

IDENTIFICATION OF SOME VIRAL DISEASES OF LEGUMINOUS CROPS IN THE CERRADOS

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SUMMARY - Several viruses were isolated from diseased soybean, French bean and pea plants in the Cerrados. Isolated viruses were identified on the basis of host range, symptomatology, transmission, stability in crude sap and serological affinities. Soybean mosaic, bean rugose mosaic and cowpea severe mosaic viruses were isolated from soybean plants. Bean golden mosaic, bean rugose mosaic and bean common mosaic viruses frequently occurred on French bean, while tomato spotted wilt virus was isolated from pea plants. Field surveys have been conducted in several fields planted with soybeans, French beans and peas. Plants showing symptoms suggesting the presence of a virus disease were collected and studied at CPAC. The purpose of the studies is to identify viruses occurring naturally on major leguminous crops in the Cerrados, on the basis of the symptomatology, host range, transmission, serological affinities and a few other properties.

Key words: leguminous crop, virus disease, identification, Cerrados.

Soybean (*Glycine max*)

1. Soybean mosaic virus

The virus which has been reported in Brazil (Anjos, 1985), causes one of the most important virus diseases of soybean in the Cerrados. The virus occurs in many experimental fields of Agricultural Research Organizations, because the virus is transmitted through soybean seeds and also by many species of aphids. Host range of this virus seems to be restricted to soybean in nature, but the virus has been transmitted to some leguminous plants experimentally (Figures 1, 2 and 3). The thermal inactivation point in sap from infected soybean plants was approximately 65 °C (10 min.), the dilution end point was 1,000-10,000, and the longevity in vitro was 4-6 days (20°C). The virus reacted positively with the antiserum against soybean mosaic virus from Japan.

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FIG. 1 - Soybean mosaic in field.



FIG. 2 - Soybean mosaic transmitted through seed.



FIG. 3 - Mottling on soybean seeds caused by soybean mosaic virus.

2. Bean rugose mosaic virus

"Virus do mosaico em desenho do feijoeiro" is a strain of bean rugose mosaic virus (Lin, et al., 1981), which was isolated from French bean in Brazil (Kitajima, et al., 1980).

A virus disease was observed on several soybean plants in an irrigated field of CPAC, in May, 1989 (Figure 4). The symptoms of the disease consisted of mosaic with dark green and puffed areas. The plants were slightly stunted. The symptoms resembled those observed in the disease caused by soybean mosaic virus. About 20 soybean varieties tested as well as French bean and peas were found to be infected with the virus systemically. *Chenopodium* spp. produced local lesions on inoculated leaves. The virus was transmitted by the beetles, *Cerotoma* sp. and *Diabrotica* sp. No seed transmission was observed in soybean and French bean. The thermal inactivation point in sap from infected French bean was 60-65 C (10 min.), the dilution end point was 10,000-100,000, and the longevity in vitro was over 6 days (20 C). The virus reacted positively with the antiserum against "virus do mosaico em desenho do feijoeiro" but not with the antiserum against cowpea severe mosaic virus (both antisera were kindly supplied by Dr. E.W. Kitajima, Professor, UnB).

This is the first report on the isolation of the virus from soybean plants.



FIG. 4 - A new virus disease caused by bean rugose mosaic virus.

3. Cowpea severe mosaic virus

The virus isolated from soybean plants in Brazil caused bud blight in soybean plants (Anjos and Lin, 1984).

A virus disease characterized by terminal bud necrosis and severe stunting, was observed in a soybean field of Barreiras (BA), in March, 1989 (Figure 5). All the varieties of soybean tested, 2 out of 8 varieties of French bean, cowpea, lima bean, mung bean, azuki bean, pea, *Nicotiana benthamiana* and a few plant species were infected systemically. Several varieties of French bean, *Nicotiana glauca*, *Chenopodium* spp. and a few plant species showed local lesions on the inoculated leaves. The thermal inactivation point was 60-65 C (10 min.), the dilution end point was around 10,000, and the longevity in vitro was over 6 days (20 C). The virus reacted positively with the antiserum against cowpea severe mosaic virus, but not with the antiserum against "virus do mosaico em desenho do feijoeiro".

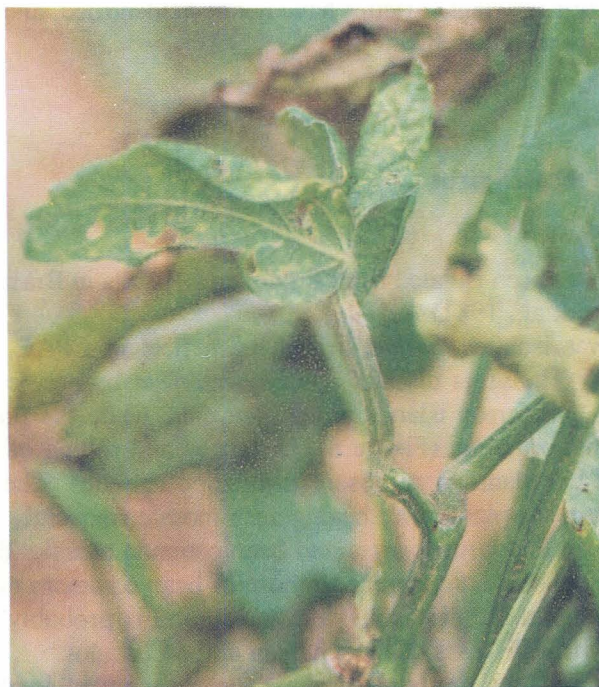


FIG. 5 - A virus disease caused by cowpea severe mosaic virus.

