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Glutinous corn (*Zea mays var. ceratina*) variety demonstration trial during wet season

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Abstract

The study was conducted to demonstrate the performance of four varieties of glutinous corn during wet season in the province of Cagayan, in terms of agronomic and economic characteristics. Specifically, it aimed to find out the best suited corn variety under CSU Lal-lo condition during wet season in terms of: (a) plant height (cm); (b) length of corn ear (cm); (c) rows per ear; (d) ear diameter; (e) weight of 1000 kernels dried and fresh (g); (f) yield per plot (kg) and cost and return analysis. The treatments were: T1 (Lagkitan), T2 (Nutri Lyt), T3 (Batik) and T4 (Purple gem). These were randomly allocated in the different plots following the Randomized Complete Block Design (RCBD). The result of the study did not show significant difference in terms of plant height (cm) at 30 days, plant height (cm) at 60 days, length (cm) of corn ear, weight (g) of 1000 dried kernels, weight (g) of 1000 fresh kernels and yield (kg) per plot. However, it showed significant difference in terms of number of row per ear and ear diameter. Results further shows that purple gem produced the highest number of rows per ear and widest ear diameter. In terms of ROI, all the treatments showed positive ROI but the highest was gained by Treatment 4 (purple gem) with 297. 29%.

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Introduction

The Philippine is a country showing rapid increase of its population yearly as manifested on the data of the Philippine Statistic Authority. In the year 2017 it registered a total of 105.2 million (*StatCan, World Bank*) and as its population climbs, food problems loom (*Manila, Reuters*). Thus, to address this issue, the Department of Agriculture encouraged people to serve other staple food for the family like root crops, banana, corn and etc.

Corn, as one of the major crops in the country, second to rice, aside from being used as feed for animals, it can also serve as food for human most especially the glutinous corn or waxy corn variety. It also became familiar in food processing and being converted to "chichacorn" (*Pablico, S.Ma,* 2009), and for cornick production (*M. Bueno, J.,* 2003). With this, most farmers are interested to raise glutinous corn because of its high demand in the market.

Glutinous corn or scientifically known as *Zea mays var. ceratina* which ranks next to rice as a staple crop in the country, encountered problems on its production. For instance, its production during the wet season for calendar 2017 is decreased by 5.73 percent from the 1.73 million metric ton output of 2016 compared to the recent output of 1.63 million metric ton (PSA, 2017). The timing and number of planting in a year substantially depends on both economic and climatic condition. In addition, weather induce limitation on workability is a key factor. The delay of some operation could lead to crop failure and decreased number of harvests. In addition, different localities of the country do not have the same climatic condition, leading for not having the same quantity and quality of yields.

Lal-lo, Cagayan is one of the Municipalities of the country having tropical monsoon climate (*Wikipedia*) is being dominantly inhabited by farmers. However, glutinous corn is not a primary crops planted by them. Glutinous corn as a potential staple food and being familiar for its many uses, it should be promoted and introduced to the farmers.

However, as the farmers known for their cultures in "to see is what to believe", a study should be conducted first to look for the possibility of planting glutinous corn in the town and to determine which variety is best suited. Therefore in this study, four glutinous corn varieties, i.e., *Lagkitan, Nutri Lyt, Batik* or *Bi-color*, and *Purple gem* or the *Purple corn* were used and planted during wet season to to determine the performance of the four varieties of glutinous corn under CSU Lal-lo condition during wet season. Specifically, it aimed to find out which variety is best suited under CSUL condition during wet season in terms of the following parameters: (a) Plant height (cm) at 30 DAT; (b) Plant height(cm) at 60 DAT; (c) Length (cm) of corn ear (cm); (d) Ear diameter (cm); (e) Rows per ear (no); (f) Weight of 1000 kernels fresh per plot (g); (g) Weight of 1000 kernels dry per plot (g); (h) Yield per plot (kg) and (i) Cost and Return Analysis.

Materials and methods

Experimental Design and Treatments

The Randomized Complete Block Design (RCBD) was used in the study with four treatments replicated four times. The treatments were as follows; T1 - *Lagkitan*, T 2 - Nutri-Lyt, T 3 – *Batik* and, T 4 – Purple Gem.

