THE INTRODUCTION OF SOIL-BORNE ONION DISEASES INTO THE BRITISH COLUMBIA INTERIOR

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Abstract

Pink root and basal bulb rot of onion became established in the Okanagan Valley over 40 years ago; onion smut in 1945 at Kelowna; and white rot in 1964 at several locations. Circumstances under which these diseases became established indicate that the pathogens were brought into the Valley on seedling onion plants imported from Washington State. Pink root and basal bulb rot are now widely distributed throughout the irrigated sections of the British Columbia Interior; smut has become established throughout the Kelowna district.

Introduction

For over forty years, commercial onion growers in the semi-arid sections of B.C. have been importing onion seedlings each spring from Walla Walla, Washington. There is considerable evidence that with these plants they have also introduced the pathogens that cause the most serious diseases on onion in this region. These include the Fusarium spp. responsible for pink root, Fusarium oxysporum Schlecht. f. cepae (Hanz.) Snyd. & Hansen causing basal rot, Urocystis magica Pass. (U. cepulae Frost), causing onion smut, and Sclerotium cepivorum Berk., causing white rot.

The importations are fall-sown seedlings of an early-maturing strain of 'Sweet Spanish' onion. These imported plants have had a continuous demand among B. C. growers because under local soil and climatic conditions they grow well and provide an early cash crop normally harvested before the main crop of spring-sown onions is mature.

Pink root and basal bulb rot

There are two types of circumstantial evidence to suggest that the Fusarium spp. causing these diseases were introduced from Washington. Although onions have been grown in the B.C. Interior for over seventy years, pink root and basal rot were first recorded about the time the first importations of seedlings were made. Moreover, a proportion of the Walla Walla seedlings have shown pink root symptoms in each of several years that the author has inspected them, both at the time of importation and in the field on growing plants. The Fusarium type of pink root is due to F. solani (Mart.) Appel & Wr. Basal bulb rot is caused by F. oxysporum Schlecht. f. cepae (Hanz.) Snyd. & Hans. Both of these fungi occur at Walla Walla, Wash. (8) as well as in the Okanagan valley. No attempts have been made in British Columbia to discriminate Fusarium (F. solani) pink root from pink root caused by Pyrenochaeta terrestris (Hans.) Lorenz, J. C. Walker and Larson. Shaw (8) has reported the occurrence of P. terrestris in Washington. This is confirmed by isolation of the fungus by Duran (5) from the roots of onion plants collected at Walla Walla. Thus there are strong grounds for concluding that this fungus was also introduced into the Okanagan valley on imported plants and is responsible for at least part of the pink root disease found in onion crops produced in this area.

Onion smut

The first record of the occurrence of onion smut in B. C. was made in 1947. During that season diseased plants were brought to the Plant Pathology Laboratory at Summerland for diagnosis. The owner of one diseased field reported that he had first observed the disease two years previously on a few plants. Since 1947 the disease has increased in prevalence in infested fields, and has spread to most other onion fields in the Kelowna district.

The following evidence indicates that onion smut was introduced to the Okanagan Valley on plants imported from Washington:

(1) Onion plants infected with smut have been intercepted by Plant Protection officials in shipments from Walla Walla destined for the Kootenay districts of British Columbia. It seems probable that the disease was not detected in plants imported into the Okanagan Valley because they were imported in such very much larger numbers that spot inspections only could be made, and the chances of detecting the disease were thereby reduced. The fact that the first occurrence of the disease was very much limited indicates that soil infestation with the pathogen came from only a few plants.

(2) Cultures of the pathogen secured from smutted plants grown in the Okanagan valley are compatible with cultures made from diseased specimens collected at Walla Walla (5).

(3) Disease control experiments, conducted independently at Kelowna and Walla Walla (6) have provided the same finding that captan is relatively ineffective against the disease, although this fungicide is effective against onion smut in many other regions. In these two districts hexachlorobenzene, one brand only, controls smut very effectively.

These facts suggest that the strain of the fungus in the Okanagan Valley plantings is the same as that in the Walla Walla district.

