A CURVULARIA LEAF DISEASE OF MAIZE

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ABSTRACT

A leaf disease of maize incited by *Curvularia pallescens*, is characterized by small, round, abundant lesions which may or may not be surrounded by pellucid areas. *C. pallescens* is capable of inciting " pellucid ring spots " on certain cultivars.

Artificial field inoculations indicate that the inbred line CM 300 is resistant inasmuch as only flecks are produced in which the pathogen is not able to sporulate.

A severe leaf spot disease was observed in an open-pollinated local variety at the Village Sarahan, District Sirmaur in Himachal Pradesh in August, 1969. Several cultivars at Dhaulakuan in the same district were also found to be affected by a similar leaf spotting. Frequent isolations from both the locations yielded species of Curvularia. A majority of collections yielded *C. pallescens* Boed. but, from a few, *C. lunata* Boed. was also isolated.

Nelson (10) reported *C. maculans* (Bancroft) Boed. as the causal agent of a leaf spot disease in U.S.A. (North Carolina and Georgia) and Malaguti and Subero (8) in Venezuela.. Vasal *et al.* (11) recorded a severe leaf spot disease incited *C. lunata* in Thailand. Mabadeje (7) observed that a leaf spot of maize in South-West Nigeria is caused by *C. pallescens*.

Jain (5) found a new species, *C. tuberculata* jain, on maize leaves but described no symptoms. Lele *et al.* (6) showed that *C. tuberculata* incites die-back in citrus and the same citrus isolate induced leaf spots on maize seedlings. Mandokhot and Basu Chaudhary (9) have recently recorded a leaf spot of maize incited by *C. clavata* Jain.

Material and Methods

The work reported here is based on studies with 4 pathogenic cultures isolated from CM 600 (designated as F_1) and CM 104 (designated as G, G_1 and G_5) at Dhaulakuan (H.P.), Isolate G was found to be highly virulent and was, therefore, used in field evaluation programs. In the 1970 and 1971 crop seasons, 86 cultivars (48 inbred lines, 11 single crosses, 9 released hybrids, 7 composites, 10 locals and one sweet corn variety) were planted for evaluation to this disease. Isolate G was seeded on autoclaved sorghum seeds as well as on dried maize leaves and incubated for at least 15 days by which time the cultures had sporulated profusely. Such cultures were ground powdered and used as inoculum. The first inoculation was made when the plants were 15 days old by pouring a thimbleful into the plant whorls. In dry weather this was followed

