WEEDS INFESTATION IN CORN INTERCROPPED WITH FORAGES AT DIFFERENT PLANTING DENSITIES

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ABSTRACT: This study aimed to evaluate weeds infestation in soybean following corn/forages intercrop, as a function of corn plant structure, forage species and sowing density. Experiments were conducted in Ponta Porã and Dourados municipalities, Mato Grosso do Sul State, Brazil, in the 2010/2011 growing season. Three corn hybrids with distinct plant architectures were intercropped with three forage species: *Brachiaria ruziziensis*, *B. brizantha* and *B. decumbens*, at five densities, and the resulting biomass was maintained throughout the winter. On the following cropping season, forages were desiccated prior to planting soybean, and dry mass of weeds, and the broadleaf/grass weed species index (WPI) were determined 15 days after soybeans emergence, as a function of dry mass accumulated by forage species. When intercropping corn with species of *Brachiaria*, more problems with weeds may be anticipated in areas with less competitive species, like *B. ruziziensis.* At the conditions of the trials, *B. brizantha* and *B. decumbens* were more capable of inhibiting the multiplication of weed species in the winter.

Keywords: *Brachiaria*; weed proportion index; wintercrop; mulching.

INTRODUCTION

Corn is planted at the Center West region of Brazil as a second crop, between January and March, following soybeans or beans. These fields usually present low mulch on the soil surface during the winter due to the small amount of dry mass resulting from corn crop, which favors the multiplication of weed species during this period (Oliveira Neto et al., 2010).

The intercropping of *Brachiaria* species with corn in the fall/winter season represents an important alternative for increasing the volume of mulching in the cropping system (Ceccon et al., 2010), with no reduction in crop yield (Ceccon, 2007).

Infestation by weed species may be a concern in such intercropping systems if they occur at high levels, mainly due to the limitation on herbicides and doses allowed to be applied in the intercropping (Ceccon et al., 2010). Introduced intercropping species should be, by themselves, efficient in minimizing the occurrence of weed species in the intercrop

(Ceccon, 2007).

This study aimed to evaluate weeds infestation in soybean following corn/forages intercrop, as a function of corn plant structure, forage species and sowing density.

MATERIAL AND METHODS

Trials were installed in two experimental areas owned by the Brazilian Agricultural Research Corporation – EMBRAPA, Western Region Agriculture Center. One of them is located in Dourados city (Lat -22.2844°, Lon -54.8068°, Alt 400m), and the other one at Ponta Porã city (Lat -22.5489°, Lon -55.6515°, Alt 655m), State of Mato Grosso do Sul, Brazil. The experiment was arranged in split-split plot design 3x3x5, with four replications. Main plots were composed by three corn hybrids, sub-plots by three *Brachiaria* species and sub-sub-plots by five populations of *Brachiaria*.

Corn hybrids were chosen by contrasting features: AG9010 (very short cycle, erect leaves); BRS1010 (short cycle, intermediary leaves) and DOW2B710 (short cycle, decumbent leaves), being planted in intercropping with populations of 0, 5, 10, 20 and 40 plants m^{-2} of *Brachiaria ruziziensis* and *B. decumbens*, or 0, 2, 4, 8 and 16 plants m^{-2} of *B. brizantha* cv. Piatã. This difference in density for Piatã is due to its known higher aggressiveness in dry mass accumulating. Planting of corn was accomplished in rows spaced in0.9m, with the rows of Brachiaria in the interrows of the corn, and fertilization was done at the seeding furrow of corn by applying 200 kg ha^{-1} of NPK 05-20-20. Weed control was done by application of the herbicide atrazine at dose of 1.5 L ha^{-1} in early post-emergence of both crop and weeds.

Corn was harvested in August 2010 and the forages were desiccated with 1440 g a.e. ha^{-1} of glyphosate in October 2010, 14 days before planting soybean, whose emergence occurred 7 days after planting (DAP) for both locations. Weed species emerged from soil seed bank were evaluated 36 days after forages desiccation (15 DAE of the soybean).