Experimental Layout, Design and Planting

A total land area of 2,152.2 sq.m. including spaces was prepared and was subdivided into four equal blocks, each block was divided into four equal plots (9.8m x 12m) to represent the four treatments. Furrows were made by plowing followed by basal application of inorganic fertilizer (Ammophos 16-20-0) and organic fertilizer (ultimax) and thinly covered with fine soil, the planting of glutinous corn seeds was done at a distance of 30cm between hills and 70cm between rows at the rate of one seed per hill. Replanting was done after five days to ensure uniform population of the plants. package of technology (POT) for corn production was followed, such as (a) control of pest and diseases; (b) applying fertilizer; (c) weeding and cultivating; (d) harvesting.

However, 75 DAE, harvesting was done base from the color and size and when the corn ear has already reach full development of the kernel, harvesting was

done first for the ten (10) sample plants separately and properly labelled for the data collection. Then the remaining plants followed.

After gathering the necessary data from the harvested ten sample plants, the variety of corn (Lagkitan, Nutri-Lyt and Batik) was sold at Php20.00 per kilo fresh and the Purple gem variety was sold Php 36.00 per kilo fresh to the students, faculty and staff of the campus.

Data Gathered

From the ten (10) sample plants per treatment, the following above mentioned parameters were gathered for data analysis. The data gathered were statistically analysed using the analysis of variance (ANOVA) in Randomized Complete Block Design (RCBD).

Results and discussion

Average Plant Height (cm) at 30 DAP

Table 1 shows that *Lagkitan* variety gave the tallest height with a mean of 99.32cm, followed by Nutri Lyt variety with a mean height of 99.12cm and Batik variety with a mean height of 90.92cm. While the Purple Gem variety was noted to be the shortest with a mean height of 88.02cm. Nevertheless, the different glutinous corn varieties gave slight differences in height at 60 DAP. *Lagkitan* was the tallest with a mean of 207cm, followed by Nutri Lyt with a mean height of 205.25cm and Purple Gem with a mean height of 198.75cm. While the *Batik* was noted as the shortest plant with a mean height of 194.50cm. The two data gave no significant differences among the heights of corn at 30 and 60 DAP as revealed by the analysis of variance (ANOVA), respectively.

Corn Ear Diameter

The Purple Gem and Lagkitan comparably have a wide ear diameter of 3.07cm and 2.94cm, but significantly wider diameter compared to *Batik* and Nutri Lyt varieties, with a mean diameter of of 2.80cm and 2.77cm, respectively. This is a clear manifestation that the varietal trial of glutinous corn under CSU Lal-lo condition during wet season has a significant effect on the ear size, which possibly affects the yield performance of the corn variety (Table 1).

Table 1. Plant height at 30 and 60 DAP, ear diameter (cm), length of corn ear (cm), ear diameter, number of rows per ear, weight (g) of 1000 fresh kernels and weight (g) of 1000 dried kernels (cm) produced by glutinous corn varieties during wet season under CSU Lal-lo condition. Cagayan State University, Lal-lo, Cagayan. July 2017 to October 2017.

Corn Variety	Plant Height (cm)		Ear Diameter (cm)	Ear Length (cm)	No. of rows per ear	[1]Fresh Kernel Weight(g)	[1]Dried Kernel Weight(g)
	30 DAP	60DAP					
T_1 –Lagkitan	99.32	207.00	2.94 ab	14.40	12.25 b	350.00	318.75
T_2 –Batik	99.12	205.25	2.77 b	15.26	12.25 b	328.75	296.25
T_3 -Nutri Lyt	90.94	194.50	2.80 b	13.49	11.75 b	331.75	283.00
T_4 -Purple Gem	88.02	198.75	3.07 a	14.11	13.50 a	348.75	309.00
CV(%)	16.74	4.73	4.67	5.41	5.72	6.12	10.14

*All means followed by the same letter are not significantly different at 5% level of significance.

[1]1000 kernels

Length of Corn Ear (cm)

Nutri Lyt variety gave the longest length of corn ear with a mean of 15.26cm followed by Lagkitan variety and Purple gem variety with their mean of 14.40 and 14.11cm, respectively, while Batik variety produced a shortest length of corn ear with a mean of 13.49cm, respectively. Analysis of Variance shows no significant difference among the treatments tested, which simply means that varietal trial of glutinous corn under CSU Lal-lo condition during wet season did not affect the length of corn ear (Table 1).

