The increase in the importance of C. graminicola is recent. The black coloration on the exterior stalk is characteristic and has been seen mainly in the last 3 years. Plants with these symptoms were not observed in the 1958 and 1959 surveys (2) and C. graminicola was not identified in the 1948-52 surveys of Koehler and Boewe (3) (Table 1).

Gibberella stalk rot is still important in Illinois as it has been for the last half century. G. zeae has a wide host range, including wheat, another major Illinois crop. The persistence of this pathogen is expected to continue.

The significance of Helminthosporium spp. as stalk rot pathogens is not known. These fungi are common in rotted stalks and resemble H. carbonum in morphology.

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SCREENING FOR RESISTANCE TO STERILITY MOSAIC OF PIGEONPEA

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We are grateful to J. P. Meiners, Agricultural Research Service, U.S. Department of Agriculture, and J. M. Green, ICRISAT Pigeonpea Breeder, for useful comments on the manuscript. The assistance given by B. C. Reddy in screening work and L. J. G. van der Maesen, ICRISAT germplasm scientist, is acknowledged.

The International Crops Research Institute for the Semi-Arid Tropics receives support from a variety of donors, governments, foundations, etc. including IBRD, IDRC, UNDP, USAID.

The responsibility for all aspects of this publication rests with the International Crops Research Institute for the Semi-Arid Tropics.

ABSTRACT

Two thousand eight hundred and four accessions including pigeonpea (Cajanus cajan) germplasm/cultivars, Atylosia spp. and Cajanus x Atylosia crosses were screened for resistance to sterility mosaic, by utilizing a "leaf-stapling" inoculation technique. Four pigeonpea lines, ICRISAT-3783, -6986, -6997, -7035, and one cultivar (ICRISAT-7119 or Hy. 3C) were identified as immune. Lines showing other desirable characters including longer incubation period, less disease incidence, mild symptoms, and flowering in spite of infection were also identified.

Plant Dis. Reptr. 60: 1034-1036.

The sterility mosaic of pigeonpea is widely prevalent in the Indian subcontinent. It produces complete or partial sterility in affected plants. In some fields 100% incidence was observed (2). Capoor (1) established the infectious nature of the disease. Seth (4) reported transmission of the causal agent through the eriophyid mite, Aceria cajani Channabasavanna, and this was confirmed by Nene (2). Whether the causal agent is a virus is not yet established. Nene (2) and Ramakrishnan and Kandaswamy (3) independently reported the transmission of the causal agent through the vector by tying branches from diseased plants on to healthy ones.

At present, no effective control measures are known even though eradication of diseased plants in the vicinity of pigeonpea fields has been suggested as a measure to reduce disease incidence (5). Development of resistant varieties appears to be the only feasible method of control. Efforts by other workers to identify sources of resistance in pigeonpea were unsuccessful (3, 5). Seth (5), however, suggested a species of Atylosia (I.W. 1451) as a promising material for incorporating resistance to the causal agent. In our breeding program at ICRISAT, we attempted to locate sources of resistance in pigeonpea.

MATERIALS AND METHODS

For screening, the seedlings were raised in 30-cm earthen pots filled with red soil and farm yard manure (10 : 1) mixture. For each accession, 25 seeds were sown in a single pot. A "leaf-stapling" technique, which yielded 100% infection in susceptible cv. Sharda, was followed. Inoculations were made by stapling individual diseased leaflets carrying more than 50 mites/leaflet on 10- to 15-day-old seedlings. Two to four diseased leaflets of Sharda, depending on their size, were used for inoculating the two primary leaves of each seedling. When the leaflets were larger in size, one leaflet was folded on each primary leaf in such a way that its lower surface came in contact with the upper and lower surfaces of the primary leaf and then was stapled. When the leaflets were smaller, two (one above and one below) were stapled to each primary leaf with their lower surfaces against the primary leaf. The stapler and staples used were "Max-10" manufactured by the Max Co., Ltd., Japan. With each batch of accessions screened, we also inoculated plants of susceptible check Sharda to compare performance. Observations on incubation period, percent infection, severity of symptoms, and flowering of infected plants were recorded.

RESULTS

In a period of 15 months, 2604 pigeonpea lines, 198 intergeneric (Cajanus x Atylosia spp.) lines and two species of Atylosia (A. platycarpa and A. lineata) were screened. Of the pigeonpea lines screened, ICRISAT-3783, -6986, -6997, -7035 and -7119 were found immune in repeated tests (more than ten times) both in pots and in the field (Fig. 1). Back inoculations (by using leaflets of immune plants carrying mites) to susceptible cultivar Sharda were negative. The information on identity, origin, maturity and 100-seed weight of these lines is presented in Table 1. None of the intergeneric lines and Atylosia spp. screened showed high resistance.

The incubation period in the lines screened ranged from 5 to 73 days. In certain lines the time taken for symptom expression was substantially longer than in the susceptible check Sharda. We identified 38 lines that developed symptoms at least 3 weeks after the susceptible checks.

The percent infection in lines classified as susceptible varied considerably (6.66% to 100.0%). Only three lines (ICRISAT-1131, -2719 and A. lineata) showed less than 10% infection, however.

Almost all of the lines screened developed severe mosaic symptoms. Only four lines, namely ICRISAT-276, -2360, -6392 and -6546, showed mild mosaic symptoms. The number of lines that flowered in spite of infection was 338, and the percentage of flowered plants ranged from 3.7 to 100.0. All of the infected plants of only two lines (ICRISAT-5004 and -5038) produced flowers.

Table 1. Information on pigeonpea accessions found immune to sterility mosaic.

ICRISAT accession no.	Identity	Place of origin in India	Maturity in days at Hyderabad	100 seed weight (g)
3783	JA-275	Bastar, M. P.[a]	214	18.41
6986	-	Jeypore Road, Orissa	210	13.40
6997	-	Bastar, M. P. (originally from Bangla Desh)	180	13.40
7035	Bheda Ghat	Bheda Ghat, M. P.	219	22.22
7119	Hy. 3C	Hyderabad, A. P.	203	19.20

[a]M. P. - Madhya Pradesh state; A. P. - Andhra Pradesh state.

FIGURE 1. Reactions of Sharda (susceptible) and ICRISAT-7035 (immune) pigeonpeas to sterility mosaic.

DISCUSSION

Earlier efforts to identify sources of resistance to sterility mosaic in pigeonpea were unsuccessful. Seth (5) screened 18 lines of pigeonpea and found all of them to be susceptible. He reported Atylosia sp. (I.W. 1451) to be a promising line for incorporating resistance to the disease, however. Ramakrishnan and Kandaswamy (3) screened about 3800 pigeonpea lines and cultivars and grouped them into three categories (mild, medium, severe) according to symptom severity. As many as 2039 lines were classified under the "mild" category.

We have identified four pigeonpea lines and one variety (Hy. 3C) apparently immune to sterility mosaic (Table 1). The four lines (ICRISAT-3783, -6986, -6997, -7035) were collected directly from cultivators' fields. In addition to being resistant, these lines possess other promising characters, such as good combining ability and larger seed size, and are therefore already being used in the breeding program of ICRISAT.

Materials with other desirable characters such as less disease incidence, longer incubation period, mild mosaic symptoms and flowering in spite of infection were also identified. These lines could be used in the future in the breeding program, if necessary. Both species of Atylosia that were screened in this study were susceptible. Atylosia sp., claimed by Seth (5) to be resistant, has not yet been screened.

Because some of the immune lines identified are already being used as parents in the ICRISAT breeding program, screening of F_1, F_2 and triple cross progenies has been initiated in collaboration with the breeders.

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