Data from both locations were pool analyzed by the F-test. Corn genotype was not significant for any of the variables and will not be discussed. Factors considered were location, *Brachiaria* species and density. Dry mass of weeds and dry mass of the forages at the time of the evaluation were submitted to regression analysis by location, being also calculated the Weed Proportion Index [WPI=(Bw/(Bw+Gw)), where Bw = broadleaves and Gw = grass weeds], ranging from 0.0 (grass weeds only) to 1.0 (broadleaved weeds only) as a function of location, forage species and its planting density.

RESULTS AND DISCUSSION

Dry mass of weed species is shown in Figure 1. In the trial at Ponta Porã it is possible

to observe that dry mass of grass weeds (o) was relatively low even at the treatment with absence of forages, except for the area with *B. ruziziensis*, where the infestation level of grass weeds was constant, of about 1 g of dry mass per square meter.

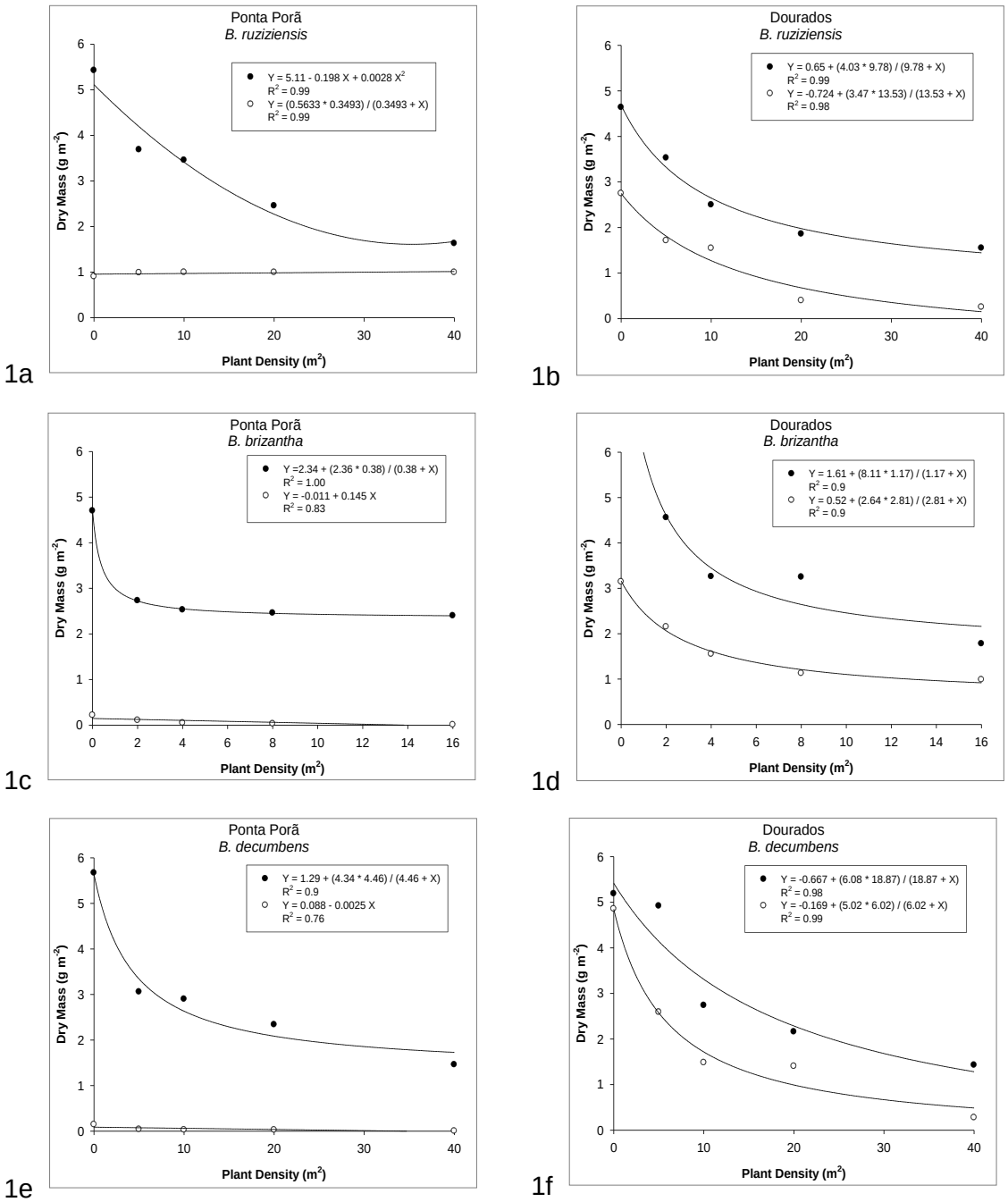


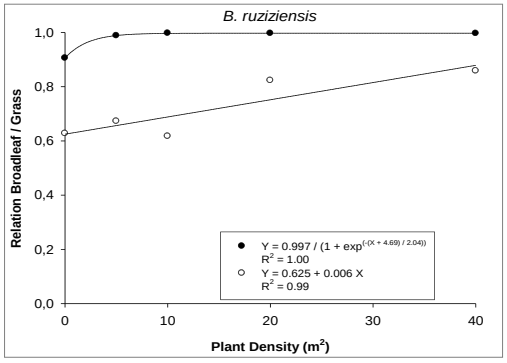
Figure 1. Dry mass of weed species (g m^{-2}) as a function of location (Ponta Porã and Dourados), forage species (*Brachiaria ruziziensis*; *B. brizantha* cv. Piatã; *B. decumbens*), and plant group (● broadleaved weeds; ○ grass weeds). Embrapa Western Region Agriculture, 2011.

