive native stands and planted in new areas. 'Cultivars' as defined for cranberries were simply selections from the wild with various desirable traits. No systematic genetic improvement took place until the 20th century.

In 1929 the USDA, with the Massachusetts Cranberry Experiment Station and Rutgers University, established a cranberry breeding program. The primary aim of this program was the production of cranberry plants that were resistant to false blossom disease, which was particularly severe in eastern production areas. There was also interest in greater productivity, better fruit quality and improved storability (Eck 1990). The first crosses were made in 1934 and the seedlings were placed at Whitesbog, NJ. Through the 1930's and 40's thousands of seedlings were evaluated for fruit quality and attractiveness to the blunt nosed leafhopper that vectored false blossom disease. In 1940 a selection of 40 superior seedlings were made by breeders, growers and processors and these selections were placed in larger plots. The seedling that became 'Stevens' was designated number 33 (Chandler et. al. 1950).

'Stevens' was the result of a cross between 'McFarlin' (Massachusetts origin) and 'Potter' (Wisconsin origin) made by H. F. Bain. McFarlin was known to be less attractive to the blunt nosed leafhopper and Potter was known for vine vigor and productivity. 27 of these crosses were made. It was evaluated in the late 1940's and released in 1950 along with two other hybrids, Beckwith and Wilcox. 'Stevens' is named for Dr. Neil E. Stevens, plant pathologist with the USDA. He was co-author of a classic work *Fungous Diseases of the Cultivated Cranberry* (1931).

The combination of large fruit size, vigor and productivity made it attractive to the breeders and evaluators. 'Stevens' is an interesting combination of its parents. Potter has poor storability, but is productive and has an attractive fruit finish. McFarlin is less productive, but has good storability and is not attractive to blunt nosed leafhopper.

Cranberry growers did not embrace 'Stevens' immediately upon its introduction. Because the vines were vigorous and coarse they would catch in the tines of the rakes and raking machines being used to harvest the crop at the time. With the advent of water reel harvesting (Dale et al. 1994) the vigor and productivity of 'Stevens' could be exploited. Also, given the vegetative methods used to propagate cranberry it would take time to develop sufficient parent stock for large-scale plantings. (Roper and Planer 1993).

'Stevens' is currently preferred by growers because of its high productivity, large fruit size and good color. Berries will stay on the uprights and not shrivel while harvest is proceeding. 'Stevens' is less sensitive to overfertilization with nitrogen (Davenport 199_) so the level of management can be somewhat less stringent.

Cranberry acreage has expanded rapidly during the last 15 years, going from 22,900 acres in 1972 to 34,000 acres in 1996 (USDA data). Much of this increase is 'Stevens'. In a 1998 survey Roper found that 47.9% of cranberry

[1]Associate Professor, Dept. of Horticulture, University of Wisconsin-Madison, 1575 Linden Drive, Madison, WI 53706.

Lutte contre la maladie

Sélection variétale

Cultivars de 2e génération

RUTGERS

- Scarlet knight
- Crimson Queen
- Mullica Queen
- DeMoranville
- Haines
- Welker
- Vasanna

WARF
Wisconsin Alumni Research Foundation

- Hyred
- Sundance
- Ruby Star
- Big Reds
- Sweeties

EST. 1882
VALLEY
CORPORATION

- Crimson king
- Midnight
- Pilgrim king
- Granite red
- Super star
- Badgers
- BG
- GH1

Réémergence de la maladie

Wisconsin: phytoplasme confirmé en 2018

Massachussetts: phytoplasme confirmé en 2017

New-Jersey:
Symptômes observés dans les années 1990
Présence du phytoplasme confirmé dans les années 2010

