Fungi associated with pole rot of cigar tobacco in Quebec[1]

S.K. Gayed

Botrytis cinerea, Rhizopus reflexus. Alternaria alternata, Fusarium tricinctum are the most common fungi associated with pole rot of cigar tobacco in Quebec. Apparently, this is the first trial to identify these fungi on cigar tobacco, and the first record of R. ***reflexus*** in Canada. A laboratory technique was devised to test the pathogenicity of these fungi on injured and uninjured green leaf disks of mature cigar cultivars Ottawa 705 and Resistant Havana 211. The most virulent pathogen was B. ***cinerea,*** and the least virulent was ***F. tricinctum.*** Only ***B. cinerea*** caused rot to uninjured leaf disks of both cultivars.

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Botrytis cinerea. Rhizopus reflexus. Alternaria alternata, Fusarium tricinctum sont les champignons les plus frequemment associés a la maladie de la fermentation (chauffage) a la pente sur le tabac à cigare au Quebec. Il semble que cette etude soit le premier essai d'identification de ces champignons sur le tabac à cigare, et aussi la premiere mention de la presence de ***R. reflexus*** au Canada. Nous avons mis au point une technique de laboratoire pour apprecier la pathogénicité des champignons sur des disques intacts ou blesses de feuille verte des cultivars Ottawa 705 et Resistant Havana 211 a maturite. Le pathogene le plus virulent est ***B. cinerea*** et le moins virulent ***F. tricinctum.*** Sur les deux cultivars, B. ***cinerea*** a ete le seul a causer le chauffage a la pente sur les disques de feuille intacte.

Introduction

Cigar tobacco is grown mainly in the Montcalm, L'Assomption and Joliette counties in Quebec. In early to mid-September the plants are cut, left to wilt in the field, and 5-6 plants are speared on a lath. Laths are loaded into a curing barn equipped with bottom, side, and head ventilators to help in air circulation and reduction of humidity during curing.

Pole rot (barn rot, pole sweat, or shed burn) is a common disease that infects cigar tobacco during curing particularly under humid conditions. Fungi develop on the stem and the leaves of the tobacco plants. There is no record on the identity of these fungi and their relative pathogenicity to cigar tobacco. The present work includes a survey carried out in the cigar area in Quebec between 1969-1973 to identify these fungi, and also comments on their relative pathogenicity under laboratory conditions to injured and uninjured leaves of cigar tobacco.

Materials and methods

Samples of diseased cigar tobacco plants were collected from the St. Jacques Tobacco Co-operative, and from 20 farms in the area. The fungi were microscopically examined and cultured on potato dextrose agar (PDA) and identified.

A laboratory test was used to compare the virulence of the fungi on green leaves of mature cigar tobacco (*Nicotiana tabacum* L.) cv. Ottawa 705 (0-705) susceptible to pole rot and those of the Resistant Havana 211 (RH-211) both grown at the Delhi Research Station. Leaf disks, 5 cm in diameter, were cut from similar positions of the lamina of leaf No. 6 and 7 from the base of mature plants. The disks were surface sterilized by immersing in a 0.5% calcium hypochlorite suspension for 3 minutes and then rinsed in sterile water. Each leaf disk was slightly injured in the center with a dissecting needle. The four fungi were grown on PDA and 6-mm disks were cut from the edge of the actively growing fungus. The fungal disks were placed on the injured centers of the wet leaf disk, with the mycelium-bearing surface facing the leaf disk. Leaf disks that were not inoculated served as checks. For each treatment and check 15 leaf disks were prepared. The disks were then inserted in the slots of slide magazines each with 30 slots (Fig. 1). The magazines were placed in a saturated atmosphere in humidity chambers. After 12 days incubation at 22-25 C, the rot on each disk

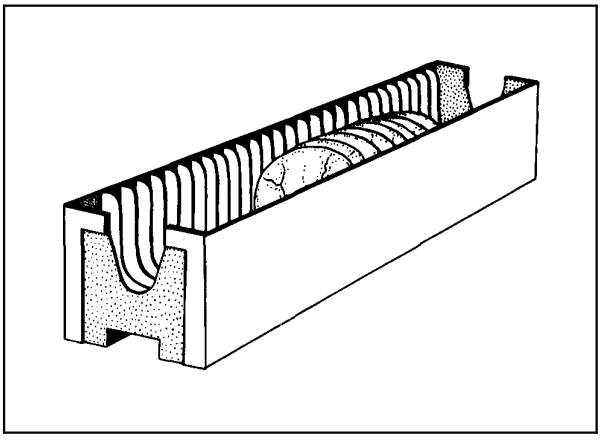

Fig. 1. A diagram of the slide magazine used with the inserted tobacco leaf disks.

