INTERNAL BREAKDOWN OF RED CLOVER IN PRINCE EDWARD ISLAND[1]

C. B. Willis[2]

Abstract

An internal breakdown (IB) of the crown tissues of red clover was found in all fields observed in Prince Edward Island. With increasing chronological age of the plants, the incidence of IB increased. Plants 4, 16 and 28 months old had 1, 20 and 68 percent IB, respectively. Regardless of age, from any given site, plants with IB had a larger mean root diameter. Considering plants of the same root diameter, the incidence of IB was higher among older plants. Fusarium spp. were the organisms most frequently isolated from IB tissues.

Introduction

The lack of persistence of red clover stands has been attributed to various disorders. A crown and root-rot complex is one of the factors responsible for this lack of persistence (4). Graham et al (3) reported that an internal breakdown (IB) of crown tissues, a physiogenic, disease has also been observed in Washington (1). The longevity of red clover is affected by IB which is often considered as part of the crown and root-rot complex.

In recent studies concerning factors affecting the development of root rots in red clover, a breakdown of the crown tissues was observed in all lots of roots examined. A summation of those observations is reported herein.

Materials and methods

The red clover plants studied were obtained from fields throughout Prince Edward Island and ranged in age from 4 to 28 months. Each lot consisted of a minimum of 100 plants collected at random. More than 4,700 plants were lifted, washed, the tap root split, and examined for discoloration and breakdown in the crown tissues. Root diameters were measured at the crown. Isolations were made from internal crown tissues surface-disinfected with 70% alcohol and 5% sodium hypochlorite and transferred to plates of potato dextrose agar containing 100 ppm streptomycin sulphate.

Results and discussion

No characteristic external symptoms of internal breakdown of the crown tissues were visible. Breakdown areas varied from small, watery, necrotic areas to dry corky areas and eventually to hollow crown piths. In advanced stages, IB often extended to external necrotic areas. The numbers of crowns affected increased with the age of the plants (Table 1). Considering any one lot of roots, those of that lot having IB invariably had larger mean root diameter regardless of age.

When all the roots of a particular age were grouped according to root diameter, the incidence of IB increased with increasing root diameter (Table 2). Considering roots of the same diameter, the older roots had a higher incidence of IB. The data indicate that IB is correlated with chronological age and with root diameter.

Table 1. Internal breakdown of red clover in Prince Edward Island.

Root lot number	Age of roots (months from spring)	Size of sample	Roots with IB (%)	Mean diam. tap roots (mm)	
				With IB	Without IB
A	4	519	1	4.8	3.1
B	16	417	15	6.5	5.8
C	16	603	35	11.2	9.5
D	16	921	11	9.8	7.4
E	16	1618	20	10.8	8.7
F	16	100	33	10.4	9.7
G	28	125	78	12.1	9.8
H	28	265	60	8.7	7.5
I	28	100	72	10.2	9.1
J	28	100	77	14.0	10.7

No one organism was consistently recovered from the internal necrotic and adjacent tissues. Of more than 400 isolates recovered, Fusarium spp. accounted for 27%, Chaetomium spp. 25%, Phoma spp. 19% and Gliocladium, Penicillium and Rhizoc-

1 Contribution No. 151, Experimental Farm, Canada Department of Agriculture, Charlottetown, P.E.I.

2 Plant Pathologist.

Table 2. Relationship of internal breakdown of red clover to tap root diameter and chronological age of the root.

Tap root diam. (mm)	Roots 16 months old		Roots 28 months old	
	With IB (%)	Total no.	With IB (%)	Total no.
5	6	345	41	34
6	7	438	49	43
7	8	437	47	51
8	13	477	59	64
9	20	489	66	71
10	28	499	72	79
11	37	330	75	67
12	46	189	81	43
13	44	144	78	32
14	43	65	84	25
15	48	48	90	21

tonia spp. another 18%. The fungi isolated, and in the proportions indicated, did not differ appreciably from those obtained from other necrotic areas associated with the same roots.

Cressman (1) reported that the incidence of IB was similar in clovers of all flowering types but that it developed more rapidly in plants which flowered more intensively. Histological and histochemical studies, in general, have been negative or inconclusive. Selection within red clover varieties for resistance to IB is possible and some progress has been made (2). The selection of IB-resistant varieties would contribute to the persistence of red clover and would also aid in the elucidation of the crown and root rot complex.

Literature cited

1. Cressman, R.M. 1965. Studies on internal breakdown and persistence of red clover. Paper presented at the Annual Meeting of the American Society of Agronomy, 1965.
2. Graham, J.H. 1965. Personal communication.
3. Graham, J.H., C.L. Rhykerd, and R.C. Newton. 1960. Internal breakdown in crown of red clover. Plant Disease Reptr. 44: 59-61.
4. Willis, C.B. 1965. Root rot of red clover in Prince Edward Island and factors influencing the incidence of associated fungi. Can. J. Plant Sci. 45: 369-373.