Fermentative capacity of soybean varieties harvested in two stages of development

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Introduction Soybean forage is considered a legume with high protein content. With soybean is possible to reduce protein concentrates participation in animal feed, once this nutrient is largely used in diets and is the most expensive on formulation allowing the decrease of total diet cost. This forage can be utilized as silage, making it a promising option since it has some favorable characteristics such as seed availability in the market, production capacity in different climates, erect to facilitate mechanization in harvesting, good yield and high protein concentration (Rigueira et al., 2007). The objective of this work was to evaluate the effect of soybean varieties cultivated for grain production, harvested at two stages of development, on fermentative capacity, dry matter, crude protein, soluble carbohydrates and buffering capacity.

Materials and Methods The trial was carried out in Ilha Solteira, SP, Brazil (22 ° 22'S, 51 ° 22'W) and the evaluated treatments consisted of two factors: varieties (Valiosa RR, A7002 and BRSMG 790) and harvesting stage (R6 and R7). The plants were chopped into stationary machine for a particle size between 3-8 mm and then two samples were taken of each variety (3), harvesting stage (2) and repetition (4), ensiled in plastic buckets (15 kg), which contained 2,5 kg of sand in the deep and lids adapted with Bunsen valves. Samples for carbohydrates (SC) and buffering capacity (BC) (Campos et al. (2004)) were taken immediately and stored in a freezer (-8 °C). For dry matter (DM) determination, samples were dried at air oven on 55 °C for 72 hours. After, they were ground at 1 mm and dried at 105 °C for 12 hours for determination of second DM. Crude protein (CP) was adjusted for DM on 105 °C. The fermentative capacity (FC) was estimated as suggested by Weissbach & Honig (1996): FC = DM(%)+8x(SC:BC).

Results and Discussion There was effect of harvesting stage, variety and interaction between stage x variety in most parameters evaluated (Table 1). In Table 2, there was difference ($P<0.01$) in DM for harvesting stage. The R7 had the highest results and the variety BRSMG 790 showed higher DM content, followed by the variety A7002 and valiosa. At the R7 stage production and forage quality were higher because the higher content of grains in the total mass, so CP was also high (Hoffman et al., 2004). For BC, there was no difference between harvesting stages, just for varieties, with the BRSMG 790 showing the lower value. In addition to the DM and SC, the BC which defines the resistance of the pH variation and it is another factor that influences the conservation of forage as silage. The values of SC differed between the stages and the varieties Valiosa and A7002 showed the highest results. In stage R7 the variety BRSMG 790 showed higher FC, than the varieties A7002 and Valiosa. The FC of all varieties in R6 stage was below the minimum value of 35, while varieties in R7 stage were above it. According to Weissbach and Honig (1996) forages with FC less than 35 pass undesirable fermentation in the silo. The lower content of SC observed in R7 was compensated by the higher content of DM and provided FC value above 35. The same was observed in the variety BRSMG 790.

Conclusion Soybeans harvested at R7 stage provide highest values of silage fermentation process. The varieties analyzed provide potential for silage.

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Table 1. General mean, treatments effects and interactions, in the parameters of dry matter (DM), crude protein (CP), buffering capacity (BC), soluble carbohydrates (SC) and fermentative capacity (FC)

Item (%)	Variety	Stage	V x S	CV (%)
DM	**	**	**	4.36
CP	*	**	**	6.00
BC	*	NS	**	7.27
SC	**	**	**	13.81
FC	**	**	**	4.57

NS P > 0.05; *P < 0.05; **P < 0.01

Table 2. Dry matter (DM), soluble carbohydrates (SC), buffering capacity (BC) (emg HCl/100g DM) and fermentative capacity (FC) of soybean forage varieties harvested at two stages (R6, R7)

Item (%)	Stage		Varieties		
	R6	R7	Valiosa	A7002	BRSMG 790
DM	31.6a	44.35b	33.65c	36.27b	44.01a
CP	19.43b	21.77a	19.94b	20.27ab	21.59a
BC	32.65a	31.88a	34.45a	35.41a	26.94b
SC	6.37a	4.95b	6.25a	6.82a	3.91b
FC	33.14b	45.36a	35.09c	37.46b	45.20a

Means followed by different letters in lines differ by Tukey test (P<0.05)