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YIELD INDICES OF SOYBEAN CULTIVATED AMONG ROWS OF EUCALYPTUS ARRANGED IN A NORTH/SOUTH ORIENTATION IN THE SOUTHERN CONE OF RONDÔNIA

Roberto Dias Marinho
Student in Agricultural Engineering, Instituto Federal de Rondônia, *Campus* Colorado do Oeste, RO, Brazil

André Luiz da Silva Baia
Student in Agricultural Engineering, Instituto Federal de Rondônia, *Campus* Colorado do Oeste, RO, Brazil

Gisele Cristina da Silva
Student in Agricultural Engineering, Instituto Federal de Rondônia, *Campus* Colorado do Oeste, RO, Brazil

Amanda Bonifacio Maciel
Student in Agricultural Engineering, Instituto Federal de Rondônia, *Campus* Colorado do Oeste, RO, Brazil

Mateus Ribeiro Rosa

Ernando Balbinot
Professor in the Agronomic Engineering Course of the institution: Instituto Federal de Rondônia, Colorado do Oeste, RO, Brazil

Fabiano Gama de Sousa
Professor in the Agronomic Engineering Course of the institution: Instituto Federal de Rondônia, Colorado do Oeste, RO, Brazil

Rafael Henrique Pereira Reis
Professor in the Agronomic Engineering Course of the institution: Instituto Federal de Rondônia, Colorado do Oeste, RO, Brazil

Dany Roberta Marques Caldeira
Professor in the Agronomic Engineering Course of the institution: Instituto Federal de Rondônia, Colorado do Oeste, RO, Brazil

Abstract: The Integrated Agricultural Production systems make it possible to carry out the consortium between annual and tree crops, bringing benefits to the environment and economic income to the producer. Thus, the research aimed to evaluate the productive components of soybean, in a silvia-agricultural environment, in the 2071/18 harvest, which corresponds to the second year after the implementation of the forest component. The experiment was implemented in the micro-region of Colorado do Oeste-RO, using a randomized block design with seven treatments (planting rows at different distances from the tree component), with three replications. Soybean was grown between rows of eucalyptus with double rows, 22.0 m apart, in a north-south direction. The results obtained showed a significant reduction in the productivity of the plants located at the eastern end, with the lines with a distance smaller than 3.75 m from the eucalyptus row being the ones with the lowest yield in terms of the number of grains per plant and in productivity.
Keywords: *Eucalyptus* sp, *Glycine* max, integrated Agricultural Production System.

INTRODUCTION

The progress of Brazilian agriculture contributes with great significance to the expansion of the agricultural frontier, increase in productivity and food production. For the development of a more sustainable agriculture, the Integrated Agricultural Production system can be adopted, which brings together annual crops, such as soybean, in consortium with tree species in the early years. After this time, a quality pasture can be implanted in the environment. This system aims to increase the intensification of land use with sustainability, favoring soil quality and benefiting the ecosystem (BUZZELLO, 2014).

In this type of system, the consortium between soybean and eucalyptus tends to increase the planting area, as the soybean crop stands out for its undeniable importance for Brazilian agribusiness, in addition to other qualities that make it suitable for cultivation.

Eucalyptus, on the other hand, has important characteristics, such as high productivity, rapid growth, good wood quality, making it the main species for silvicultural use in the country (Mora & Garcia, 2000). Therefore, it is extremely important to know the development of these two species in consortium and to investigate the interference that the eucalyptus culture imposes on the agronomic characteristics of soybean.

Thus, the study aimed to evaluate the number of grains per pod and soybean yield as a function of the eucalyptus shading effect, in the second year after its implantation.

MATERIAL AND METHODS

The research was carried out at the Federal Institute of Education, Science and Technology of Rondônia – Colorado do Oeste Campus. The soil of the experimental area is characterized as a typical Eutrophic Red Argisol (EMBRAPA, 2013), with flat-wavy topography. The climate, according to the Koppen classification, is Aw, tropical hot and humid with two well-defined seasons, dry and rainy seasons.

