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# Growth and yield performance of Glutinous Corn (*Zea maize)* as supplemented with carrageenan and fermented Goat manure as bio-fertilizer

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**Key words:** Glutinous Corn, Bio-fertilizer, Carrageenan, Goat manure, Fermented goat manure, Agricultural practices.

**Abstract**

The study was conducted to determine growth and yield performance of Glutinous corn (Zea maize) supplemented with carrageenan and fermented goat manure as bio-fertilizer and aimed to find out which among the treatments can give the best result in terms of Plant Height at 30 and 60 DAE (cm), Length of Unhusked and Husked Ear (cm), Diameter of Unhusked and Husked Ear (mm), Weight of Unhusked and Husked Ear (g), Projected Yield (ton) per Hectare and Cost and Return Analysis. The study was conducted from January 08, 2018 to June 05, 2018 in single factor experiment in a Randomized Complete Block Design (RCBD) replicated three times with three treatments. T1-Control, T2-Carrageenan at 22.5ml per 1.2 L of water and T3- Fermented Goat Manure at 22.5ml per 1.2 L of water. Application of carrageenan and fermented goat manure affected the growth and development of corn as manifested by the Plant Height at 30 and 60 DAE, Length of Unhusked and Husked Ear (cm), Diameter of Unhusked and Husked Ear (mm), Weight of Unhusked and Husked Ear (g) and T3 was shown to have Highest Projected Yield (tons) per Hectare.The study revealed that supplementation of carrageenan and fermented goat manure improved glutinous corn production. Supplemented with fermented goat manure revealed the highest return of investment with 400.92%, further study in two cropping season is recommended to validate the result and come up with a more reliable conclusion.

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**Introduction**

Optimizing yield is an important component of economical corn production. Managing fertilizer inputs is essential as it can be a significant portion of total crop input costs. Typically, the soil source is for adequate supply and plant uptake of essential nutrients in corn production (Sawyer and Barker, 2000). Likewise, micronutrient spraying is a new method for crop feeding, which micronutrients in forms of liquid are used into leaves (Nasiri *et al.*, 2010). Similarly, Foliar application of microelements is more beneficial than soil application, Since application rates are easier as compared to soil application, same application could be obtained easily and crop reacts to the nutrient application immediately (Zayed *et al.*, 2011).

Corn (*Zea maize*) is an important crop in the Philippines as a staple food, livestock feed and raw materials for starches used in food processing and other industries. It is one of the major crop grown in the country with over a million Filipino farmers depending on it as their main source of income and employment. Filipino farmers have traditionally planted open-pollinated varieties (OPV) of white glutinous corn that allowed them to save seeds from their harvest for the next planting season. Traditionally OPV planting also makes it possible for farmers to exchange seeds and breed varieties that are better adapted to the environment.

Most farmers are interested to raise green corn because of the price and high demand in the market. Through the years, farmers have augmenting yield using inorganic fertilizers. Typically, the essential nutrient from fertilizer inputs form part of the optimum production of crops but also contribute to the ample portion of total crop inputs cost leading many farmers having a dilemma of subsidiary the agricultural inputs and the effect of overusing of inorganic pesticide to human health. Researches showed that dependency on inorganic fertilizer to nourish agricultural land also resulted in soil pollution and imbalances. Due to the excessive application of inorganic fertilizers, the pH value of soil has shown a significant change. This has made most agricultural lands become stressed and unproductive. Because of the major disadvantage of inorganic fertilizers, several types of research have focused on managing fertilization need through gradually shifting into Good Agricultural Practices (GAP) to organic farming to reduce long-term input costs and bring back the fertility of the soil. Likewise, the application of seaweed emulsion affected the kernel development as manifested by longer and heavier corn ear. Higher rates (3-6 li/ha proved to more efficient as indicated by the bigger ear, highest yield and ROI of 909.62 percent (Butay, J.S., 2017).

Moreover, (DOST-PCAARRD, 2016) stated that Carrageenan plant growth promoter (PGR), extracted from the red edible seaweeds, proved to be beneficial for Roger Cornelio, farmer cooperator in Bay, Laguna. He shared his experience in using the technology during a Farmers' Field Day held in his farm. Cornelio tested the technology in his 6,000 square meter farm in Bay, Laguna. He observed that his rice yield has increased from 2.4 tons last year to 3.9 tons this year or an increase of 62.5 percent.

