Field Surveys to Monitor Soybean Rust in Paraguay from 2001 to 2005

W. Morel[1], M. R. Miles[2], G. L. Hartman[2,3],R. D. Frederick[4], T. A. Steinlage[3], L. E. Cubilla[5]. [1]CRIA, Capitan Miranda, Itapua, Paraguay; [2]USDA-ARS, Urbana, IL, [3]University of Illinois, Urbana, IL; [4]Foreign Disease-Weed Science Research Unit, USDA-ARS-NA; [5]CAPECO, Paraguay.

Abstract

The first detection of soybean rust (*Phakopsora pachyrhizi*) in South America was in the Pirapó District of Paraguay during 2001. Field surveys were established to monitor soybean rust and to identify potential overwintering sources. During the 2001-2002 and the 2002-2003 seasons, soybean rust severities were low in the main soybean production areas that were planted October through November; however, rust severity in soybean planted after mid-December was severe with yield losses up to 50%. During 2003-2004, rust was detected 25 days after soybean emergence near infected kudzu (*Pueraria lobata*). As in previous years, late-planted soybean had more severe soybean rust with yield losses of up to 70%. During the 2004-2005 growing season, soybean rust was severe only in northern Paraguay; other regions had a prolonged drought. In general, frequent rains and low temperatures in November and December favored early disease development in the main production season, but dry conditions in January and February reduced final disease severity. Soybeans planted after mid-December had more severe soybean rust with the greatest yield losses. In each of the years, volunteer soybean and kudzu were found to be sources of overwintering the soybean rust pathogen and may be primary sources of inoculum.

Introduction

Soybean rust, caused by *Phakopsora pachyrhizi* Sydow, is destructive to soybean plants and often causes economic losses. The disease occurs in many parts of the world including Paraguay, where soybean rust was first detected in commercial fields in March 2001 in Pirapó, Itapua. Based on soybean leaf samples sent to the Foreign Disease-Weed Science Research Unit, USA (R. D. Frederick), the occurrence of the "Asian" rust was confirmed in the American Continent. In several heavily infected fields, severe defoliation was observed. The life cycle of these plants was reduced 25-30 days with yield reductions of greater than 60%. The disease has spread to the main soybean regions in Paraguay. The objectives of this research was to record annual soybean rust occurrence in Paraguay and to monitor potential overwintering sites.

Kudzu and soybean host plants

Soybean rust on a leaf

50x Uredospores

Methods

Once a month samples of 15 to 20 leaves were collected from over 20 locations in the northern, central and southern soybean production areas of Paraguay (Fig. 1). Samples were placed in ziploc bags and examined under a dissecting scope in the laboratory within three days of collection and the presence of sporulating uredinia was recorded. Each sampling point was marked with GPS coordinates. Samples collected May through October were used to identify overwintering sites. During the production season fields were visually evaluated and catagorized as no rust, low severity, moderate severity or high severity.

References

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Fig. 1 Sample sites in main soybean production regions of Paraguay

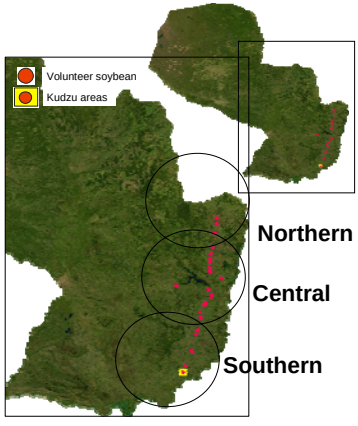
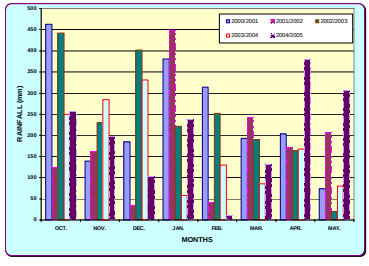


Fig 2. Monthly rainfall in Capitán Miranda, Paraguay during the production seasons 2000-2001 through 2004-2005



Results

Locations found positive for soybean rust in the 2000-2001 season were in the southern and central soybean production regions of Paraguay. The disease was found on the two cultivars, MG/BR 46 'Conquista' and CD 205, as well as on volunteer plants that survived the winter. In 2001-2002, the first detection was at Pirapó, in the southern region, on cultivar BRS 133 that was growing close to severely infected kudzu. By the end of the season, the disease was found in all three production regions. Due to low rainfall in February, rust severity was comparatively lower in the early 2001-2002 season compared to early 2000-2001. However, rust severity was much greater on late-planted soybean following increased rain in March. Yield reduction of more than 50% was seen in some late-planted fields. In 2002-2003, rust was found on 30 to 35-day-old soybeans that were planted early. However, disease development in the main production season was suppressed due to high temperatures. Temperatures were above 35°C with some days having temperatures above 40°C. Late-planted soybeans, which matured under lower temperatures, had more severe rust. During the 2004-2005 growing season, soybean rust was severe only in northern Paraguay; other regions had a prolonged drought. Again, the disease was severe on late-planted soybean, where rainfall had occurred.

Field affected by soybean rust

Kudzu affected by rust

Conclusions

In each year, volunteer soybean and kudzu were infected and may be the primary sources of inoculum. Soybeans planted in October and November for the main production season had less rust than soybeans planted after mid-December. In Paraguay, frequent rains and low temperatures in November and December favor early disease development in the main production areas, but dry conditions or high temperatures in January and February have an impact reducing final disease severity. Disease severity increases in later planted soybeans as temperatures decline and rainfall increases from March through April.