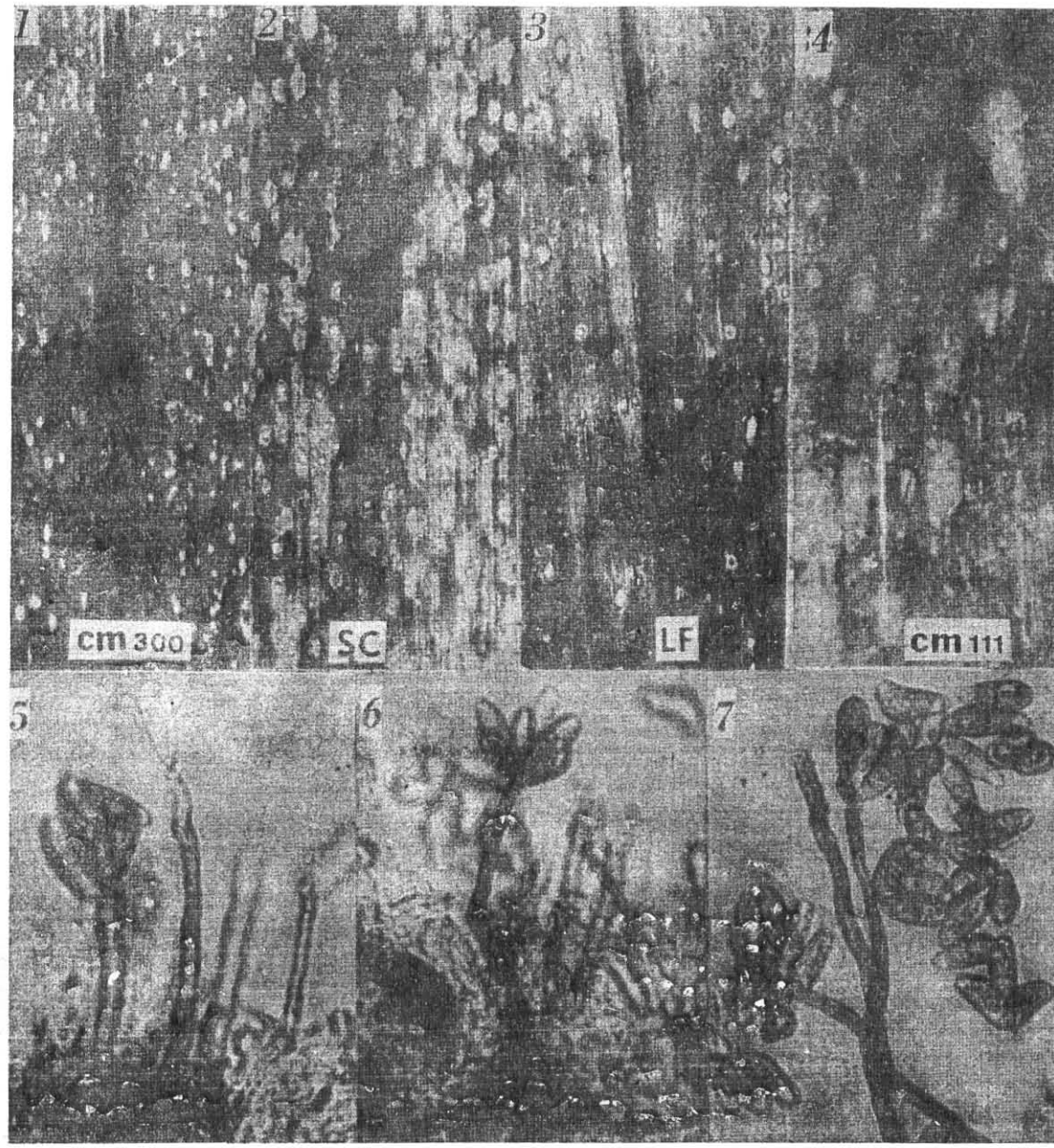

Fig. 1—7. Symptoms and Pathogen. 1) Minute chlorotic flecks on inbred line CM 300 2) Lesions surrounded by translucent halos on sweet corn. 3) "Brown Spots" on Lady Finger Pop Corn. 4) "Pellucid Ring Spots" on inbred line CM 111. 5) A conidium of *C. pallescens* developing on geniculate conidiophore. 6) A cluster of 7 conidia on conidiophore. 7) Conidiophores and conidia.

by a water spray, but in cloudy and rainy weather it was not necessary. Three more inoculations were made the last being when the crop was 45 days old. Experience has shown that two inoculations provide adequate disease to evaluate the reaction of maize cultivars.

The degree of sporulation of the pathogen on various cultivars was also determined (3, 4). Leaf discs (9 mm. diameter) of various cultivars which were field-inoculated, were incubated in moist chambers for 36 hours at 28 C. Spore counts were made after this period in at least 3 fields of the stereoscopic microscope and averaged. Calculations were then made for the total number of spores present per sq. mm. leaf area.

The colony characters of the pathogen have been described on the basis of growth on Potato-Dextrose-Agar medium.

The Pathogen. Colonies: on PDA velvety, dirty greenish to greyish-brown becoming dark brown with age, reverse of colonies greyish-brown. Mycelium septate, dark brown, hyphae 1.5–4.5 μ in diameter. Conidiophores: folicolous mostly hypophyllous, occasionally amphigenous, erect, swollen at the base, lower part straight, upper fertile portion flexous, geniculate, septate, brown smooth, 30–268 μ long, 3–6 μ thick, bearing conidia in clusters of 3–8 (Figs. 5, 6, 7). Conidia : arise porogenously, acropleurogenous, straight or slightly curved, ellipsoid to obovoid, 3—septate, end cells hyaline to subhyaline, the two intermediate cells concolorous, pale brown to brown, 18—30 x 7–15 μ (Figs. 5, 7).