At this location, broadleaved weeds (●) were predominant, being able to accumulate about 5.3 g m^{-2} of dry mass in absence of forages (Figure 1a,c,e). In general terms, the level of infestation decreased as forage density was increased, with about 1.7, 2.5 and 1.6 g m^{-2} of

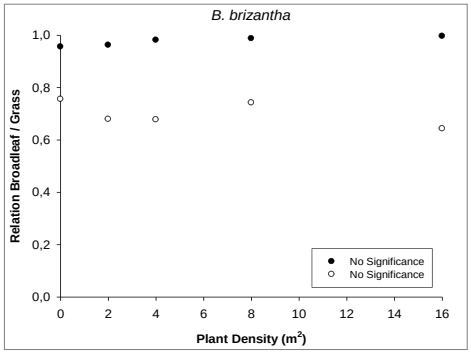
dry mass of broadleaved weeds under the highest forages densities.

In Dourados the level of infestation was more balanced between grass and broadleaves, and at the highest densities, *B. ruziziensis* was able to reduce the infestations in 57.4 and 89.3 % (Figure 1a); *B. brizantha* in 75.3 and 58.0 % (Figure 1b), and *B. decumbens* in 65.4 and 93.8 % (Figure 1c), respectively for broadleaved and grass weed species.

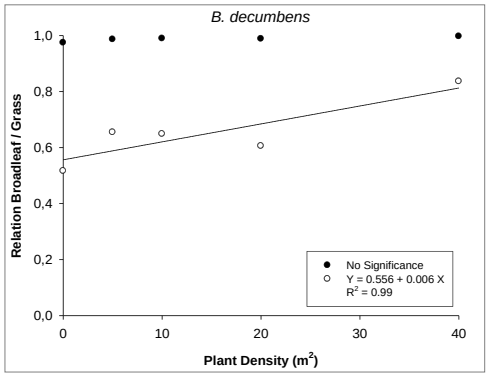
The Weed Proportion Index (WPI) shows the relation broadleaves / grasses which infest a given field; when the infestation is exclusively by broadleaved weeds this index will be equal to 1.0; on the other hand when only grass weed species are present the index will be equal to 0.0 (Figure 2). Infestation by grasses in Ponta Porã was almost null, except for *B. ruziziensis*. The influence of forage density was almost null on the proportion of broadleaved weeds observed at the treatments in Ponta Porã.



