



Review Article

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Cercospora Leaf Spots of Wheat in the Lowland Tropics of Santa Cruz, Bolivia



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Abstract

The cultivation of wheat (*Triticum aestivum* L.) in the lowland tropics of Santa Cruz department in Bolivia is recent. Leaf spots diseases are an important yield-reducing factor. Since 1996, Pyricularia blast wheat is the most destructive disease in tropical regions producing wheat. In 2023, sampling was carried out in different locations in the East (Cuatro cañadas) and North (Okinawa1, Okinawa2) production wheat of Santa Cruz. Leaf, sheath and glumes simples were analyzed under microscopy and were estimated incidence. Two *Cercospora* species, *C. oryzae* and *C. sorghi*, were recorded associated with the leaf spots of 'Motacu' variety and these leaf spots seem to be prevalent and widely distributed in the production wheat áreas in the lowland tropics of Santa Cruz, Bolivia.

Keywords: wheat leaf spots, *C. oryzae* and *C. sorghi*, new disease.

Introduction

In the lowlands tropics of the Santa Cruz department, the cultivation wheat (*Triticum aestivum* L.) began to expand between 1985-1990. In 2022, one 120,000 to 140,000 has were cultivated (INE 2023). Main leaf spot diseases causing losses in wheat production in the north and eastern Santa Cruz región are Septoria leaf and glume spots (*Septoria tritici* and *Septoria nodorum*) and spot blotch (*Cochliobolus* sp). Barea and Toledo (1996) reported *Pyricularia* wheat blast in Santa Cruz Department of Bolivia [1]. Currently, *Pyricularia* blast wheat is the most destructive leaf spot for wheat production in the Santa Cruz lowland tropics. According to Xinyao et al. [2], some major non-rust diseases of wheat with global and/or regional economic importance are addressed, including three spike diseases (Fusarium head blight, wheat blast, and Karnal bunt), four leaf spotting diseases (tan spot, *Septoria nodorum* blotch, spot blotch, and *Septoria tritici* blotch). Other foliar diseases that affect the wheat, were not reported. During the agricultural year wheat (2023), other leaf spots were observed that were affecting commercial wheat production. The objectives of this research were: i. To identify the casual agent of the leaf spot of wheat; and, ii. To estimate the "unknown" leaf spot incidence.

In August 2023, sampling was carried out in commercial production winter wheat ('Motacu' variety) production areas at the harvest stage in two winter wheat-producing municipalities (April-August) in the lowlands of the Santa Cruz department: Okinawa in the Warnes Province and Cuatro cañadas in the Ñuflo de Chavez Province. In Olkinawa two localities were sampled: Okinawa 1 (262 meters above sea level, 20K 510442 and UTM 8091262) and Okinawa 2 (271 masl, 20K 517888 and UTM 8085843), in the Okinawa municipality, Warnes Province. In Cuatro Cañadas one sample were collected in this municipality (267 masl, 20k 531485 and UTM 8098189). Samples were taken from a 1 m² area. Three 1m² replicates were randomly set in each sampled field. Each sample was cut manually with a sickle at the height of the stem base, was identified and transferred to the laboratory. Each sample was evaluated independently for symptoms and signs. The identification of the causal agent was carried out by mounting microscopics slides using lactophenol solution based on morphological characters in vivo and analyzing conidiophores and conidia according to Chupp [3], Ellis [4] and Braun et al. [5]. The incidence of disease was assessed according

to Campbell and Madden [6] [% Incidence (Total diseased plants/ total number plants*100)] and was carried out on each plant under a stereomicroscope, checking leaf, stem, glume, and spike.

Two types of symptoms were found: linear spots (Figure 1A, B,C,D) and elliptical leaf spots (Figure 1G,H). The linear spots are dark brown, with variable length, average 2-10 x 1-2 mm, parallel to the midrib or the leaf veins of leaves (Figure 1A), sheaths (Figure 1B-C), and glumes base (Figure 1D). Conidiophores emerge through the stomata in linear form over the symptoms and amphigenous locating fruiting bodies were present (Figure 1C), being sometimes dense in fascicles, brown or dark brown, 1-2-septate, slightly attenuated at the tip (Figure 1E-F), with 1-2 mild geniculations and, 1-3 thickened scars (Figure 1F), 30-70 x 3.5-4 μm. Conidia are hyaline, cylindrical to obclavate, straight or slightly curved, 3-4 septate, obconic at base having thick dark scar, obtuse at apex, 12-60 x 2.5-3 μm. Conidiophore and conidia associated for these leaf spot are coincident to *Cercospora oryzae* Myake, described by Chupp [4], *Sphaerulina oryzina* Hara (Syn. *C. oryzae*) by Ellis [5] and Syn. *Cercospora janseana* according Braun et al. [5], causing narrow Brown spot.

