Direct Drilling of Soybean in a Pensacola Bahiagrass Pasture in the Northwest Region of Rio Grande Do Sul, Brazil

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DIRECT DRILLING OF SOYBEAN IN A PENSACOLA BAHIAGRASS PASTURE IN THE NORTHWEST REGION OF RIO GRANDE DO SUL, BRAZIL

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Abstract

The response of methods of soil preparation (M_1=conventional tillage, and with no-tillage using the following herbicides M_2=50% Paraquat plus 50% Orizalin; M_3=50% Paraquat plus 50% Diquat and M_4=Paracol (20% Paraquat plus 20 Diuron)) and row spacing (E_1=17 cm, E_2=24 cm, E_3=51 cm and E_4=68 cm) on soybean grain yield direct drilled in an eight-year-old grazed sward of Bahiagrass cv. Pensacola (*Paspalum notatum* var. s*aurae* Parodi) were studied in southern of Brazil. The results showed that direct drilling of soybean on Pensacola accompanied by desiccant herbicides is a viable agronomic practice. The narrow row spacing is beneficial to this agronomic practice resulting in higher grain yields. The relationship between soybean grain yield and Pensacola dry matter yield was expressed by a negative linear regression. In spite of the damage to the Pensacola caused by herbicides and by soybean competition the sward recovered immediately after the soybean maturation and harvest.

Keywords: Forage, DM, soybean, herbicides, integrated farming, crop system

Introduction

Soil preparation by conventional tillage is not essential to reach high yield on grain crops (McNeill, 1977). Cropping systems for minimum or no-tillage have been developed to ensure crop yields equal to or higher than those obtained by conventional systems (Edwards et al., 1988). In Rio Grande does Sul, Brazil, direct drilling of soybean and wheat over stubble or mulch of annual crops became a very common agronomic practice. In spite of the benefits of this method soil degradation by water erosion is still occurring and increasing production costs. No-till crop systems that integrate perennial pasture and animal production, due to the presence of grasses, show high potential to recover soil structure, increase water infiltration rate and storage water capacity, to reduce soil erosion and the risk of yield losses as a consequence of soil water deficit. The benefits of Pensacola bahiagrass (*Paspalum notatum* var. *saurae* Parodi) on soil properties such as organic matter and mineral contents have been shown by some researchers (Beaty and Tan, 1972; Tan et al., 1975). The cropping soybean can be one opportunity to recuperate degraded perennial grasses swards due either to N immobilization or to a negative nitrogen balance in the system. Evidences suggest that N accumulation in the soil after a grain legume crop can be substantial (Mohamed Sallem and Fisher, 1993). The main objective of this experiment was to determine the effects of desiccants herbicides and row spacing on soybean grain yield drilled directly on a Pensacola bahiagrass pasture.

Material and Methods

The experiment was carried out in the Centro de Treinamento COTRIJUÍ, Augusto Pestana (28^o 50’ S; 54^o W, 448 m altitude), RS, Brazil. The climate is Cfa type (Köeppen), subtropical humid, with light frosts, 1600 mm average annual rainfall. The soil is a dystrophic red-yellow latossol, clay texture, pH 5.6, 6.5 ppm P and 3.6 % organic matter content. Methods of seedbed preparation: M_1 =conventional tillage; and with no-tillage using the following herbicides: M_2 =50% Paraquat plus 50% Orizalin; M_3 =50% Paraquat plus 50% Diquat; M_4=Paracol (20% Paraquat plus 20% Diuron) and row spacing (RS): E_1=17 cm; E_2 =24 cm; E_3 =51 cm; E_4 =68 cm were used to determine soybean grain yield (SGY) direct drilled in an eight-year-old grazed sward of Bahiagrass cv. Pensacola *(Paspalum notatum var. saurae Parodi*). Pasture dry matter yield (PDMY) was also recorded. Limestone and fertilizers were applied according to soil test analysis. A split plot experimental design with four replicates, with methods of soil seedbed preparation as main plots and space between rows as sub-plots, was used. Seeds of an early maturing soybean cultivar (Bossier) were sown using direct drill sod seeder, in December 12, 1984.