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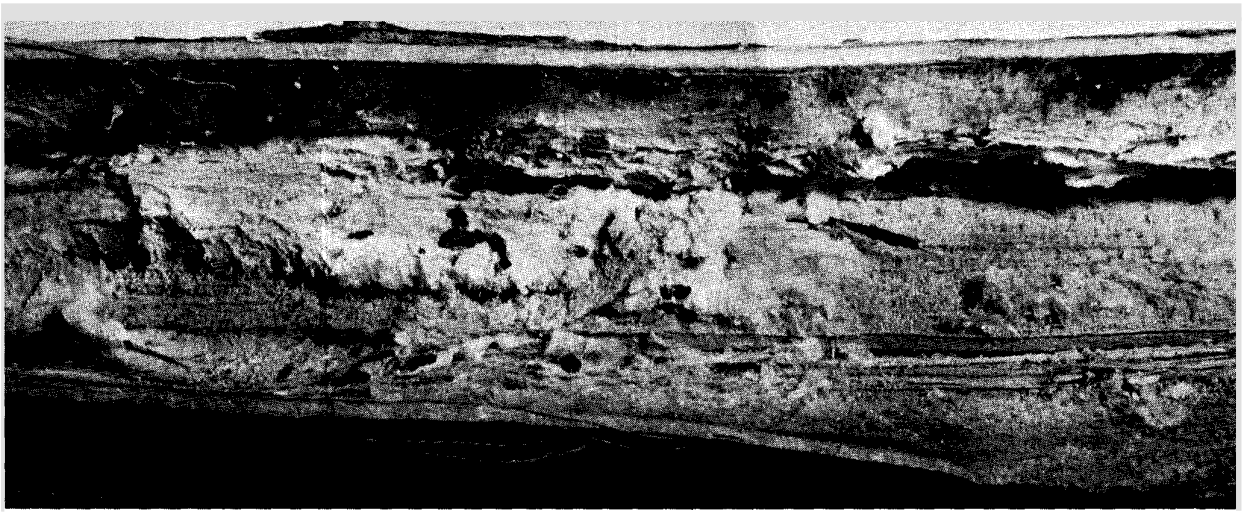

Fig: **2.** A longitudinally split stem of cigar tobacco cv. Ottawa 705 infected with *B.* cinerea. Notice the densely growing mycelium, spores, and the black sclerotia attached to the pith tissue

was visually rated and the average per cent rot-coverage on the 15 replicate disks represented the disease index of the treatment. The test was repeated.

An identical test was carried out using uninjured leaf disks from mature 0-705 and RH-211 plants grown in pots under greenhouse conditions in order to minimize leaf injury by natural causes.

Results and discussion

Botrytis cinerea Pers. was the most common fungus associated with pole rot. Greyish mycelium and spores covered a considerable part of the stem and the fungus reached the pith of the stem particularly through the injury caused by spearing. In many areas the fungus produced masses of mycelium and spores as well as sclerotia (Fig. 2). Leaves of infected plants, particularly those of the susceptible cultivar 0-705 were soggy, thin, and partially decomposed.

Anderson reported ***B. cinerea*** and ***Sclerotinia sclerotiorum*** (Lib.) de Bary as the major fungi causing pole rot of air-cured tobacco in Connecticut (2). From the present study there are two facts supporting ***B. cinerea*** and not ***S. sclerotiorum*** as the major fungus on cigar tobacco in Quebec; first is the firm attachment of the sclerotia to the plant tissue and second, all trials to stimulate the germination of the collected sclerotia in order to produce the perfect stage of the fungus were unsuccessful.

Rhizopus reflexus Bain was common in 1969 in association with ***B. cinerea.*** The mycelium of R. ***reflexus*** is fluffy and carries tiny black sporangia. Sporangia of this species are smaller than those of ***Rhizopus arrhizus,*** Fischer, the cause of pole rot of flue-cured tobacco (4). Apparently R. ***reflexus*** is not a common fungus in other parts of the country since it has not been previously recorded in Canada (1,3).

Table 1. Pole rot index induced by four different fungi on cigar tobacco cv Ottawa 705 (susceptible) and cv Resistant Havana 211 under laboratory conditions on injured and uninjured leaf disks

Fungus	Pole rot index[1] on tobacco leaf disks			
	Injured[2]		Uninjured[3]	
	0-705	RH-211	0-705	RH-211
Botrytis cinerea	**99**	**84**	**30**	12
Rhizopus reflexus	77	1	***0***	**0**
Alternaria alternata	**75**	**37**	***0***	**0**
Fusarium tricinctum	71	***8***	**0**	***0***
Uninoculated	0	0	0	**0**

1 Average of 2 trials, each consists of 15 leaf disks. Pole rot index is the average per cent coverage of the tobacco leaf disks with rot.

2 Injury was made on leaf disks from field-grown plants by a dissecting needle.

3 Uninjured leaf disks were cut from greenhouse-grown plants.

Alternaria alternata (Fr.) Keissler grew in the form of dark or blackish areas on the stem and leaves of infected plants also in association with ***B. cinerea*** and other fungi.

Fusarium tricinctum (Cda) Sacc. was characterized by its white growth on infected plants, and was noted as the dominant fungus in samples from three farms in the St. Jacques area in 1972.

Laboratory studies proved that the 4 fungi caused severe damage to injured leaf disks of the susceptible cv 0-705, whereas injured leaf disks of the resistant RH-211 were severely damaged by ***B. cinerea,*** moderately

by A. ***alternata,*** slightly by ***F. tricinctum,*** and hardly any damage was caused by ***R. reflexus*** (Table 1). On the uninjured leaf disks only B. ***cinerea*** was able to cause rot, and the other 3 fungi failed to cause any damage during the 12-day period of the experiment. Rot caused by B. ***cinerea*** on the uninjured leaf disks of the susceptible cultivar was more than double that on the resistant cultivar (Table 1). Thus, injury of the susceptible cigar tobacco cultivar does not only increase the damage caused by the dominant pathogen B. ***cinerea*** but also increases damage caused by ***Alternaria, Fusarium*** and ***Rhizopus.*** The nature of this susceptibility is not known and further work is needed.

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