LOCAL AND REGIONAL SOYBEAN RUST EARLY DETECTION SYSTEM.
The RiiA EXPERIENCE IN SANTA FE, ARGENTINA.
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SUMMARY

With the objective of improving the decisions on fungicides utilization for controlling the “asian” soybean rust, technologies have been developed that estimate the regional risk of fungus infection and development (climate based models, detection of urediniospores in the air). Never the less, disease response in the central region of Santa Fe County in Argentina, after two years (2004 and 2005) showed that the period between the early detection in an area and its spread to nearby commercial plots is variable, and can be longer than fungicide activity when sprayed on disease free plots to prevent infections (30 days).

In search of an un-expensive, simple and effective system to accomplish the objective enunciated, the program RiiA (FCA-Esperanza and INTA Rafaela) developed a monitoring and alert system, consisting in the selection of commercial plots homogenously distributed in the region, weekly sampling of 40 central leaflet from the lower half of the crop in at least six sampling locations, and their observation in the laboratory.

After a two year experience, the system showed to be highly efficient in early detecting the disease at a regional level, as well as at a local one, providing enough time to decide adequate fungicide applications for each particular case. In addition, the system provided a means of evaluating incidence, severity and prevalence of the disease a regional level.

INTRODUCTION

The most used an recommended method for soybean rust management is the chemical control, spraying on disease free plots to prevent infections as well as after the infection to control it (Ploter, 2004). Never the less, the opportunity of fungicide application has some difficulties, a too early applications may demand a second one or more which would increment production costs, and on the other hand, too late application may be ineffective.

Now days there are available technologies that estimate regional risk for rust infection and later disease development (X. B. Yang, 2004 a b) or for to early disease detection like the use of country-wide “rust trap” network (“sentinel plantings”) (C. Levy, 2004) as a means of improving fungicide application decisions. Brasilean experience in early detection of soybean rust for commercial plots have demonstrated difficulties, making complex management decisions (J.T. Yorinori 2004).

The disease was first detected in Argentina in 2002 in Alem, Misiones province (Rossi, 2002). Preventing a probable soybean rust outbreak in the central region of Santa Fe province, the program RiiA (Agronomical Interest Information Network) (Astegiano et al., 2003), organized in 2003 a monitoring and alert system, un-expensive, simple and effective, as a mean of improving decisions for fungicide use to control the “asian” soybean rust.
METHODS

Homogenously distributes commercial soybean fields were selected in the central area of Santa Fe province. Weekly sampling of 40 central leaflets collected at random from the lower half of the crop was performed in at least six locations of each plot. Leaflets were kept in plastic bags hermetically sealed (zip-lock) for later observation in the laboratory with a 40x lens.

Incidence was obtained as percentage of leaflets with the presence of pustules. Severity in 2003/04 was recorded as percentage of affected tissue using a 0-5 scale (0= 0%, 1=<15%, 2=15-30%, 3=30-50%, 4=50-75%, 5=>75%), and in 2004/05 it was expressed as number of pustules/cm² and recorded from four 0.5 cm² measuring areas located on the center of the leaflets quadrants. During the second year, observations after detection of the disease were performed for the 1/3 middle and upper layer of the crop, on 25 leaflets per layer (no active leaf were observed on the 1/3 lower layer).

Disease regional evolution was estimated using a “prevalence index” (percentage of infected soybean fields/total observed soybean fields).

RESULTS

- The method has shown to be very sensitive, detecting the disease at a very low incidence and severity, and as a consequence, increasing the time for making decisions on crop management.
- Disease evolution was very fast, reaching prevalence values above 90% after 20 to 30 days of the first detections.
- High air humid conditions anticipated disease outbreak.
- Soybean fields without fungicide application, reached 100% incidence, never the less, severity response was slower and variable depending on the field and the crop layer considered.
- Fungicide application, previous or after infection, showed efficient disease control.
Figure 1: Prevalence evolution in 2003-2004, and in 2004-2005 for humid and dry areas. Arrows indicate the period needed to reach maximum prevalence.

Figure 2: Incidence and severity evolution of the disease in soybean fields with fungicide applications after detection (Fung>R), 15 days before detection (Fung<R), and without fungicide (Sin Fung) for two crop layers.
CONCLUSIONS

Commercial soybean crops colonization by *Phakopsora pachyrhizi* was variable, so fungicide applications based only on early detection in a region may lead to low control efficiency and increasing costs due to additional control demands. Systematic and continuous monitoring provided a means for early detection of the disease. Sampling of soybean fields representing planting date distribution for a region (at least one every 2500 has) also proved to be an adequate regional alarm system. Regional and local climatic data considerations may lead to modify the number of soybean fields and/or sampling frequency to reduce the variance outcome.

REFERENCES


