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Leaf blast *Pyricularia grisea* effects on buffelgras forage and seed production in Northwestern Mexico

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Introduction

Common buffelgrass *Cenchrus ciliaris* (T-4464) is an introduced species intensively planted in Mexico to increase productivity on rangelands. Studies have shown that the species produces 5 to 10 times more forage as compared to native species on rangelands (Martin *et al*., 1995). Previous studies in the Gulf of Mexico have shown that the fungus *Pyricularia grisea* causes a disease in buffelgrass known as "leaf blight" and induce serious damage to the plant affecting forage production and nutritive quality (Ocumpaugh and Rodríguez, 1998; González, 2002). Injuries begin in the inferior leafs as small dark stains that later are converted in injuries bronze color of round and elliptic form, necrotic, with dark red margins and with a chlorotic yellow halo (Rodriguez *et al*., 1999). A high humidity and temperature condition in the Pacific Northwest during the last years is believed to be creating ideal conditions for *Pyricularia* which is suspected to affect buffelgrass. Currently, no data are available in this region to confirm fungus presence and its impact on forage and seed productivity on buffelgrass pastures. The study was conducted at north central Sonora, Mexico to: a) evaluate the incidence and damage intensity of *Pyricularia grisea* in buffelgrass pastures and b) to determine its impact on forage and seed production.

Materials and Methods

The study was conducted at Rancho el Aguila located 30 miles south of Santa Ana, Sonora at 30° 19' 44.5" north latitude and 111° 03' 31.8" west longitude, in a meadow of buffelgrass well established during the summer of 2010, actually on fair to good condition. Accessions planted on the buffelgrass pasture were Common and Formidable on an 80:20 seed mixture. Buffelgrass leaf blight damage was observed on grass plants one summer before study initiation. The study site was approximately 2 ha in size. Plot size was 10 by 20 m. The study area was fenced with barbed wire to protect from livestock grazing. Treatments tested were: T_1 - Common damaged buffelgrass, T_2 - Common undamaged buffelgrass, and T_3 - Formidable undamaged buffelgrass. Variables evaluated in the study were: percent of plants damaged (presence and/or fungus absence and degree of damage), plant density, height, basal cover, forage production and seed production.

Buffelgrass density was determined by counting the total number of plants in three 1 m^2 quadrats, distributed randomly in each plot. Plant height was determined in each experimental plot with a measuring tape, on 30 randomly selected plants per plot. Basal cover of grasses in each plot was quantified using ten 1 m^2 quadrants and was estimated by measuring the crown area of all grasses. Forage production (dry matter) was determined in ten quadrats 1 m^2 randomly selected in each plot. The presence and/or the possible absence of the fungus were determined in 100 randomly selected mature plants per plot. The intensity of fungus plant damage was determined on ten random samples in each experimental plot. Plant leaf damage was estimated by using a 10 point arbitrary scale (Diaz *et al*., 2007) where 0 is undamaged and 9 represent intensive damage. Seed of buffelgrass was harvested by hand during the fall on ten 1 m^2 quadrats per plot. All forage and seed samples were analyzed in the University of Sonora laboratory to confirm presence and/or absence of *Pyricularia.* The experimental design used was a randomized blocks with three treatments and eight replicates. All tested variables were analyzed separately and subjected to a simple analysis of variance, using the Duncan´s multiple range test for means comparison ($P \leq 0.05$).

Results and Discussion

The results demonstrate that 39.5% of the total common buffelgrass plants sampled show *Pyricularia* damage, while plants of Formidable buffelgrass were not affected (Table 1). Plant density was similar ($P \geq 0.05$) between species with ranges varying from 3.9 to 4.9 pl/m^2. Plant height was higher for unaffected Common buffelgrass and Formidable with 110.5 and 115.0 cm, while the damaged common buffelgrass averaged 83.5 cm. Basal cover was higher ($P \leq 0.05$) in

unaffected common and Formidable accessions with 10.9 and 11.1%, followed by damaged common buffelgrass with 7.5%. Forage production was higher in undamaged common and Formidable buffelgrass with 3.9 and 3.8 ton/ha, while the damaged common buffelgrass averaged 2.2 ton/ha. Total annual seed production was higher in unaffected common and Formidable accessions with 289.5 and 308.9 kg/ha, while the affected common buffelgrass averaged 205.9 kg/ha.

Table 1. Grass density, height, basal cover, forage and seed production on damaged and not damaged Common buffelgrass and Formidable buffelgrass on *Pyricularia grisea* affected buffelgrass pastures at northcentral, Sonora, Mexico.

Variable	Common Buffelgrass		Formidable Buffelgrass
	Damaged	No damaged	No damaged
Affected plants (%)	39.5 b*	0.0 a	0.0 a
Plant density (pl/m^2)	3.9 a	4.4 a	4.9 a
Plant height (cm)	83.5 b	110.5 a	115.0 a
Basal cover (%)	7.5 b	10.9 a	11.1 a
Forage production (t/ha)	2.2 b	3.9 a	3.8 a
Seed production (kg/ha)	205.9 b	289.5 a	308.9 a

* For each variable means flowed by similar letter are not significantly different ($P \leq 0.05$; Duncan).

The results of this study agree with Gonzales (2002) and Diaz *et al*. (2007), on the fact that not all common buffelgrass plants are equally damaged by *Pyricularia*. In this study only 39.5% of the total grass population show fungus damage. From these plants damage was light on 31.5%, moderate on 42.8% and intense on 25.7% of the population. Other studies in the Gulf of Mexico region show that *Pyricularia grisea* has caused losses of 11% in buffelgrass chlorophyll content, 20 to 26% in total biomass and 13% in protein content (Diaz *et al*., 2007) and up to 30% reduction in the total digestible dry matter (Rodriguez *et al*., 1999; Gonzalez, 2002). In this study mean temperature was from 27 to 30 ^{o}C, the relative humidity was greater than 75% and total rainfall was close to 300 mm, climatic conditions that favor buffelgrass leaf blast development (Rodriguez *et al*., 1999). This study demonstrates that *Pyricularia* can reduce on 33.3% the quantity of buffelgrass seed produced annually. Gonzalez (2002), suggests that the pathogen can severely reduce buffelgrass seed quantity and quality because it infects the spike involucres. This means that the disease not only affects buffelgrass seed production but the pathogen can be transmitted and transported to other areas by the seed. If ranchers continue planting buffelgrass to increase productivity in Sonoran Desert rangelands (Martin *et al*., 1995), they must be prevented to either no plant common buffelgrass or use *Pyricularia* resistant accessions for future seeding. This will maximize natural resources and reduce unnecessary land clearing, soil erosion and economic losses.

Conclusion

Pyricularia grisea was identified as the fungus causing the disease on buffelgrass plants. Common buffelgrass plants were severely damaged by the fungus but not all plants present in the pasture were similarly affected. The cultivar Formidable showed resistance to *Pyricularia grisea*. Leaf blight affects the growth of buffelgrass plants, produces intense chlorosis on foliage growth and reduces basal cover as well as plant height, which limit buffelgrass biomass and seed production. Ranchers with buffelgrass pastures under similar conditions may expect a 42.1 to 43.6% decline in annual forage production and from 28.8 to 33.3% in annual buffelgrass seed production.

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