The experiment consisted of characterizing the silvia-agricultural phase of the ILPF system, with soybean growing in an integrated system with eucalyptus in the 2017/18 harvest, which corresponds to the second year after planting the trees. Soybeans were planted between rows of eucalyptus, in double rows, spaced at 22.0 m (ILPF 22m), with 3.0 m between rows and 2.0 m between plants, which were implanted in a north-south arrangement. According to the forest inventory carried out, the eucalyptus had an average height of 4.62 m at the time of maturation of the soybean grains.

The experimental design was in randomized blocks, where the plots were constituted by seven lines of soybean, being these lines demarcated by sampling points, identified by the following Arabic numerals 1; two; 3; 4; 5; 6 and 7, with the following distances from the eucalyptus rows in the north/south orientation (ILPF 22m): 1 (1.50 m); 2 (2.40 m); 3 (3.75 m); 4 (5.55 m); 5 (11.00m); 6 (16.45 m); and 7 (18.25 m), these distances being demarcated from the east face to the west face. Point 1 is located 1.50 m from the row on the east face, point 5 represents the central line of the row and sampling point 7 is located at 3.75 m on the west face. On this side there is no cultivation closer to the trees due to the presence of the terrace just above the eucalyptus row.

The evaluations were performed with three replications, totaling 21 experimental units. The experimental unit consisted of an 8.0 m long soybean line, disregarding the 2.5 m border at each end of the line. The spacing between rows was 0.45 m, totaling 38 soybean rows between rows of eucalyptus. The population density was approximately 177,777 plants ha-1.

Soybean sowing between the eucalyptus rows was carried out on October 28, 2016. The INTACTA RR2 PRO technology, cultivar TEC 7022 IPRO, was used in a direct sowing system on the residues of the corn crop produced in the off-season. Soybean seeds were inoculated with Bradyrhizobium japonicum, approximately two hours before sowing, in the proportion of 50 ml of inoculant for 25 kg of seed. The planting was carried out with the aid of a mechanical seeder with five rows. At the time of planting, fertilization was carried out using only triple superphosphate, with a dosage of 270 kg/ha-1. Potassium fertilization was carried out in

the cover, between the phenological stages V3 and V4, at a dosage of 66.66 kg/ha-1 of KCL. During the soybean crop cycle, the necessary cultural treatments were carried out, as well as for the tree species.

When the soybean reached physiological maturity, the following evaluations were performed: 1) number of grains per plant; and 2) grain yield (kg ha-1). The plants were harvested in 4.0 linear m of the useful area and submitted to manual threshing. Humidity was determined in an air circulation oven at a temperature of 105º C for 24 hours (BRASIL, 2009) and later the productivity was corrected for humidity of 13%. For the number of grains per plant, seven plants were randomly evaluated in the useful area of the plots.

The result was submitted to analysis of variance, applying the F test. For the significant effect, regression analysis was performed.

RESULTS AND DISCUSSION

The number of grains per plant was influenced by the different sampling points between the eucalyptus rows (figure 1). Point 1 differed statistically from the others, while the other sampling points did not differ.

The drop in the number of grains of soybean plants located 1.50 m from the trees reflects the excessive shading provided on the east face, especially in the morning. According to Almeida et al. (2014), the east face is the place with the lowest incidence of solar radiation throughout the day.

According to França et al. (2013), soybean plants close to eucalyptus lines, in relation to the central line, may have a reduction between 40 and 46.8% in the number of grains. At point 1, a drop in the number of grains of around 58.38% was observed, in relation to the central point, being higher than that reported in the literature.

For productivity, there was a significant difference between the sampling points. The data from this work were fitted to a quadratic regression model (figure 2). The most central points had a greater emphasis on productivity or technical efficiency. At the central sampling point, productivity of 3,206.71 kg ha-1 was obtained, while at point 1 it was only 615.77 kg ha-1, configuring a loss of 80% in productive efficiency.

