

PHYSIOLOGICAL RACE AND SOURCES OF RESISTANCE TO DOWNY MILDEW
 [PLASMOPARA HALSTEDII (FARL.) BERL. & DE TONI] IN BRAZIL

A.A. Henning & J.B. França Neto, EMBRAPA-Centro Nacional de Pesquisa de Soja, Caixa Postal 1061, 86.100, Londrina, PR, Brazil.

Abstract

The occurrence of the sunflower downy mildew in Brazil was observed in 1982. This study was carried out to determine the physiological race and to find out possible sources of resistance to *P. halstedii*. Identification of the race was made using the breeding lines AD 66, (resistant to European race I), RHA 271 and RHA 274, resistant to European race I and American race II, and cultivar Issanka, susceptible to both races. Seeds were artificially inoculated with oospore suspension obtained from field infected leaves, and planted in the greenhouse in trays containing nonsterilized soil. The disease was observed only on plants of Issanka and AD 66, indicating that the race of *P. halstedii* occurring in Brazil is the American race II. Among the several lines, varieties and hybrids tested, Issanka, Cordobes, Contissol 112, Progress, PGIB, PIIDR, KLM, 3GR, 2GB x Nains and 6B x Ilnissei were susceptible. Only the hybrid DK 180 was resistant to the disease.

Introduction

The downy mildew is considered one of the most important diseases of sunflower. From the United States of America, its original place, the disease was spread throughout the world through infected seeds (Commonwealth Department of Health, 1981).

Leppik (1966) pointed out the importance of preventing the dissemination of the fungus and its physiological races into new areas, through effective quarantine regulations for disciplining international seed market. The pathogen, after being introduced into a new area, is difficult to be eradicated, since the oospores can remain viable in the soil for many years (Zimmer & Hoes 1978). For this reason and its high epidemic potential, *P. halstedii* is considered by Neergaard (1980) as quarantine object "A", in which strict quarantine regulations are recommended. The fungus can not be effectively detected in tests based on sampling, and if germoplasm material from infested areas is imported for breeding or research purposes, it may be "filtered" through postentry control by growing seed-bearing plants from introduced seeds under closed quarantine, i.e., in special greenhouses that exclude escape.

Although Sackston (1957) reported *P. halstedii* on sunflower in Uruguay, and Leppik (1962, 1964 and 1966) pointed out its occurrence in South America on *Ageratum*, *Galinsoga*, *Clibadium* and *H. annuus*, it was not found any reference describing the occurrence of this disease on sunflower in Brazil. In this country the disease was observed for the first time in 1982, on the varieties Cordobes and Issanka.

The objectives of this study were: i) to identify the physiological race occurring and, ii) to find out sources of resistance to the race of *P. halstedii* found in Brazil.

Materials and Methods

In order to identify the physiological race, seeds of 'Issanka', susceptible to all races of the fungus, the breeding lines AD66, resistant to race I (Fick 1978), RHA 271 and RHA 274, resistant to races I and II (Georges Piquemal, personal communication) were used.

Plants of 'Cordobes' showing disease symptoms were collected from the field, and incubated in a moist chamber at 15°C for 12 hours, with the roots submersed in water. After this period, the zoosporangia obtained were washed off with sterile destiled water, and kept in water suspension for two hours at aproximately 18°C, in order to obtain the zoospores. Following this, the zoospore suspension was added to pre-germinated seedlings with radicale length of 5 to 10mm, and incubated for 12 hours at 18°C. After inoculation, the seedlings were planted in greenhouse, in trays containing nonsterilized soil and kept in moist chamber at 20°C for 10 or more days, until sporulation was observed on the lower surface of the leaves, since the fungus can sporulate on cotyledons of resistant plants (Luka Ćuk, personal communication). Several breeding lines, varieties and hybrids were also tested for resistance or susceptibility to the disease.

Results and Discussion

Downy mildew was observed only on plants of Issanka and AD66, indicating that the race of *P. halstedii* occurring in Brazil is the American race II.

Among the several lines, varieties and hybrids tested, Issanka, Cordobes, Contissol 112, Progress, PGIB, PIIDR, KLM, 3GR, 2GB x Nains and 6B x Ilnissei were susceptible. Only the hybrid DK 180 was resistant to the disease.

Based on these information, it is suggested that all breeding programs carried out in Brazil by private and official institutions should include the test for resistance to this race of *P. halstedii*.

References

- COMMONWEALTH DEPARTMENT OF HEALTH. 1981. Sunflower downy mildew (*Plasmopara halstedii*). Canberra, Australian Government Publishing Service. **Plant Quarantine Leaflet**, 13. 4p.
- FICK, G.M. 1978. Breeding and genetics. In: CARTER, J.B. (Ed.), Sunflower Science and Technology. American Society of Agronomy, Madison. 297-338.
- LEPPIK, E.E. 1962. Distribution of downy mildew and some other pathogens on sunflower. **FAO Plant Protection Bulletin** 10, 126-128.

LEPPIK, E.E. 1964. Mapping the world distribution of seed-borne pathogens. **Proceedings of the International Seed Testing Association** 29, 473-477.

LEPPIK, E.E. 1966. Origin and specialization of *Plasmopara halstedii* complex on the compositae. **FAO Plant Protection Bulletin** 14, 72-76.

NEERGAARD, P. 1980. A review on quarantine for seed. In: National Academy of Sciences, (Ed.), Golden Jubilee Commemoration Volume. India. 1-36.

SACKSTON, W.E. 1957. Diseases of sunflower in Uruguay. **Plant Disease Reporter** 41, 885-889.

ZIMMER, D.E. & HOES, J.A. 1978. Diseases. In: CARTER, J.F. (Ed.), Sunflower Science and Technology. American Society of Agronomy, Madison. 225-262.