The elliptical leaf spots had sharp or rounded edges (Figure 1G), with center pale and margin brown (Figure 1H), amphigenous fruiting bodies, fascicle dense at the center (Figure 1I-J), stromata dark Brown; conidiophores brown in color, slightly paler and narrow toward the tip, 1-3 septate, attenuated at the tip, slightly undulated, scarce rounded tip (Figure 1I-J); conidia hyaline 35-120 x 3-3.5 μ, acicular to obclavate, straight to mildly curved, mostly 1-4 septate (longest ones may have 8 septa) not catenulate, apex subacute, base truncated or usually long obconic, tip subacute to acute 3-3.5 x 15-60 μ (Figure 1K). Conidiophore and conidia associated with the *Cercospora* leaf spot are coincident to *Cercospora sorghi* Ellis & Everhart described by Chupp [4], Ellis [5] and Braun et al. [3]. According to these authors *C. sorghi* is widely distributed in tropical and subtropical countries affecting leaves of grasses. On the other hand, Metha [7] and Xinyao et al. [2] are not report *Cercospora* leaf spot affecting wheat. The incidence of *Cercospora* leaf spots in wheat was recorded in the three sampled locations (Cuatro cañadas-3.96%, Okinawa2-9.7%, and Okinawa1-16.45%), being higher in Okinawa1, probably due to the higher environmental humidity prevalent during the study.

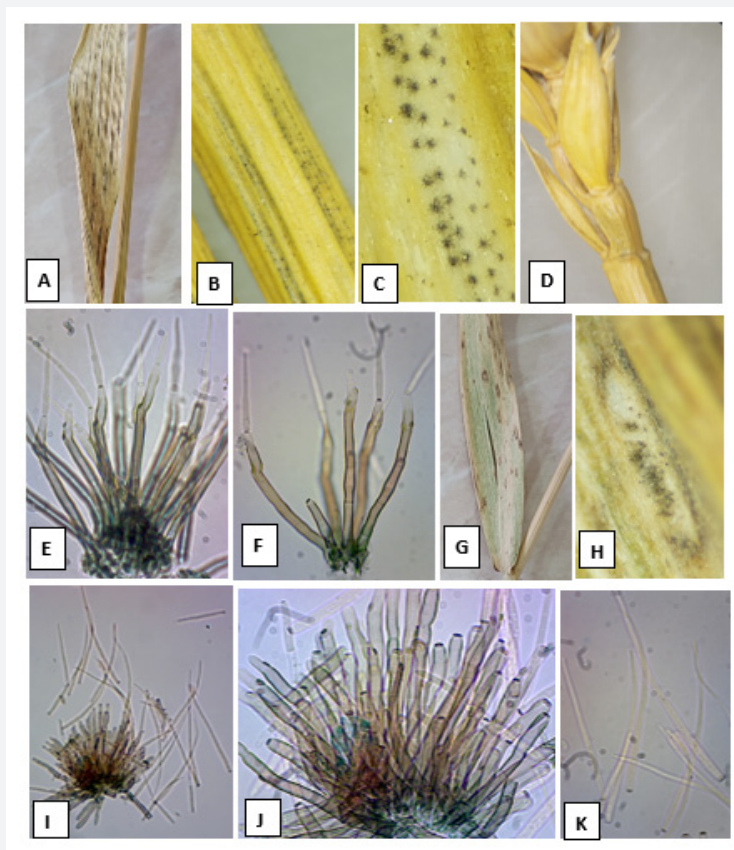


Figure 1: Symptoms, signs and causal agents of wheat blotch spot. *Cercospora oryzae*. A: Leaf spot; B: linear spot on sheath; C: Amplified linear spot (30X); D: on base glumes; E-F: Fascicle of conidiophores and typical conidia of *Cercospora oryzae* (100X); G: Leaf spot with elliptical symptom; H: Approximation elliptical leaf spot (30X); I: Fascicle of conidiophores and typical conidia of *Cercospora* spp (100X); J: Fascicle (400X); K: Typical conidial of *Cercospora sorghi* leaf spot (400X). Motacu Variety. Santa Cruz, Bolivia. Year 2023.

Conclusion

In conclusion, two *Cercospora* species were recorded for the first time affecting the leaf, sheath, and glume wheat in different degrees of incidence in the production wheat area in the lowland tropics of Santa Cruz, Bolivia.

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