In the comparison between sampling points 3 and 7, it is observed that they are points with the same distances from the rows of eucalyptus and statistically there is no difference between these points for the variables evaluated in this work.

Almeida et al. (2014), in an experiment in the north/south orientation, observed greater production on the west face and less on the east face, which, according to the works of these authors, is the one with the lowest incidence of solar radiation during the day.

Productivity was significantly higher at 3 sampling points; 4; 5; 6 and 7, with an average productivity of 2,872.96 kg ha-1. These results may be related to the higher solar incidence, which tends to reach the points that are farthest from the eucalyptus line. Therefore, when the eucalyptus lines are closer than 3.75 m, a reduction in soybean production yields of 27.93% at point 2 and 78.56% at point 1, in relation to the average of the most productive points. Points 1 and 2 seem to have suffered a greater interference from the shading performed by the eucalyptus. Another fact that may be related to the lower soybean yield at points 1 and 2 is the location at the extreme east side. According to Quintino (2015), soybean grown between rows of eucalyptus 15.0 m apart, introduced in the north/south orientation, has higher productivity on the extreme west side and lower productivity on the eastern side, due to being the place with less solar radiation during the day.

The low productivity in the lines close to the eucalyptus rows may be related to possible

competition for water, nutrients and light. However, in this work, due to the control of production factors, light restriction may have had a greater relationship with the drop in soybean yield in the rows close to the tree component, since the experiment was carried out in the rainy season and the fertilization followed the recommendations suitable for each culture. Even so, it cannot be said that the drop in productivity is related only to shading or light deficit. According to Casaroli et al. (2007) because soybean is a C3 plant, it is less efficient in the use of solar radiation and water, so when this crop is subjected to low light intensity, it has lower rates of phytomass and liquid assimilation, causing a drop in the yield of its components.

CONCLUSIONS

The soybean crop in integration with eucalyptus shows a significant reduction in production rates, in the second year of the system, at a distance of less than 3.75 m from the trees.

The negative effect of eucalyptus shading on soybean yield and number of grains is greater on the east side due to the north/south orientation of the rows implantation.

THANKS

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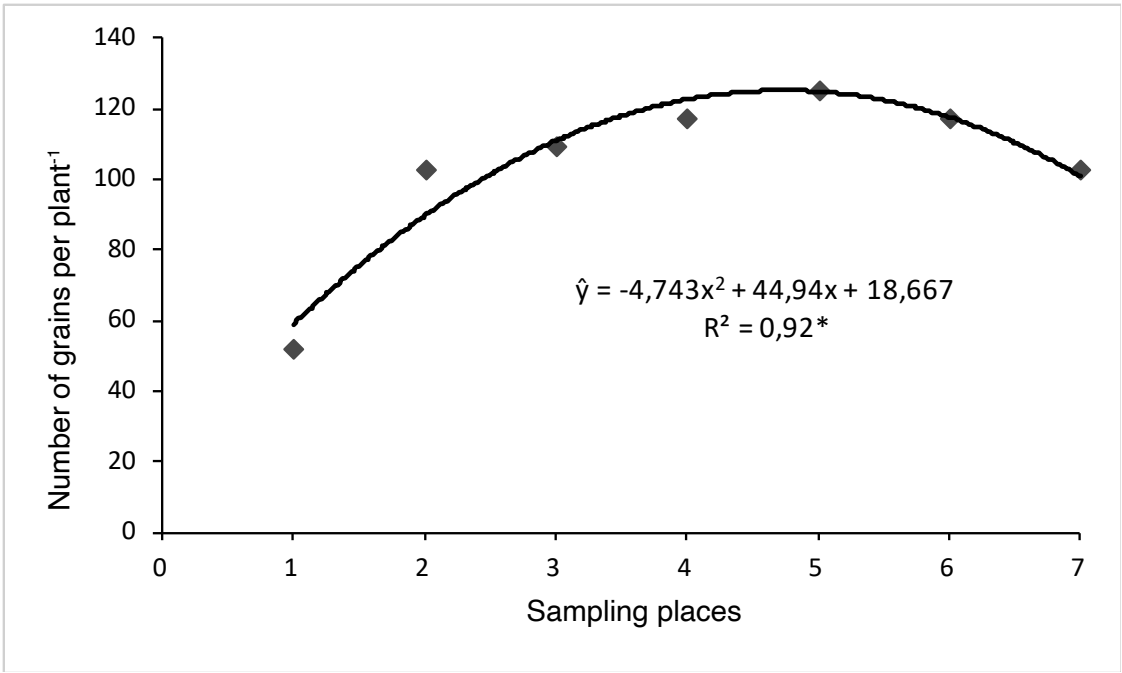