Seaweed products exhibit growth-stimulating activities, and the use of seaweed formulations as bio-stimulants in crop production is well established. Bio-stimulants are defined as "materials, other than fertilizers, that promote plant growth when applied in small quantities" and are also referred to as "metabolic enhancer" (Zhang and Schmidt, 1997). Seaweed components such as macro and microelements nutrients, amino acids, vitamins, cytokinins, auxins and abscisic acid (ABA)-like growth substances affect cellular metabolism in treated plants leading to enhanced growth and crop yield (Crouch *et al.*, 1992; Crouch and van Staden 1993a; Reitz and Trumble 1996; Durand *et al.*, 2003; Ordog *et al.*, 2004). Seaweed extracts are bioactive at low concentrations (diluted as 1:1000 or more) (Crounch and van Staden 1993a). Although many of the various chemical components of seaweed extracts and their modes of action remain unknown, it is plausible that these components exhibit synergistic activity (Fornes *et al.*, 2002; Vernieri *et al.*, 2005).

Goat manure is an excellent organic fertilizer as well as a good source of organic matter and nutrients in contrast to chemical fertilizers. It adds organic matters to soil that improves soil physical, chemical and biological/microbial properties of soil like soil structure, nutrient retention, aeration, soil moisture holding capacity, water infiltration and phosphorus availability to plants. (Garg and Bahla, 2008). It also found out more nitrogen, phosphorus, and potassium (N, P, and K) than any other animal manure, such as those of cows, deer, horses, pigs, and chicken. Hence, it is a Bio-fertilizer is considered as a vital solution in revitalizing the fertility of the soil and bringing backs its hummus and productivity. The study is therefore designed to generate scientific information that is glutinous corn production by supplementing carrageenan and goat manure as a bio-fertilizer. To improve the production of crops by using carrageenan and goat manure as biofertilizers, some efforts are required to fulfill a part of nutrients and improve the physical, chemical, and biological traits of the soil through the application of carrageenan and goat manure as bio-organic fertilizers. Furthermore, various limitations of using organic fertilizers have been pointed out, such as the difficult access to trustworthy sources of information and the lack of specific research (Giulietti *et al*., 2008).

*Growth and Yield Performance of Glutinous Corn (Zea maize) as Supplemented with Carrageenan and Fermented Goat Manure as Bio-Fertilizer*

Generally, this study was conducted to evaluate the efficacy of Glutinous Corn (*Zea maize)* as Supplemented with Carrageenan and Fermented Goat Manure as Bio-Fertilizer. Specifically, it was conducted to 1.) Evaluate the growth and yield of glutinous corn with the addition of different concentrations of fermented goat manure as bio-fertilizer combined with the recommended rate of fertilizer; 2.) Identify the optimum combination of different concentrations of fermented goat manure as bio-fertilizer supplemented to the recommended rate of fertilizer effective for glutinous corn production; 3.) Evaluate which of the combination of different concentrations of fermented goat manure as a biofertilizer supplemented with the recommended rate of fertilizer has the highest return on investment.

**Materials and methods**

*Research Design*

The study is an experimental research which was conducted in a single factor experiment in Randomized Complete Block Design (RCBD) with 3 treatments and 3 replications.

*Laying-out the Experimental Area and Experimental Design*

A total land area of 404.25m $^2$ (16.5m x 24.5) including alleys were used for the experiment. It was divided into three (3) blocks and each block was further subdivided into 3 plots with a total of nine (9) plots. Each plot measures 5m x 7.5m with a total area of 37.5m$^2$ per plot.

*Experimental Treatments*

The experimental treatments used were the following: T1- recommended rate for the glutinous corn. The treatment was based on the soil analysis. T2- Recommended rate + 6 liters of carrageenan per hectare. In this treatment the recommended rate which is based on soil analysis plus 22.5ml of carrageenan. The carrageenan was diluted with 1.2 liters of water. This was sprayed on the leaves of the plants at 15, 30 and 45 days after emergence. T3- Recommended rate + 6 liters of Fermented Goat manure per hectare.

In this treatment the recommended rate which is based on soil analysis plus 22.5ml of Fermented Goat manure. This was diluted with 1.2 liters of water. This was sprayed on the leaves of the plants at 15, 30 and 45 days after emergence.

