Development of fungi in different stages of the production of Tifton-85 hay with N fertilizer

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Introduction The yield of hay of high quality over the summer is important, therefore the efficient form to utilize the yielded forage with the purpose of higher allowance of the bulky is over the dry season (Calixto Júnior, 2007). Moisture content higher than 200 g kg^{-1} in hays, produce heat spontaneously, fungi growth and undesirable modifications in the nutritive value of forages (Turner et al., 2002). There are little information about the characteristics of storage and the modifications in the nutritive value in hays of tropical grasses. The decrease in the nutritive value of hays is induced by microbial activity, heat, no structural carbohydrates; growth of fungi associated with toxin production and increase in the fibrous components and breaking of protein fraction (Coblentz, 2000). However, several works show that N fertilization improved nutritive value of forage, in special crude protein. The purpose of this work was to evaluate the effects of N doses and three stages in the process of hay-making of Tifton-85 grass on the incidence of fungi.

Materials and Methods The experiment was conducted between October 2010 and December 2010 in a field of hay production established with Tifton-85 grass in Marechal Cândido Rondon, PR, Brazil (24º33'40''S, 54º04'12''W, 420 m altitude). The experimental design was a completely randomized blocks in a factorial scheme 5x3 with five N doses (0; 25; 50; 75 e 100 kg ha^{-1}) applied as urea after forage harvesting and three stages to obtain samples (at harvesting, during packing and after 30 days storage), with four replications. The forage harvesting was realized within 28 days regrowth. The dehydration time was of 6 days, until reach 85% dry matter. The forage was turned twice a day. After packaging the forage was stored for 30 days. The samples, approximate 100 g, were reduced in particles of 5 mm and diluted in distilled water (1,000 mL) and sowing in resource means of cultivation with 200 g of potato, 20 g of dextrose, 15 g of agar e 1,000 mol of distilled water. The genus of fungi was identified with a microscope (Guarro et al., 1999) and specific keys. The statistical analysis was submitted to the variance analysis and means were compared by Tukey test with 5% probability.

Results and Discussion There was effect of N x stages in populations of *Fusarium* and *Penicillium* (Figure 1). Without N application, the *Fusarium* population (46 $CFUg^{-1}$) was higher in the packing stage. In the application of 25, 50 and 75 kg ha^{-1} of N, the harvesting stage presented the lower *Fusarium* populations, 5, 8 and 5 $CFU.g,^{-1}$, respectively. There was no difference in the *Fusarium* population between harvesting, packing and storage stages in the higher N dose. The population of *Penicillium* (15 CFU g^{-1}) was higher in the packing stage, with application of 50 kg ha^{-1} N, and in the application of 100 kg ha^{-1} N, the population of *Penicillium* in the storage stage was higher than the harvesting and packing stages, which presented lower populations but did not differ. In the 0 and 25 kg ha^{-1} N doses there was no difference between stages for *Penicillium* population. There was no significant difference for *Aspergillus* populations. The *Fusarium* is a fungi typically found in the field and can result in losses during packing and storage, which was not observed in this study, because both *Fusarium* and *Penicillium* were the largest populations in these stages and *Aspergillus* rarely develops in less than 15% moisture. During the dehydration period, the average relative humidity and temperature

above 80% and 22.9ºC, respectively, may have facilitated the proliferation of conidia that contaminated fodder. Nascimento et al. (2000) studying methods of natural drying and storage periods in alfalfa hay, found a higher occurrence of *Aspergillus* and *Penicillium* at the packing day. At 15 and 30 days storage the predominance was for *Penicillium*, with the occurrence of *Fusarium* and also, *Aspergillus* in the hay pile (partially dried in the sun and after in the shadow). Séguin et al. (2010), studying a permanent field of 'hay production harvested in two periods and two different agricultural practices, identified several species of fungi and attributed this diversity to the level of low-cut (3 cm) bale with 75% dry and rain after harvesting. The predominance was of fourteen species of *Aspergillus*, nine species of *Penicillium* and two species of *Fusarium*.

Conclusion The hay packing and storage stages provided higher population of fungi *Fusarium* and *Penicillium*. Further studies are needed on the conditions of production of Tifton-85 hay to understand the dynamics population of fungi.

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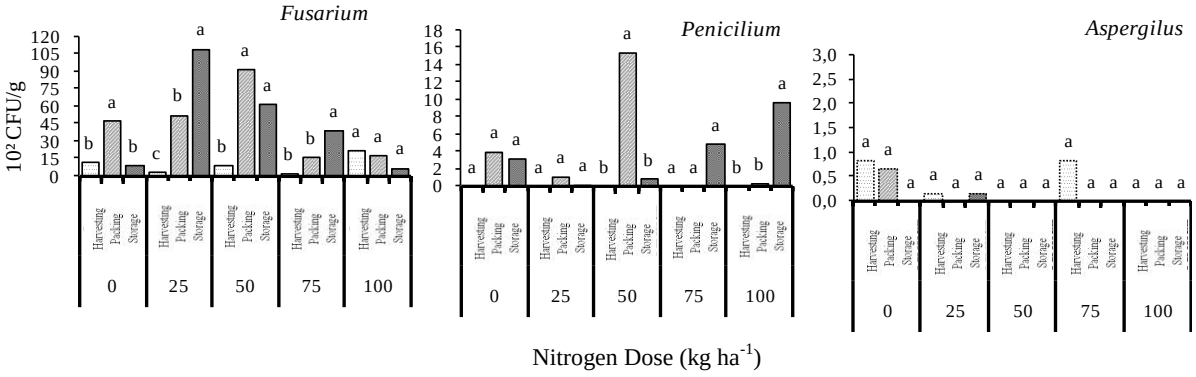

Figure 1. Colony forming unit (cfu g^{-1}) of fungi in Tifton-85 hay at different stages of the hay-making process and fertilizer N doses. Different letters between stages differ by Tukey test ($P<0.05$) into of each N fertilization dose.