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The Aggressiveness of Asian Rust

JOSÉ LUIS DA SILVA NUNES

BADESUL Development, Agribusiness Superintendence, Porto Alegre,
Rio Grande do Sul state, Brazil.

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Introduction

Asian soybean rust, caused by the fungus *Phakopsora pachyrhizi*, is one of the most important diseases of the soybean crop today, due to the great potential for losses in productivity that it can cause, and can occur at any phenological stage of the crop (Silva *et al*., 2021).[5]

The symptoms caused by Asian rust start on the lower leaves of the plant and are characterized by tiny spots (1 to 2 mm in diameter), darker than the healthy leaf tissue, with a greenish to greenish gray coloration. These lesions, originating from the initial phase of the infection, correspond to the formation of a protuberance, called uredia (reproductive structures of the fungus), which appear as small bumps in the lesion (Hossain *et al*., 2018).[3]

Rust lesions tend to be angular in shape and can reach 2 to 5 mm in diameter and may appear on the petioles, pods, and stems. Progressively, the uredia, acquire a light brown to dark brown color, open into a tiny pore, through which the uredospores are released. The observation of uredia is the main characteristic that allows the distinction between soybean rust and other diseases with other similar symptoms, such as the initial brown spot lesions (Septoria glycines) that form a yellow halo around the necrotic lesion, which is angular and reddish-brown. The uredospores, initially hyaline (crystalline) in color, turn beige and accumulate around the pores or are carried by the Wind (Silva *et al*., 2021).[5]

As sporulation proceeds, the leaf tissue around the first uredia becomes light brown ("TAN" type lesion) to reddish-brown ("reddish-brown" type lesion – RB), forming the lesions that are easily visible on both sides of the sheet. Uredia that ceased to sporulate present pustules clearly with open pores, which allows them to be distinguished from bacterial pustules, which have often been confused with rust (Fantin *et al*., 2019).[1]

CONTACT José Luis da Silva Nunes joselsnunes@yahoo.com.br BADESUL Development, Agribusiness Superintendence, Porto Alegre, Rio Grande do Sul state, Brazil.

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From an initial infection, it is estimated that the first generation of pustules can maintain sporulation for up to 15 weeks, even under low humidity conditions. If conditions for reinfection are sporadic during the season, there may be sufficient inoculum potential to re-establish the epidemic. Asian rust has several alternative hosts and thus there are a large number of inoculum sources. The spores are spread by the wind and can travel great distances.

Conclusion

Infected plants with Asian rust present early defoliation, compromising the formation and filling of pods, reducing the final weight of the grains (Silva *et al*., 2021).[5]

The disease evolution and final severity in cultivars vary depending on the sowing date. When sowing is done early, the infection tends to start at the seed formation stage, with greater severity at the end of the cultivar cycle. With later sowing, the disease starts at the beginning of the pod formation stage and the severity was greater in the seed formation.

The spread of rust occurs solely through the dispersal of uredospores by the wind. The uredospores follow the wind direction and can travel up to 96 km per week. The spread of the disease within the crop can reach 3.0 meters per day. Therefore, variables such as planting density, planting time, phenological stage, spacing, variety, amount of residual inoculum must be considered in the management of the disease. Climate is considered a key factor in the epidemiology of Asian soybean rust. Environmental variables are influenced by macro, meso, or microclimate, which affects different processes of the disease cycle and also influences the rate of progress and severity of epidemics. In the field, rain seems to be the key factor influencing the severity of the disease at a regional scale, with the disease appearing later and its dispersion is slower under drought conditions for a prolonged period (Fantin *et al*., 2019).[1]

Currently, several Asian soybean rust control tactics are available. However, most research involves the use of fungicides and host plant resistance. The existence of races makes control difficult through vertical resistance (Hossain *et al*., 2018).[3] Another management measure that can be adopted is the sowing schedule, in relation to the crop cycle. Precocious plants spend less time in the field, are harvested earlier, and thus can “escape” the disease or be less affected. As in most regions, there is no soybean in winter, in the first sowings the fungus would start to multiply, and the tendency is for the inoculum to increase as the harvest progresses. Thus, earlier sowings also present an escape mechanism regarding the inoculum concentration.

When the disease is already occurring, chemical control with fungicide is, so far, the main control measure (Braga *et al*., 2020)1. The most frequently used strategy is disease monitoring associated with chemical control. The decision on the moment of application (in the observation of initial symptoms or preventively) must be technical, taking into account the factors necessary for the appearance of rust (presence of the fungus in the region, age of the plants, and favorable climatic conditions), the application logistics (availability of equipment and size of property), the presence of other diseases and the cost of control (Schmitz *et al*., 2014).[4]

The delay in monitoring and in the application of control measures, after the initial symptoms are verified, can lead to a reduction in productivity, if weather conditions favor the progress of the disease. The incidence of Asian soybeans can lead producers to significant financial losses. Thus, the use of technology and information, associated with proper management, can mitigate the aggressiveness of this disease and reduce damage to the crop.

References

1. BRAGA, K.; FANTIN, H.L.; MINCHIO, C.A.; LUIGI BERTOLACCINI SCOLIN, L.B.; PADUAN, F.N.; CANTERI, M.G. Sensibilidade de populações de *Phakopsora pachyrhizi* ao fungicida protioconazol.

Summa Phytopathol., Botucatu, v. 46, n. 2, p. 150-154, 2020.

2. HOSSAIN, M.Z.; ISHIGA, Y.; YAMANAKA, N.; OGISO-TANAKA, E.; YAMAOKA, Y. Soybean leaves transcriptomic data dissects thephenylpropanoid pathway genes as a defence response against *Phakopsora pachyrhizi*. *Plant Physioly Biochemistry,* Amsterdã, v. 132, p. 424-433, 2018.
3. SCHMITZ, HK; MEDEIROS, CA; CRAIG, IR; STAMMLER, G. Sensitivity of *Phakopsora pachyrhizi* towards quinone-outside-inhibitors and demethylation-inhibitors, and corresponding resistance mechanisms. *Pest Management Science,* Hoboken, v. 70, p. 378-388, 2014.
4. SILVA, E.; GRACE, JP; PORTO, C.; MEADOW, RM; NUNES, E.; MARCELINO-GUIMARÃES, FC; MEYER, MC; PILAU, EJ Untargeted Metabolomics Analysis by UHPLC-MS/MS of Soybean Plant in a Compatible Response to *Phakopsora pachyrhizi Metabolites, Basel*, v. 11, nº 3, p. 179-194, 2021.
5. FANTIN, LH; FELICE, ALSM; BRAGA, K.; GAETA, GM; FRANCE, JA; CANTERI, MG Spectral characterization and quantification of *Phakopsora pachyrhizi* urediniospores by Fourier transform infrared with attenuated total reflectance. *European Journal of Plant Pathology*, Netherlands, v. 153, n. 4, p. 1-9, 2019.