Planting density, photosynthetic activities and agronomic performance of the corn varieties MP1 and Chicken Corn

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Introduction

Corn (Zea mays L.) is the most important cereal crop grown in Haiti. National production in 2021 was estimated at 200000 tons for an area harvested of 248115 hectares, thus an average yield of 806 t ha-1 (FAO 2023). Low corn yield in Haiti can be attributed to the genetic potential of the corn varieties used by the farmers as well as management practices, such as planting density (Balkcom and Bowen 2020, Licht et al. 2029). The MP1 corn is an Open Pollinated Variety (OPV) recently selected by CIMMYT and proved to perform well in virous trials across the country (Jean Simon et al. 2020). Yet, this variety has not been evaluated for its response to planting density. Hence, the aim of this study was to assess the photosynthetic activities, vegetative growth and yield performance of the corn varieties MP1 and Chicken Corn (CC) as influenced by within row plant spacing.

Materials & Methods

A field experiment was conducted at Leduc, Ducis, during the period March to July 2021 to evaluate the effect of within row plant spacing on photosynthetic activities, growth and yield performance of the corn varieties Maïs Plus 1 (MP1) and Chicken Corn (CC). The experimental layout was a randomized complete block design with factorial structure, including 2 corn varieties (MP1 and CC) and 4 within row spacings (15, 20, 25 and 30 cm) in 3 replications. The experimental unit comprised four 5-m rows spaced 80 cm, thus an area of 16 m^2 per experimental unit.

PhotosynQ instrument

A photosynQ instrument was used to measure these following variables: photosynthetic parameters (LEF, PAR, relative chlorophyll, phi2, phiNO, phiNP Q), growth parameters (flowering date, plant height, ear height, leaf length, leaf width, stem diameter), and grain yield. The data collected were subjected to analysis of variance (ANOVA) and test of Tukey at 5% alpha error (Di Rienzo et. al 2012) using the InfoStat software 2012 version.

Results

The corn variety MP1 had a higher yield (p-value <0.0001) than the variety CC (Table 1). However, no significant yield difference was detected between the planting distances (p-value = 0.5341). At V12-VT, phi2 was higher for the corn variety CC compared to the variety MP (p-value = 0.0153), reflecting a more efficient photosynthetic activity for the corn variety CC (Table 2). Relative chlorophyll was also higher for the corn variety CC than the variety MP1 at the R1-R2 stage (p-value = 0.0002). Also, relative chlorophyll significantly increased at the R1-R2 stage as the planting distance between plants increased from 15 cm to 30 cm (Figure 1).

Table 1 : Comparison of the corn varieties MP1 and CC for yield variables

Variety	Ear kernel rows (Count)	Kernels per row (Count)	1000-kernel weight (g)	Grain yield (kg ha^{-1})
MP1	14.42a	27.73a	295.18a	4590.08a
CC	9.71b	28.08a	269.82b	3138.58b
p-value	<0.0001	0.7437	0.0022	<0.0001

Means with a common letter are not significantly different (p > 0.05

Table 2: Comparison of the corn varieties MP1 and CC for photosynthetic parameters at V12-VT growth stage

Variété	LEF	PAR	Relative chlorophylle	NPQT	Phi2	PhiNO	phiNPQ
CC	84.41b	357.32 b	40.20 a	1.14 a	0.57 a	0.20a	0.23 b
MP1	174.10a	835.11 a	43.08 a	1.58 a	0.49 b	0.21a	0.30 a
P-value	0.0016	0.0029	0.1809	0.1107	0.0153	0.8227	0.0355

Means with a common letter are not significantly different (p > 0.05)