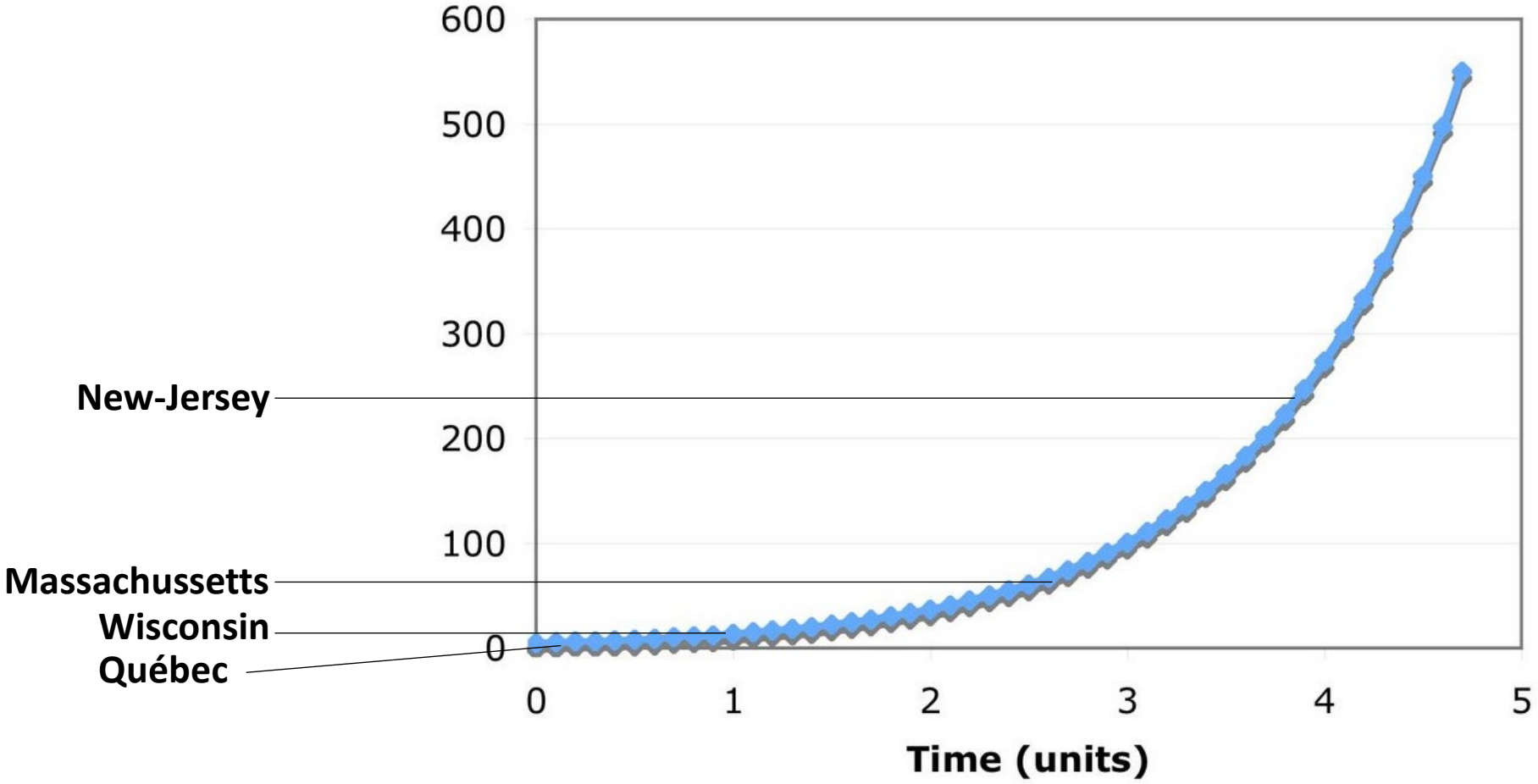
Et au Québec?

Achat de boutures ou « plugs » aux É-U

Blunt-nosed leafhopper présent (2021)

1 cas sous investigation en 2024

Courbe d’évolution de la maladie



Lutte contre la maladie

En trois étapes « simples »

1. Gérer le vecteur (lutte contre le blunt-nosed leafhopper)
2. Intervention dans les champs infectés
3. **Repartir avec du matériel « propre ».**

Remerciements

- Laboratoire d’expertise et de diagnostique du MAPAQ (Ann-Marie Breton, Jean-Philippe Légaré)
- EdeLab (Edel Perez-Lopez et Nicolas Plante)
- PE Marruci Center – Rutgers University et USDA-ARS (Jim Polashock)

- Membres du comité sur la propagation de la canneberge
- Producteurs partenaires
- CETAQ