White rot

Onion white rot was found in the Okanagan Valley for the first time in 1964. Mr. E. M. King of the Horticultural Branch, B. C. Department of Agriculture, had examined fields of fall-planted onions at Walla Walla early in the 1964 season, and had been

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disturbed to learn that the white rot disease occurred extensively in Walla Walla plantings. Surveys were initiated during the summer in Okanagan Valley fields that had received recent shipments of planting stock from Walla Walla, and Mr. King's anxiety proved to be justified. White rot was found on a new farm, developed on virgin land within the last five years. The disease affected approximately 75% of the plants growing in a small section of a 35-acre field of 'Stockton Yellow Globe' onions. These had been fall-seeded in August, 1963, but the immediately preceding crop had been onion plants imported from Walla Walla.

Subsequent 1964 inspections in some Okanagan Valley fields that had been planted that year with seedling plants from Walla Walla disclosed traces of white rot infection in 15 of the 16 fields inspected.

In 1965 the field in which severe infection had been found in 1964 was seeded to alfalfa. However, white rot was found in two other fields on the same farm, in onion plants that had been imported as seedlings from California. Both fields in previous years had been planted with seedlings from Walla Walla. One of these fields had only a trace of infection, The disease was moderate to severe in patches throughout the second field.

Discussion

The accumulated evidence that these important soil-borne onion diseases have been introduced to the Okanagan Valley in seedling plants is a significant demonstration of the risks involved in wholesale movement of living plants from one region to another. Even the careful inspection given by regulatory officials during transshipment has not proved effective in preventing entry of pathogens causing these diseases. Once introduced they add seriously to the problems of onion culture.

Since their introduction, the fusaria causing pink root and basal bulb rot have become widely distributed throughout the irrigated sections of the B. C. Interior. They occur in most onion fields and often cause considerable losses. Basal bulb rot has become considerably more destructive in recent years, with the replacement of open pollinated varieties by hybrid varieties that are much more seriously affected. The incidence of the disease is as high as 20 - 50% in some of the hybrid varieties being grown.

Within the same region the more recently introduced onion smut pathogen has been restricted to one major onion-growing district, that surrounding Kelowna. It has become distributed generally through the onion fields of this district, and is quite destructive if not adequately controlled by seed treatment. There appears to be little hope of preventing its eventual spread to other onion growing districts of the region.

Although an eradication programme for white rot has been considered, it appears unlikely that eradication can be effected, especially because the acreages of many of the infested farms are too small to encourage or practise rotations of sufficient duration. Some hope can be derived from the reports that minor outbreaks of the disease in Canada have been observed at Steveston, B. C. (1) and Thetford Mines, Quebec (3), on garlic, and at Winnipeg, Man., (2) and Sherrington, Que., (4) on onion, and that the disease has not persisted in these districts. However, the history of white rot in the Walla Walla district suggests that the disease can become firmly established in the Okanagan Valley. It was first found in Walla Walla plantings in 1951 (6) and has increased steadily in importance until it has become a limiting factor in onion production there. Soil, climate, and cultural methods in the Okanagan Valley are very similar to those at Walla Walla.

The establishment of seedling propagation plantings in B. C. early in the history of the Province's onion industry would have minimized the chances of introducing these pathogens. Although climatic and economic factors discouraged domestic propagation, the evidence of disease introduction now accumulated indicates that more has been lost than gained from the practice of importing young plants. It provides strong justification for initiating local production of this planting stock.

literature cited

1. Conners, I. L. and D. B. O. Savile. 1952. Canadian Plant Disease Survey 31: 50.
2. Creelman, D. W. 1960. Canadian Plant Disease Survey 39: 50.
3. Creelman, D. W. 1961. Canadian Plant Disease Survey 41 (2): 69.
5. Duran, Ruben. 1966. Correspondence.
4. Creelman, D. W. 1963. Canadian Plant Disease Survey 43 (3): 90.
6. Duran, Ruben and George W. Fischer. 1959. The efficacy and limitations of hexachlorobenzene for the control of onion smut. Plant Disease Reptr. 43 (8): 880-888.
7. Locke, Seth Barton. 1965. An improved laboratory assay for testing effectiveness of soil chemicals in preventing white rot of onion. Plant Disease Reptr. 49 (6): 546-549.
8. Shaw, Charles Gardner. 1958. Host fungus index for the Pacific Northwest I. Hosts. Washington Agric. Expt. Sta. Circular 335.