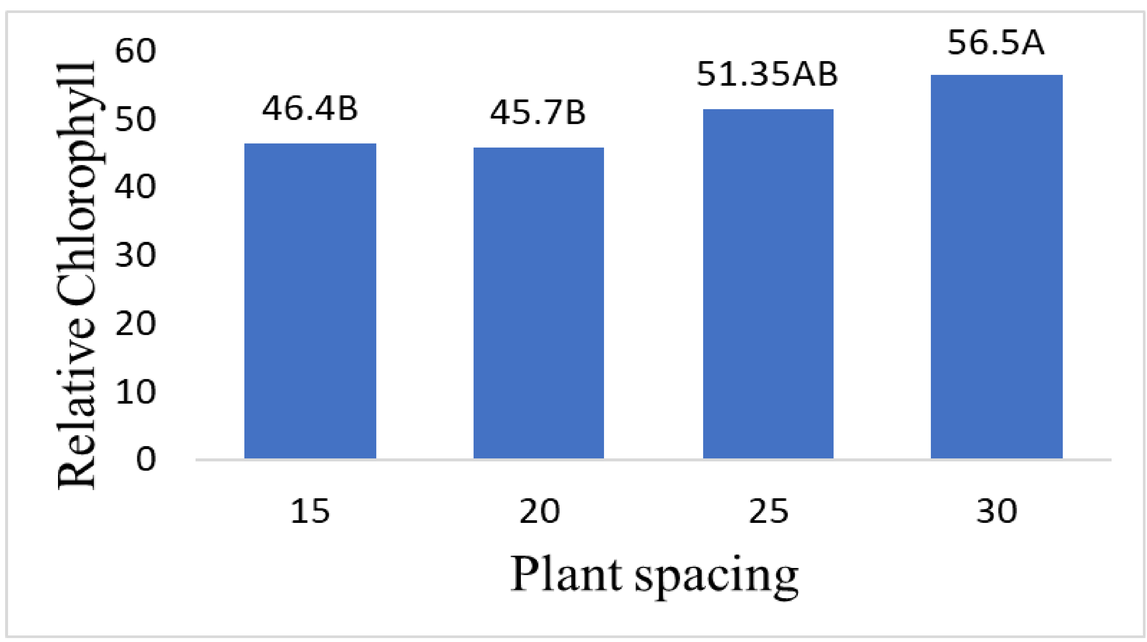

Figure 1: Relative chlorophyll as influenced by plant spacing indifferent of corn variety at R1-R2 stage

Conclusions

The results of this experiment show that the within row spacing of 30 cm between plants is more advantageous than the lower spacings for the corn varieties MP1 and CC. These results also confirm the higher yield performance of the corn variety MP1 compared to Chicken Corn.

Literature cited

Balkcom K. S. and K. L. Bowen. 2020. Corn response across plant densities and row configurations for different moisture environments. Hindawi International Journal of Agronomy. Vol. 2020. Article ID 4518062, 10 pp. https://doi.org/10.1155/2020/4518062

Di Rienzo J.A., F. Casanoves, M.G. Balzarini, L. Gonzalez, M. Tablada, and C.W. Robledo. 2012. InfoStat versión 2012. InfoStat Group, Facultad de Ciencias Agropecuarias, Universidad Nacioal de Córdoba, Argentina. URL http://www.infostat.com.ar

FAO. 2022. FAO Statistics. https://www.fao.org/faostat/en/#data/QCL

Jean Simon L., M. Bohn, M. D. Dorval, E. Joseph, Z. Rochelin, A. M. Eliscar, P. D, E. Romain, F. N. E. Lucas, J. J. Auguste, E. Nazaire, G. René, L. Eugene, and J. Denis. 2020. Evaluation Collaborative de Variétés de Maïs en Haïti. In : Conférence Internationale de Recherche et Innovation Agricole. https://area.ifas.ufl.edu/media/areaifasufledu/docs/4A02_Ludger_Simon.pdf

Licht M. A., M. R. Parvej, and E. E. Wright. 2019. Corn yield response to row spacing and plant population in Iowa. Article in: Crop, Forage & Turfgrass Management. DOI: 10.2134/cftm2019.05.0032