PREVALENCE OF DISEASES OF FORAGE CROPS IN QUEBEC

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Abstract

A 2-year survey of forage plant diseases showed the presence of several diseases in Quebec. Common leaf spot of alfalfa caused by Pseudopeziza medicaginis (Biv.-Bern. ex Fr.) Fckl. f. sp. medicaginis-lupulinae Schmied. and target spot of red clover caused by Stemphylium sarcinaeforme (Cav.) Wilts. are widespread and destructive. Fusarium spp. caused severe damage to alsike clover. Other foliage diseases were of minor importance. Many foliage diseases were observed on forage plants but epidemiological studies would be necessary before concluding whether or not they are of economic importance. As far as the root rots are concerned, the problem is very complex and many fungi have been isolated from the diseased roots.

Introduction

Forage plants are particularly important in the province of Quebec. In 1961, hay (grass and legumes) occupied 67% of the crop area and was worth $97,307,000 or 55.8% of the total value of field crops. Improved pastures, not included in the above figures, occupied over 2,000,000 acres (1). Since alfalfa, red and alsike clovers, and timothy are dominant in the hay crop, their agricultural importance is very evident. Because of this situation and the fact that no systematic surveys of forage crop diseases had ever been carried out, if one excepts surveys for Verticillium wilt (2), it was deemed essential that data be collected on the severity and distribution of such diseases before undertaking any scientific research.

In 1965, a 2-year survey was initiated to investigate the occurrence of diseases on forage legumes and grasses grown in Quebec. This paper reports on the results of the survey.

Materials and methods

Forage plants are grown throughout the Province of Quebec. Surveys were then made in 357 fields in 38 counties in June before the first hay crop was removed and again later in the season to check the aftermath and new seedlings before they went into the winter. Fields of different ages were selected at random for inspection. Plants of each species growing in the fields were examined while walking through the fields following an X-pattern. All information that could possibly help to explain the occurrence of any particular foliage, stem, or root disease was collected.

It is impossible to give definite figures on the losses attributable to any one of the various forage crop diseases. It is evident, however, that the combined losses aggregate thousands of dollars annually. The type of injury varies greatly. All parts of the plants, leaves, stems, crowns, and roots, are attacked and sometimes destroyed. Fungi, bacteria and viruses all cause damage. Some of the pathogens infect only specific organs of the plant, such as leaves and roots. Others attack several or all the parts of a plant. Forage plants may also suffer from mineral deficiencies and be damaged mechanically. The results of the surveys are presented below.

Diseases of alfalfa

Common leaf spot (Pseudopeziza medicaginis (Biv.-Bern. ex Fr.) Fckl. f. sp. medicaginis-lupulinae Schmied.) was the mogt prevalent of the foliar and stem diseases of alfalfa. It occurred each year and although plants were not killed by the disease, defoliation occurred mainly in late-cut stands.

Spring black stem (Ascochyta imperfecta Pk.) occurred commonly in all regions of the province. Damage was more severe in fields where two or more cuts were made.

Root rots (various fungi) were the most important diseases. Damage was more severe in old stands. Injury to alfalfa roots was quite severe in 1965; this might have been due to the lack of snow cover in the previous winter. The damage to roots,, crowns, inner parts, outer parts and feeder rootlets by the different fungi isolated will be reported later.

Non-parasitic diseases: Mineral deficiencies occurred occasionally in poorly fertilized soils and they do not seem to be very important. Old alfalfa stands are often plagued with quack grass; when roots were dug up, these were often found to be pierced by quack grass rhizomes (Figure 1). The plants did not seem to be damaged, but the hole made through the roots may be a good infection court for root parasites. The portion of the root pierced by the quack grass rhizome seemed, however, to be always well suberized.

Diseases of clovers

Target spot (Stemphylium sarcinaeforme (Cav.) Wilts.) was observed on red clover in all the fields visited. In 1965, the disease was severe whereas,

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Table 1. Diseases of forage crops in Quebec, 1965-1966.

