



Survival of *Phakopsora pachyrhizi* on volunteer soybeans in Entre Ríos province, Argentina

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INTRODUCTION

The pathogen strategy to survive is the key to the disease establishment in a determinate region. Biotrophic parasites (like rust, powdery mildew and downy mildew) use a host range to overwintering from season to season. *Phakopsora pachyrhizi* Syd. and P. Syd. was cited surviving on kudzu (*Pueraria lobata*) in Misiones province during 2004 (Formento & de Souza, 2005) and only volunteer soybean plants (*Glycine max* L. Merrill) were detected in Entre Ríos province as inoculum reservoirs during 2004-05 (Formento & de Souza, 2005).

Bioclimatic frosts and chemical control (specific herbicides) could limit the existence of living hosts in the unfavorable season. The soybean plants could tolerate low temperatures and it was reported that many plants grown to the VC stage at 9 to 15°C could survive frost of -3°C (Hume & Jackson, 1981). Furthermore soybean plants between VC to R6 could escape to frost under some protective areas, and they become a permanent initial inoculum source of the disease (green bridge).

The existence of erumpent uredinia in soybean volunteer plants, could constitute a new epidemiologic situation with an extrem peligrity, generating new risks to this country.

The objective of this study was to determinate the importance of volunteer soybean plants that could serve as overwintering sources of the pathogen and provide primary inoculum for soybean crops in Entre Ríos province.

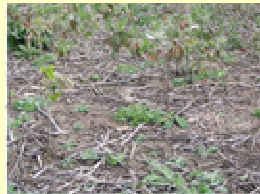
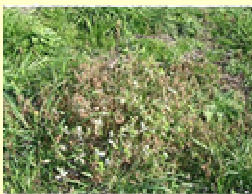


Fig. 5 and 6. Volunteer soybean plants in different development stages on field with reduced tillage (Photos by J.C. Velazquez INTA EEA Paraná).

MATERIALS AND METHODS

Volunteer soybeans plants were systematically scouted for ASR detection during 2004 and 2005. We examined plants for the presence of ASR in fields under conservative agriculture practices, near native forest, uncropped fields, wire fencing and at roadsides (Fig. 1, 2 and 3) in 16 different states from Entre Ríos province (Fig. 4). Especially we focused in some sectors to the INTA-EEA Paraná.

In all cases, was determinated the exact ubication with GIS, development stage (Fher & Caviness, 1977), pustule age (sporulating young pustules, sporulating mature pustules and empty death pustules) and the ASR level was based on the scale from traces (less than 1 % of leaf area were affected) to severe (more than 50% of leaf area were affected), presence of other diseases and arthropods damage (thrips, aphids, whitefly and mites).



Fig.4. Entre Ríos province (Argentina) map whit the scouted states for volunteer soybean plants.

LITERATURE CITED

Fher, W.R. & Caviness, C.E. 1977. low a St. Univ. Special Report 80, 11p.
Formento, A.N. & de Souza, J. 2005. Serie Extensión Nº32. EEA Paraná. p 15-17
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Subfreezing daily air (0.05 height) temperatures were registered in the INTA EEA Paraná meteorological station.

RESULTS AND DISCUSSION

Between 16/06/04 and 03/11/05 were collected 340 volunteer soybean plants samples in different development stages. High percentage (43%) of the samples were positive to ASR. The disease was observed in plants at V1 to R7 development stages (Fher & Caviness, 1977) (Fig. 5 and 6). Also ASR was detected in plants with green stem syndrome and foliar retention at R8 stage. The ASR was observed at the abaxial surface of the unifoliate leaves and first pair of trifoliate leaves. In cases where the disease was severe, the pustules of *P. pachyrhizi* were observed at the adaxial side (Fig. 7). It was detected on stems and petioles in plants without leaves (Fig. 8) but ASR was not observed on cotyledons or pods. Different levels of infection were found and the highest levels occur in plants at advanced reproductive stages.

Erumpent pustules of *P. pachyrhizi* were observed on leaves affected by other diseases, principally powdery mildew (*Microsphaera diffusa*) (Fig. 9).

During 2004, in INTA EEA Paraná, erumpent uredinia of *P. pachyrhizi* were observed on leaflets from V2 to R3 development stages surviving after 22 below-freezing temperatures (-0.1 to -7.4°C) until 11 July. After that no uredinia were observed till the next growing season (2 March, 2005). Since April until 27 October 2005 erumpent uredinia were found in volunteer plants in different development stages, while first planting dates began.



Fig. 7. Severe level of ASR on the abaxial surface of a leaflet (Photos by J.C. Velazquez INTA EEA Paraná).



Fig. 8. Erumpent uredinia on stems of volunteer soybean plants (Photos by J.C. Velazquez INTA EEA Paraná).

During this period, the number of days with below-freezing temperatures was 21 (0.0 to -4.9°C) and the coldest temperature was -4.9°C (21 May).

Early in the 2005-06 growing season disease plants were observed next to a silo bag (used to storage soybean grains) in Concordia state (Fig. 10).

Since other hosts are rare or absent in the region, we concluded that volunteer soybean plants may provide a "green bridge" and therefore be a good disease reservoirs in Entre Ríos between seasons.

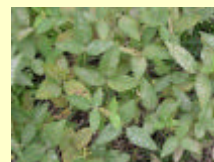


Fig. 9. ASR and powdery mildew on volunteer soybean plants (Photos by J.C. Velazquez INTA EEA Paraná).



Fig. 10. Presence of volunteer soybean plants affected with ASR next to a silo bag used to storage soybean grains (Photos by J.C. Velazquez INTA EEA Paraná).

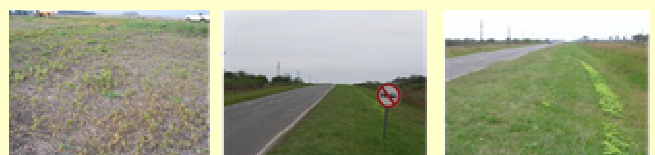


Fig. 1, 2 and 3. Presence of volunteer soybean plants affected with ASR at roadsides (Photos by J.C. Velazquez INTA EEA Paraná).