AGRONOMIC CHARACTERISTICS OF GREEN CORN AND CORRELATIONS WITH PRODUCTIVITY FOR THE ESTABLISHMENT OF MANAGEMENT ZONES IN RIBEIRA VALLEY, SP, BRAZIL.

Vanessa Satiko da Cunha Akune[1]; Wilson José Oliveira de Souza[2]; Sérgio Hugo Benez[1]; Ludielo Citon[3]; Paulo Henrique Watanabe Nagazawa[2]; Arthur José de Santana Neto[2]

1. São Paulo State University (UNESP), Engineering Rural Department, Botucatu Campus. Rua José Barbosa de Barros, n.1780, Fazenda Lageado, Botucatu, São Paulo – Brazil; 2.São Paulo State University (UNESP), Registro Campus, Agronomic Engineering. Rua Nelson Brihi Badur, n.430, Vila Tupi, Registro, São Paulo – Brazil. E-mail: souza@registro.unesp.br; 3. Santo Amaro University (UNISA), Av. Clara Gianotti de Souza, n. 258, Centro, Registro, São Paulo – Brazil.

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Abstract. *In Brazil, the progressive development in the cultivation of the corn for consumption in the green stadium stands by the relevant socio-economic role that this related to multiple applications, the attractive market price and continuous demand for the product in nature. Therefore, this study was to analyze the correlations and spatial variability of the productivity of the culture of the green corn in winter, in alluvial soil of the type Cambisols eutrophic in the amount areas and Hydromorphic eutrophic in plain grounds. The experiment went carried in the agricultural year of 2013/2014 in the commercial area belonging to Kassuga Farm, located in the city of Register, in the Ribeira Valley region, SP, Brazil. The delimited experimental area was of 4,97 ha constituted of a sampling grid distributed 68 collection points of georeferenced data, with an average spacing of 25 m between the demarcations. The sowing of the green corn went carried through in the winter, in succession to the rice crop, in the no-tillage system. The agronomic characteristics evaluated were; plant height, length, diameter, productivity of tangs with straw and without straw and productivity of corn grain in the green stage. The data relating to agronomic characteristics of green corn underwent exploratory analysis, classical descriptive and adherence to the distribution Normal. The data do not present a*

normal distribution were submitted to geostatistical analysis. The information analyzed demonstrated results with average values for height of plant, length and diameter of corncob with straw of 273,4 and 579 mm and without straw 213,8 and 481 mm. the average productivity of the tang with straw and without straw were 20.56 t ha^{-1} and 13 t ha^{-1} , respectively, while the grain reached 7.17 t ha^{-1}. The coefficient of variation shows higher values for corncob without straw productivity and grain yield. There were positive and significant correlations between the variables. Thus, the cultivation of green corn in the study region went considered viable, due to the satisfactory results of crop productivity. The division of the area on management units went considered adequate to the development of localized agricultural practices.

Keywords. *agriculture precision for mechanization, zea mays, spatial distribution.*

Introduction

Green corn producer needs to invest in technification and professionalization of the property production system to optimize crop productivity and provide high quality products, in order to meet the consumer market requirements. However, the technological development of the agricultural production process, should promote the economic viability with environmental sustainability. Thus, it is essential to proper management and technically grounded culture, because according to Portela et al., (2010) increase the amount of organic matter and improve the physical, chemical and biological soil, resulting in increased productivity and quality culture. The green corn production should take into account the most commercially valued features such as green ears largest husked than 15 cm long and 3 cm in diameter with good mulching and weight, are considered adequate standards of the product to be classified as commercial (ALBUQUERQUE et al., 2008).

The success of green corn production to meet the marketing standards depends on the proper development of managements practices of culture, covering according to Cardoso et al., (2011), the selection of cultivars adapted to climate and soil conditions of the region, time sowing, plant population, soil managements system and treatment plant, contributing to the optimization of productivity and growing area. Commercial agriculture has undergone profound changes in recent years, triggered mainly by the use of technology in the field, aimed at the mechanization of processes, use of chemical inputs, tillage system, biotechnology and precision agriculture (PA) (SANTI et al. , 2013). Thus, knowledge of the spatial and temporal variability of soil properties and the productive capacity of culture, is considered crucial for the precise management of agricultural areas.

This study aimed to analyze the correlations between the productive components of the plant and the spatial variability of the corn crop yield in winter.

Material and Methods

The experimente was carried out on Kassuga Farm, located on Registro County, São Paulo State, Brazil, on geographic coordinates (UTM) 224376,007E e 7286702,736N, with average altitude of 8,3m and declivity of 0 to 5%. The climate on Registro County is Cfa according Koeppen classification, humid subtropical with hot summer, with temperatures averaging 22 ° C and annual rainfall of 1400 mm. The soil is part of the Environmental Systems Units, defined by Ross (2002) as a system of plains and river terraces of the Iguape River, described as flat land in the Lower Ribeira and / or the Ribeira Tectonic Depression region of sediment modern, in alluvial soil like Cambisols eutrophic in upstream areas and Hydromorphic eutrophic in lowland soils.

The production area defined for this study is 4,97ha, having been grown in the previous summer period the experimental installation (2013/14), with rice var. Moti (*Oryza sativa* L., var. glutinosa). After delineating the perimeter, the area was dried out and after a week, mowed is employing trailing weeder, distributing plant mass on the surface of the soil. About the area, we have established a regular grid with 68 georeferenced points spaced 25 m apart, constituting the sampling points. The frame and the points were processed using MapSource Software Garmin and TrackMaker Pro®, adopting system Geographic coordinates UTM (Universal Transverse Mercator), the WGS 1984 and 23J Zone, and the points identified and demarcated on field with the aid of a GPS navigation.