Forage crop and disease	Disease importance[1]	Distribution[2]
ALFALFA (Medicago sativa L.)		
Bacterial wilt (Corynebacterium insidiosum (McCull.) Jens.)	3	3
Common leaf spot (Pseudopeziza medicaginis (Lib.) Sacc.)	1	1
Yellow leaf blotch (Leptotrochila medicaginis (Fckl.) Schtiepp)	3	3
Spring black stem (Ascochyta imperfecta Pk.)	1	1
Downy mildew (Peronospora trifoliorum de Bary)	3	3
Summer black stem and leaf spot (Cercospora zebrina Pass.)	3	3
Leptosphaerulina leaf spot (Leptosphaerulina briosiana (Poll.) Graham and Lutrell)	3	3
Stemphylium leaf spot (Stemphylium botryosum Wallr.)	3	2
Stagonospora leaf spot (Stagonospora meliloti (Lasch) Petr.)	3	3
Root rots (various fungi)	1	1
Viruses (unidentified)	3	2
Potassium deficiency	3	3
Phosphorus deficiency	3	3
Boron deficiency	3	3
Root damage by quack grass (See Figure 1)	3	2
RED CLOVER (Trifolium pratense L.)		
Target spot (Stemphylium sarcinaeforme (Cav.) Wilts.)	1	1
Sooty blotch (Cymadothea trifolii (Pers. ex Fr.) Wolf)	3	3
Common leaf spot (Pseudopeziza trifolii (Biv. - Bern.) Fckl. f. sp. trifolii-pratensis Schtiepp)	1	2
Powdery mildew (Erysiphe polygoni DC. ex Mérat)	1	2
Black stem (Phoma trifolii E. M. Johnson and Valleau)	2	2
Rust (Uromyces fallens Kern)	3	3
Crown rot (Sclerotinia trifoliorum Erikss.)	3	3
Root rot (various fungi)	1	1
Black patch (unidentified organism)	3	3
Phyllody (clover phyllody virus)	3	3
Viruses (unidentified)	2	2
Potassium deficiency	3	3
Phosphorus deficiency	3	3
ALSIKE CLOVER (Trifolium hybridum L.)		
Sooty blotch (Cymadothea trifolii (Pers. ex Fr.) Wolf)	1	1
Powdery mildew (Erysiphe polygoni (DC. ex Mérat)	2	3
Root rot (Fusarium spp.)	1	2
LADINO CLOVER (Trifolium repens L.)		
Summer black stem and leaf spot (Cercospora zebrina Pass.)	3	3
Powdery mildew (Erysiphe polygoni (DC. ex Mérat)	3	3
Sooty blotch (Cymadothea trifolii (Pers. ex Fr.) Wolf)	3	3
Phyllody (clover phyllody virus)	2	2
Virus (unidentified)	3	3
Magnesium deficiency	3	3
BIRDSFOOT TREFOIL (Lotus corniculatus L.)		
Stemphylium leaf spot (Stemphylium loti Graham)	3	3
BROME GRASS (Bromus inermis Leyss.)		
Leaf blotch (Drechslera bromi (Died.) Shoem.)	3	3
ORCHARD GRASS (Dactylis glomerata L.)		
Powdery mildew (Erysiphe graminis DC.)	3	3
TIMOTHY (Phleum pratense L.)		
Brown stripe (Passolara graminis (Fckl.) Höhn)	3	3

1) 1 = major importance; 2 = minor importance; 3 = rare importance.
2) 1 = observed in most fields; 2 = observed in less than half of fields; 3 = observed 1 or 2 times.

Figure 1. Alfalfa root pierced by quack grass rhizome.

in 1966, the severity ranged from slight to moderate. Target spot seems to be the most important disease of red clover.

Commonleaf spot (Pseudopeziza trifolii (Biv. - Bern. ex Fr.) f. sp. trifolii-pratensis Schlepp) was quite common on red clover. As reported by Willis (4) in Prince Edward Island, the disease was more prevalent and severe late in the summer.

Powdery mildew (Erysiphe polygoni DC. ex. Merat) was observed on red, alsike and ladino clover but it was more prevalent and severe on red clover. The disease was found late in the summer in 1965 and earlier in 1966. All the red clover fields visited on l'Ile d'Orléans in 1965 were badly infected with the disease.

Sooty blotch (Cymadothea trifolii) (Pers. ex Fr.) Wolf) was found on red, alsike and ladino clovers, However, it was more prevalent and severe on alsike. The disease was more common in 1965 than in 1966.

Root Rot (Various fungi) occurred on alsike and red clover. Red clover roots were more severely damaged than those of alsike. In 1965, damage was severe on red clover whereas it was present in moderate to severe amounts in 1966.

Roots of alsike clover, as reported by Aubé (3), were severely damaged by Fusarium avenaceum (Fr.) Sacc., Fusarium culmorum (W. G. Sm.) Sacc. and Fusarium oxysporum Schlecht. in 1965 and the disease was found in specific regions, mainly in the Lower St. Lawrence and in the Lake St. John area. In 1966, the disease was found in the same areas but the damage was less important.

Virus diseases (clover phyllody and other virus diseases) were not very important on clovers. The clover phyllody virus was found in one field of red clover in 1966, and was not found at all in 1965. On ladino clover, the phyllody virus was more prevalent in 1966 than in 1965, however, only a few fields were found to have the disease. These results are quite surprising since, according to agronomists, the clover phyllody virus was commonly found in the years before. This may mean that clover plants attacked by the clover phyllody virus have been weakened so much that they could not stand the severe winter of 1964-1965.

Mineral deficiencies were found occasionally on red as well as on ladino clover but were not important.

Diseases of birdsfoot trefoil

Stemphylium leaf spot (Stemphylium loti Graham) was found in only one field in 1965 and did not cause any appreciable damage to the plants.

Diseases of grasses

Very few diseases were found only occasionally and caused little damage on cultivated grasses.

Conclusions

No clear estimate can be given of the damage caused by stem and leaf diseases of forage crops in Quebec. All that could be determined was that some diseases were more commonly found and were relatively more important than others. To evaluate precisely the damage caused would necessitate epidemiological studies which would take into account the area of the disease on the plant vigor. Such a study would be particularly valuable with common leaf spot of alfalfaand target spot of redclover. Nevertheless, neither disease may be a problem when one considers that it is normal for most of farmers to cut this forage early. However, this problem arises with the second crop which is invariably attacked by these diseases. Root rots, on the other hand, would make a most interesting field of research. They are a real problem since the microorganisms causing them attack plants of all ages and are present in all types of soils.

Literature cited

1. Anonymous. 1961. Census of Canada. Data for commercial farms by province. Dominion Bur. of Statistics, Ser. AA, Bul. AA-5, Cat. 96-520 pp. 1-1 and 1-2, Quebec.
2. Aubé, C. and W.E. Sackston. 1964. Verticillium wilt of forage legumes in Canada. Can. J. Plant Sci. 44: 427-432.
3. Aubé, C. 1966. Pathogenicity of Fusarium species from alsike clover. Can. Pl. Dis. Survey 46: 11-13.
4. Willis, C.G. 1965. Observations on the diseases of forage crops in Prince Edward Island. Can. Pl. Dis. Survey 45: 8-11.