Figure 1 – Number of grains per plant in orientation (ILPF $_{22m}$), under different sampling points among eucalyptus rows, in Colorado do Oeste, Southern Cone of Rondônia, 2016/2017 harvest. *significant at 5% probability.

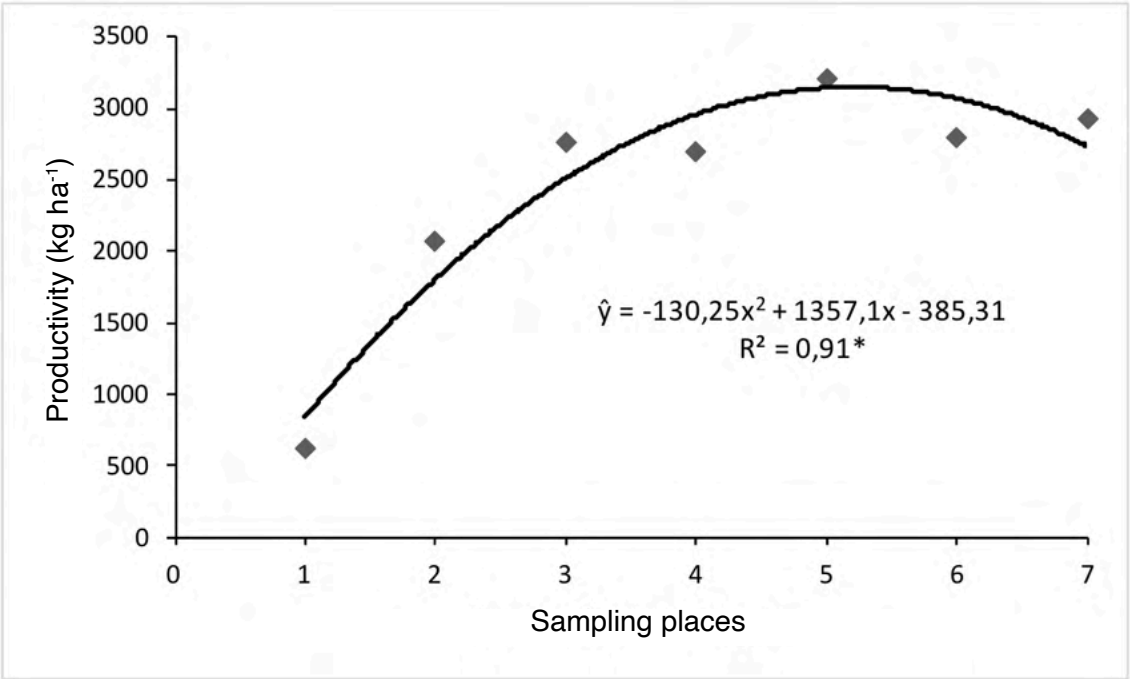

Figure 2 – Productivity (kg ha-1) (ILPF 22m), under different sampling points among eucalyptus rows, in Colorado do Oeste, Southern Cone of Rondônia, 2016/2017 harvest. *significant at 5% probability.