Sowing of autumn / winter crop was held on 26.06.2014, using conventional corn hybrid Pioneer 3646 with spacing of 0.90 m between rows and population of approximately 55,000 plants ha^{-1}. Sowing fertilization consisted in the application of 300 kg ha^{-1} of NPK 04-14-08 formulation; the weed control was performed with atrazine at the rate of 3.0L ha^{-1} with the weeds in the 2 to 4 leaves stage.

The field sampling were carried out in October 2014 and evaluated the agronomic characteristics

were; plant height (AP), length, diameter, productivity of strawed ears along and productivity of corn grain in the green stage. Analyses were made in machines and Agricultural Mechanization Laboratory (LAMMEC) of UNESP - Experimental Record-SP. To evaluate the length of the cob with straw (CEP), unhusked ear length (CED), diameter of the stem with straw (DEP), diameter of the spike without straw (DED), productivity of ears husked (PEP) and without straw (PED) and grain yield (PG).

The data relating to yield of corn underwent exploratory analysis for the presence of outliers and their influence on the measures of position and dispersion. Then were performed the descriptive statistics for the evaluation of measures of central tendency (mean, median and mode) and dispersion (standard deviation, variance, coefficient of variation), and adherence to the normal distribution, according to the Kolmogorov-Smirnov test (Goncalves et al., 2001) at levels 1 and 5% significance by means of ASSISTAT program (SILVA, 2011).

The data did not show normal distribution were submitted to geostatistical analysis (SOARES, 2006). Spatial analysis was performed with the help of GS +, version 9.0 (ROBERTSON, 2008). The structure and spatial dependence of the sampling points were evaluated by experimental semivariogram, where spatial dependence is defined by the range (Ao), the error made due to the minimum sampling spacing is defined by the nugget effect (Co) and the point wherein all semi variance of the sample is random influence is defined by level (C + Co) (Vieira, 2000). The coefficient of variation values (CV) that indicates the degree of variability of properties was characterized according to Warrick & Nielsen (1980). The degree of spatial dependence was classified according to the methodology proposed by Cambardella et al. (1994). For making contour map was used GS^{+} version 9.0 software (ROBERTSON, 2008).

Results and Discussion

The corresponding agronomic characteristics to samples collected in 68 points in the corn growing area, were analyzed using descriptive statistics. The average value measured for plant height (PH) was 2.50 m, higher than those found by Albuquerque et al., (2008) and Barros et al., (2013), which were 1.81 m. According to studies by Albuquerque et al., (2008) plant height can influence the productivity of commercial ears. The length (CEP) and diameter (DEP) average cob and straw (Table 1) showed satisfactory results for marketing since met the criteria proposed by Freire et al., (2010), who consider the ears as commercial standards husk of corn larger than 21 cm and a diameter greater than 5 cm. The length (EDC) and diameter (DED) Average tang dehusked (Table 1) also met the standards measures for marketing, as Albuquerque et al., (2008) should be above 15 cm long and 3 cm in diameter. The average productivity spike with straw (PEP) showed satisfactory performance of 20.56 t ha-1 (Table 1), because according to Pereira Filho et al., (2011), the characteristics desirable for the green corn, includes achieve productivity levels of above 12 t ha-1. Productivity Husked ear (PED) was 13 t ha-1 (Table 1), higher than that found by Barros et al. (2013) found that average productivity of 8.37 t ha-1 in the South of Minas General. The grain yield was 7.17 t ha-1 (Table 1) agreeing with the findings of Light et al., (2014).

The results of the Kolmogorov-Smirnov (KS) test, at 5% probability, showed abnormal distribution of the frequency of the data only for plant height (PH) and ear length with straw (CEP).

Tabela 1. Estatística descritiva das variáveis de produtividade do milho verde no ano agrícola de 2013/2014, no município de Registro, Vale do Ribeira, SP.

Variable	Min[4]	Max[5]	α[6]	s[7]	CV (%)[8]	Assim[9]	Curt.[10]
A.P (m)	2.034	2.766	2.5059	0.14006	5.58907	-1.1122	1.6634

C.E.P (cm)	23,04	30,64	27,3421	1,8973	6,9391	-0,38113	-0,61783
D.E.P (cm)	4,856	6,574	5,7893	0,3426	5,9179	-0,2210	0,5389
C.E.D (cm)	17,34	24,62	21,3835	1,4202	6,6417	-0,4064	0,3951
D.E.D (cm)	3,896	5,33	4,8129	0,2677	5,5619	-0,6609	1,5051
P.E.P (t/ha)	12,573	32,142	20,5550	16,8577	3,4651	0,4824	1,1724
P.E.D. (t/ha)	8,283	19,03	13,0091	2,3162	17,8042	0,3255	0,1509
P. G. (t/ha)	3,96	9,845	7,1727	1,2521	17,4568	-0,2304	-0,1286

1-Máximo; 2-Mínimo 3-Média; 4-Desvio Padrão; 5-Coeficiente de Variação; 6 -Coeficiente de Assimetria; 7-Coeficiente de Curtose

The correlations between the plant variables showed significance between several pairs as positive and highly significant, for DED x CED (r = 0.7372 **), CED x PED (r = 0.8617 **) DEP x DED (r = 0.8012 **), DEP x PED (r = 0.7870 **), DEP x CED (r = 0.7579 **), DED x PED (r = 0.7314 **). This event is important to the productivity of corn, because those high correlation significance and positive character suggests increasing function between cause and effect, or increasing specific feature involves the addition of another.

Conclusion

Productivity Husked ear and grain yield were the attributes that have greater variability in the study area.

The productivity spike with and without straw showed correlations with various agronomic characteristics.

There were significant and positive correlations between the productive parameters of the corn crop..

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