French bean (*Phaseolus vulgaris*)

1. Bean golden mosaic virus

The disease which occurs commonly on French bean plants in Brazil (Costa, 1965), seems to be the most important virus disease of French bean in the Cerrados (Figure 6). Some serological characteristics have been reported by Dr. Honda, a short term consultant.

The rates of diseased plants of French bean varieties and/or lines were observed in a field of CPAC, in April, 1989. Ten out of 60 varieties and/or lines showed low rates of infection, namely FT84-1500, FT-84-324, CNF5840, etc.

The problems associated with the epidemiology of this disease are as follows; (1) the causal agent has not been transmitted by mechanical inoculation, (2) superior resistant varieties have not been identified, and (3) lack of ecological studies on vector (white-fly).

2. Bean rugose mosaic virus

The virus has been isolated from French bean plants in Brazil (Kitajima et al., 1980; Lin, et al., 1981).

A virus was isolated from a French bean field in CPAC, in March, 1988 (Figure 7). The virus disease was characterized by severe mosaic on the leaves with dark green islands along the veins, while the pods showed mottlings and malformation (Figure 8). Distortion and rolling of the leaves, and stunting of the plants were observed in some varieties. The virus was isolated from diseased plants with bean golden mosaic frequently. There is a confusion between this virus disease and bean common mosaic, because the symptoms of this disease are similar to those of bean common mosaic. Our surveys indicated that the disease is widespread and is probably one of the most important virus diseases of French bean in the Cerrados.

The characteristics of the virus have been described in the past on soybean virus diseases.



FIG. 6 - Bean golden mosaic



FIG. 7 - Typical symptoms on French bean caused by bean rugose mosaic virus.



FIG. 8 - Mottlings on bean pods produced by bean rugose mosaic virus.

3. Bean common mosaic virus

This virus disease has been reported in Brazil (Costa, 1978).

A virus was isolated from a diseased French bean plant in a field of CPAC (Figure 9). The symptoms of the disease consisted of rolling or curling mosaic with dark green areas along the veins on the upper leaves, but sometimes faint mottling was observed on the leaves of infected French bean plants. Four out of 12 varieties of French bean tested were resistant to the virus. The virus was transmitted through seed and by many species of aphids. Host range of the virus seemed to be restricted to French bean in nature, but the virus was transmitted to cowpea, *Cassia* sp. and *Sesamum indicum*. The thermal inactivation point in sap from infected French bean plants was 60-65 C (10 min.). The virus reacted positively with the antiserum against bean common mosaic virus from Japan.



FIG. 9 - Bean common mosaic.

Pea (*Pisum sativum*)

1. Tomato spotted wilt virus

This virus disease has been reported in Brazil (Duse et al., 1988).

A virus was collected from a pea plant in a field of CPAC, in June, 1988 (Figure 10). The disease occurred in many pea fields and a 1-2% rate of infection was observed in some fields. The virus disease is characterized by terminal bud necrosis of pea plants, and the pods become brown. The following plant species were systemically infected: pea, *Cassia* sp., *Vinca*, *Zinia*, tomato, *Nicotiana clevelandii*, *N. glutinosa*, and *N. tabacum*. Local lesions were observed on *Chenopodium* spp., cowpea, French bean (cv. Kintoki), cucumber, melon and petunia. The thermal inactivation point in sap from infected tomato plants was below 55 C (10 min.), the dilution end point was around 1,000, and the longevity in vitro was within 1 day (20°C). On the basis of the host range, symptomatology and physical properties in crude sap, the virus was identified as tomato spotted wilt virus. The virus is transmitted by thrips and when the insects attack pea flowers, the plant becomes infected with the virus, and exhibits brown pods.



FIG. 10 - Top necrosis of pea plant caused by tomato spotted wilt.

References Bibliografics

- ANJOS, J.R.N.; LIN, M.T.; KITAJIMA, E.W. Caracterização de um isolado do vírus do mosaico da soja. **Fitopatologia Bras.** 10:137-151, 1985.
- ANJOS, J.R.N.; LIN, M.T. Bud blight of soybeans caused by cowpea severe mosaic virus in Central Brazil. **Plant Dis.** 68:405-407, 1984.
- COSTA, A.S. Three whitefly transmitted virus diseases in São Paulo. **FAO Plant Protection Bulletin** 13:121-130, 1965.
- COSTA, A.S. Estirpe do vírus do mosaico comum do feijoeiro útil para identificar cultivares com resistência do tipo hipersensibilidade. **Summa Phytopatol.** 4:9, 1978. (Res.).
- DUSI, A.N.; REIFSCHNEIDER, F.J.B.; CAFF FO, A.C.; KITAJIMA, E.W.; GIORDANO, L.B. Vagen marron, doença de ervilha causada pelo vírus do vira-cabeça do tomateiro. **Fitopatologia Bras.** 13:140, 1988. (Res.).
- KITAJIMA, E.W.; LIN, M.T.; COSTA, C.L.; BATISTA, M.F. Ocorrência do vírus do mosaico em desenho do feijoeiro no Distrito Federal. **Fitopatologia Bras.** 5:408, 1980. (Res.).
- LIN, M.T.; GAMEZ, R.; KITAJIMA, E.W. Bean "mosaico em desenho" virus is a member of the bean rugose mosaic virus serogroup. **Fitopatologia Bras.** 6:293-298, 1981.