Results and Discussion

The SGY was affected by the interaction of factors ($P<0.05$). The yields recorded in M_1 (2392 kg/ha), M_2 (2320 kg/ha) and M_4 (2397 kg/ha) did not differ in the narrowest row spacing (E_1). It showed that minimum tillage could produce crop yields equal to the ones obtained by conventional tillage (Edwards et al., 1988). SGY registered in M_1E_2 (2472 kg/ha) and M_4E_2 (2328 kg/ha) were similar. However, the SGY recorded in the two widest spaced rows showed that conventional methods (M_1E_3 and M_1E_4) were higher than those using herbicides (Table 1). The response of SGY to herbicides in relation to row spacing were expressed by the following equations: M_2, $SGY=2362-4.96RS$; M_3, $SGY=1689+27.4RS-0.37RS^2$; M_4, $SGY=2435-3.42RS$. The negative linear relationships in M_2 and M_4 show an increase in herbicides effectiveness with decreasing of row spacing resulting in higher SGY. The narrow row spacing to Pensacola can due to the higher competition for light impose this response.

The herbicides affected significantly ($P<0.05$) the PDMY. The PDMY recorded in M3 (623 kg/ha) and M2 (433 kg/ha) were similar but the latter did not differ from PDMY registered in M4 (272 kg/ha). The relationship between PDMY and row spacing was expressed by a positive linear model (Figure 1a). It shows that wider row spacing benefits the dry matter yield of Pensacola, probably due to a reduction in the competition for light, water and nutrients by soybean plants. A negative relationship between SGY and PDMY was recorded (Figure 1b). i. e., as the SGY increases the PDMY decreases.

Direct drilling of soybean accompanied by desiccant herbicides is a feasible agronomic practice. The narrow row seeding technique is essential for this practice. In spite of the Damage caused to Pensacola by herbicides and the competition imposed by soybean, the plants of Pensacola sward recovered during the crop maturation and harvest

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Table 1 - Soybean grain yield relating to row spacing and methods of soil seedbed preparation

Methods of seedbed preparation	Row spacing - cm			
	17	34	51	68
	---------------------------- kg/ha	-----------------------------		
Conventional tillage	2392 a	2472 a	2434 a	2552 a
Paraquat plus orizalin	2320 a	2114 b	2138 b	2021 c
Paraquat plus diquat	2043 b	2207 b	2108 b	1845 c
Paracol	2397 a	2328 ab	2176 b	2254 b

Means within column followed by a common letter are not significantly different by Duncan's multiple range test (P<0.05).

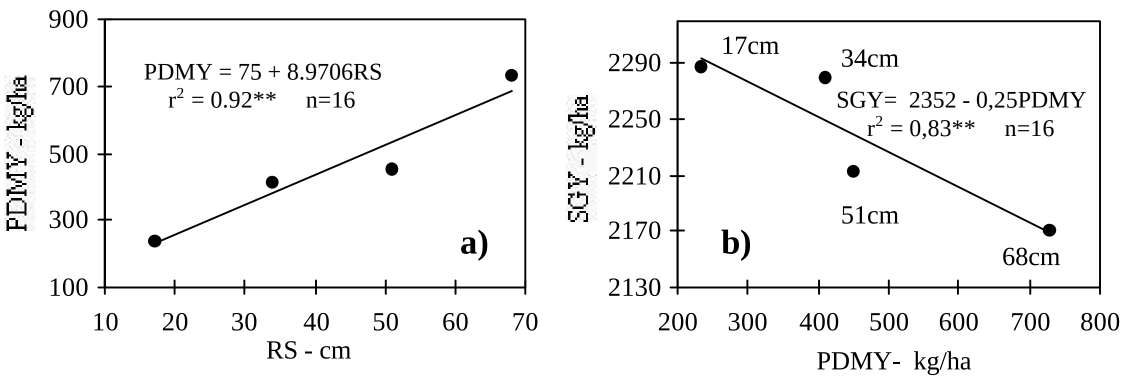

Figure 1 - Relationships between: (a) Pensacola dry matter yield (PDMY) and row spacing (RS) and (b) soybean grain yield (SGY) and Pensacola dry matter yield.