2a



2b



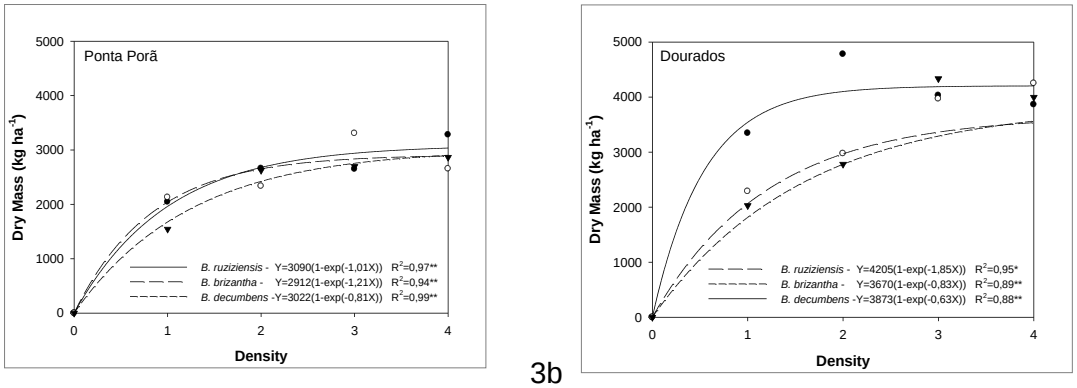
2c

Figure 2. Weed Proportion Index - WPI, as a function of species and density of the forage plants, and location of the trial. Index was arranged so that 1 = only broadleaved weeds present, and 0 = only grass weeds present. Locations: ● Ponta Porã; ○ Dourados. Embrapa Western Region Agriculture, 2011.

On the other hand, the occurrence of grass weed species decreased (WPI increased) as the density of forages was increased (Figure 2), except for *B. brizantha* where it was constant of about 0.70 for all densities. For *B. ruziziensis* (Figure 2a), WPI increased from 0.61 at the check to 0.80 under 40 plants m^{-2} of the forage; the same was observed for *B. decumbens* (Figure 2c), where WPI increased from 0.47 at the check to 0.82 under 40 plants m^{-2}.

In Figure 3 the remaining amount of straw left by the species of *Brachiaria* 36 days after desiccation is shown for Ponta Porã (Figure 3a) and Dourados (Figure 3b). In Ponta Porã all species were able to leave similar amounts of straw on the soil surface by the time of

the evaluation of weeds occurrence, while in Dourados *B. ruziziensis* was able to produce higher amounts of straw in comparison to *B. brizantha* and *B. decumbens* at the lower planting densities; at higher densities the amount of straw was similar among species (Figure 3). In addition, at the highest forage density the absolute amount of straw deposited at the soil surface was of about 3000 kg ha^{-1} in Ponta Porã (Figure 3a) and of about 4000 kg ha^{-1} in Dourados (Figure 3b), which could help explaining the lower levels of absolute infestation in Dourados at the highest forage densities in comparison to Ponta Porã (Figure 1).



3a 3b

Figure 3. Dry mass of the forage species (kg ha^{-1}) established on the previous year intercropped with corn, at the beginning of the subsequent cropping season (October), as a function of location and forage species (● *Brachiaria ruziziensis*; o *B. brizantha* cv. Piatã; ▼ *B. decumbens*). Embrapa Western Region Agriculture, Dourados-MS, Brazil, 2011.

CONCLUSION

The choice of the species to be intercropped with corn, should rely mainly on its agronomical performance in the intercrop. In addition, when intercropping corn with species of *Brachiaria*, more problems with weeds may be anticipated in areas with less competitive species, like *B. ruziziensis.* At the conditions of the trial, *B. brizantha* and *B. decumbens* were more capable of inhibiting the multiplication of weed species in the winter.

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