Number of Rows per Ear

The variety that produced the highest number of rows is Purple gem with a mean of 13.50 followed by Lagkitan and Nutri-Lyt with 12.25 and 12.25, respectively. While Batik has the lowest number of rows with a mean of 11.75cm. Analysis of variance

(ANOVA) showed significant result on the average number of rows per ear. This is a clear manifestation that varietal trial of glutinous corn under CSU Lal-lo condition during wet season has a significant effect on the number of rows (Table 1).

Weight (g) of 1000 Fresh Kernels

The result shows that Lagkitan variety gave the heaviest weight (g) among the varieties tested with a mean of 350.00g, followed by the Purple gem, Batik and Nutri-Lyt with their means of 348.75g, 331.25g and 328.75g, respectively. Result of the Analysis of Variance (ANOVA) showed no significant differences among treatment means (Table 1).

Weight (g) of 1000 Dried Kernels

The average weight of 1000 dried kernels (Table 1) shows that Lagkitan variety garnered the heaviest weight with a mean of 318.75g, followed by Purple gem, Nutri Lyt variety with their means of 309.00g, 296.25 g, and the lowest was noted in T3 (Batik) with a mean of 283.00g only. Analysis of Variance (ANOVA) reveals that the weight of 1000 dried kernels did not show any significant differences among the four varieties tested.

Yield of Glutinous Corn per Hectare (kg)

The average yield (kg) of glutinous corn per hectare is shown in Table 2. Purple gem produced the highest yield among the varieties with a mean of 9,612kg per plot, followed by the Lagkitan, Nutri Lyt and Batik with their means of 9,582kg, 9,203kg and 9,056kg, respectively. Analysis of variance (ANOVA) revealed no significant differences among treatment means.

Cost and Return Analysis

The cost and return analysis (Table 2) reveals that Purple gem had the highest ROI of 297.29% followed by Lagkitan with 266.22%, Nutri-Lyt with 251.60% and Batik with 246.73%. Based on the ROI generated by the different treatments, all the varieties tested can be produced in CSU Lal-lo during wet season since it shows as positive net income.

Table 2. Yield (kg) of glutinous corn and Cost and return analysis per hectare produced by glutinous corn glutinous corn varieties during wet season under CSU Lal-lo condition. Cagayan State University, Lal-lo, Cagayan. July 2017 to October 2017.

Corn Variety	Yield-ha (kg)	Gross Income-ha (Php)	Cost of Production -ha (Php)	Net Income-ha (Php)	Return on Investment (ROI)
T_1 –Lagkitan	9,582	180,400	49,260	131,140	266.22
T_2 –Batik	9,203	173,200	49,260	123,940	251.60
T_3 -Nutri Lyt	9,056	170,800	49,260	121,540	246.73
T_4 -Purple Gem	9,612	326,808	82,260	244,548	

Meteorological Data

It was observed that the temperature was high during the month of July and low during the month of August. Relative humidity was high during the month of October and low during the month of July. Rainfall was high during the month of October and low during the month of July while sunshine duration was high during the month of July and low during the month of October (Table 3). According to PAN Germany (2006), daily temperature of 21-30° Celsius is required for adequate growth and development of corn. Corn also requires at least 8 hours of direct sunlight daily in order to grow its best while its daily water consumption is approximately equal to field evaporation (4 to 5mm/day). However during silking and soft dough stages, water use can be as high as (6 to 8mm/day).

Table 3. Temperature, relative humidity, rainfall and sunshine duration during the conduct of the study.

Month	Temperature (°C) Min.	Max.	Relative Humidity (%)	Rainfall (mm)	Sunshine Duration (min)
July	28.1	29.39	79.42	1.67	276
August	25.8	23.38	83.65	9.6	215.9
September	24.9	29.01	82.7	5.21	219
October	24.9	27.35	86.42	16.67	134.7

Source: PAGASA Office, Appari Radar/Synoptic Station Complex, 2017.

If water supply becomes critically inadequate during this period, the potential yield may be reduced by 20 to 50% (PCAARRD, 1981.)

Conclusion

Based on the result of the study, it is concluded that Purple Gem variety significantly have the highest number of rows per ear and ear diameter which contributed of having the highest yield per unit area. It is further concluded that Purple Gem is best suited at CSUL condition and can be planted during wet season.

Recommendation

Based on the findings of the study, Purple gem is recommended for glutinous corn production in CSU Lal-lo during wet season in which it obtained the highest net income and return of investment. However, for more conclusive results, it is recommended that similar studies must be conducted using the same variety in other location and planting season.

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