Isolated from living leaves of *Zea mays* Linn. (flint type), Dhaulakuan, H.P., India, August, 1969.

In morphological characters, the pathogen agrees with *C. pallescens* Boed. It differs from *C. clavata* in that the conidia are ellipsoidal to obovoid and not clavate with tapering hyaline to subhyaline end cells and the two intermediate cells pale brown to brown.

Lesion types and sporulation :

The commonest symptom was the development of extensive flecking of the leaves in the beginning. Severe infection led to premature drying of large portions of leaf lamina, particularly the tips and, in some materials, shredding also occurred.

The lesions were generally round to oval, separate or coalescent 1—6 mm in diameter. The centre of each lesion was strawcoloured to light brown, surrounded by a dark brown margin. When the infected leaves are held against light a translucent halo is seen surrounding each spot (Figs. 2, 4). The dimensions of lesions given below include that of the halo also.

While spotting was univeral, the size and kind of lesions varied from cultivar to cultivar. Spotting in the inbred line CM 300 consisted of minute pin-point-like chlorotic flecks (1 mm in diam.) (Fig. 1). In Lady Finger Popcorn (PI 217407), the lesions were larger in size (2—10 mm diameter) and they also appeared on leaf sheaths and husk leaves (Fig. 3). In the inbred line CM 111 (Fig. 4) they were comparatively large (2—15 mm diameter). They were also prominently translucent with concentric zonations; thus, very much resembling the symptoms of the disease known commomly as " pellucid ring spot ".

Three kinds of lesions were distinguished: fleck type, pellucid ring spot type and the brown spot type. Intergrading forms between these three types also occurred. In the fleck type which was noted only in CM 300 (a parental

inbred line of released hybrids Ganga Safed 2 and Hi-starch) there was a total lack of sporulation. The pellucid ring spot type was observed in CM 111 (a parental inbred line of hybrids Ganga 3 and Ganga 5). Here the average number of spores was 22 per sq. mm leaf area. The highest amount of sporulation (95 spores per sq. mm leaf area) was noted in L.F. (PI 217407) which showed extensive " brown spotting ".

Discussion

A variety of spotting occurs on maize leaves. Some kinds are due to genetic, non-infectious or physiological factors. A lethal leaf spot governed by a single recessive gene has been recently reported by Ullstrup (13). " Zebra striping ", " striate ", " zebra necrosis ", etc., are also known to be based on genetic factors. Certain kinds of leaf flecking have been ascribed to cytoplasmic inheritance of " seed borne viruses " (1, 2). A trouble known as "pellucid ring spot" occurs in several maize growing countries. Simons (12) believed that mites might be involved in causing this spotting. Ullstrup (13) has rightly pointed out that rigorous proof regarding the nature of the true etiologic agent (s) in some of these cases is still lacking.

In spite of the fact that species of *Curvularia* can be commonly isolated from leaves showing flecks and spots, their role in inducing these symptoms has, at least in some cases, not been critically determined. It is only in recent years that reports which definitely implicate species of *Curvularia* in the causation of leaf spots in maize have appeared: *C. maculans* (8, 10), *C. pallescens* (7 and this report), *C. lunata* (11), *C. tuberculata* (5, 6) and *C. clavata* (9). Thus so far *C. clavata* and *C. pallescens* have been shown to cause leaf spotting in maize in India.

It has been shown here that under conditions of artificial inoculation in the field, the symptoms depending on the host cultivars, vary all the way from minute flecks to large pellucid spots. In lines rated to be resistant, such as CM 300, only flecking unaccompanied by any sporulation develops.

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