*Gathering Procedure*

Before land preparation, soil samples were collected in different locations within the experimental area at a depth and width of 6 inches. These soil samples were submitted to Cagayan Valley Integrated Agricultural Laboratory (CVIAL), Tuguegarao City for soil chemical and physical analysis.

*Land Preparation*

The experimental area was thoroughly prepared to have a uniform seedling emergence and good root emergence. The area was prepared by plowing two times and harrowing one week after plowing. Pick Mattock and grab hoe was used to cultivate the area to break the soil clods for effective weed control after the second plowing and are ready for transplanting.

*Construction of Furrows and Basal Application of Fertilizer*

Construct furrows at 75 centimeters apart before basal application of fertilizer. Based on the soil analysis 4 kgs. of 16-20-0, 3 kgs. of 46-0-0 and 50kgs. of organic fertilizer. Sidedressing 4.4kgs of 46-0-0.

*Planting, Thinning and Basal Application*

Three seeds were planted per hill in a furrow with a distance of 25 centimeters between hills and 75 centimeters between rows. Thinning was done at 14 days after emergence and maintains one healthy plant per hill. Thirty-five days after emergence side-dressing was done with 4.4kgs of 46-0-0 based on the soil analysis.

*Application of Carrageenan and Fermented Goat Manure*

The researcher applied Carrageenan and fermented goat manure based on the imposed treatment, using a graduated cylinder to measured and mixed with 16 liters of water per spray load (25 spray loads per hectare). It was sprayed on the leaves of the plants at 15, 30 and 50 days after planting., All treatments were administered in the morning between 8:00 and 9:00 at fair weather conditions. This was the time for stomata opening and better nutrient absorption.

*Weeding Management*

Weeding and off-barring were done at 18 days after emergence and it was repeated depending on weed population.

*Watering Management*

The corn plants were flooded during tasseling stage of the corn to promote the corn kernel to develop fully and prevent the corn plants from wilting.

*Cultivation and Care Management*

Cultivation was done to loosen the root zone of the plants to initiate the entry of oxygen in the roots and to control the growth of weeds. Hilling- up was also done at 33 days after emergence.

*Harvesting*

The corn ears were harvested the moment it reached the soft dough stage approximately 60 to 75 after emergence. The ears of the sample plants were harvested one by one, placed in the plastic sack, and properly labeled.

*Data Gathered*

*Plant Height at 30 and 60 Days after Planting (DAP).* The height of the 10 samples randomly selected was measured from the base to the tip of the meristem by using a measuring meter stick at 30 days after planting, while the plant height at 60 days after planting was measured from the based up to the first node of the tassel.

*The weight of Unhusk and Husked Ear (g).* The 10 sample ears unhusk were weighed after harvest. The husks were removed and weighed. The weight was divided by ten to obtain the weight per ear. The weights were determined using a digital weighing balance.

*Length of Husked and Unhusked Corn Ear (cm).* The length of the husked and unhusked ear from the 10 representative plants was measured by using a foot ruler from end to end.

*The diameter of Husked and Unhusked Ear (cm).* The sample ear that was used in determining the length of husked and unhusked ear, was used to determine the diameter using a Vernier caliper.

*The weight of Husked and Unhusked Corn Ear (g).* The 10 sample ears unhusk was weighed after harvest. The husks were removed and weighed. The weight was divided by ten to obtain the weight per ear. The weights were determined using a digital weighing balance.

*Computed Yield per Hectare (kg).* The yield per hectare was computed based on the yield obtained from the sampling area.

*Cost and Return Analysis.* This was computed based on the actual expenditures (cost of production and cost of materials).

*The following formulas are used*

Net Income is equaled to Gross Income – Total Expenses, to get the ROI the Net Income was divided by the total Expenses.

*Statistical Analysis*

All the data gathered and analyzed following the Analysis of Variance for the Randomized Complete Block Design (RCBD) The Duncan's Multiple Range Test (DMRT) was used to compare the means with significant results.

**Results and discussion**

*Observation*

The seeds were emerged at six (6) days after planting; some hills were missing but we replanted. The plants are not uniformly grown because of its changing weather. The experimental area was monitored daily. On the fifteen (15) days after emergence there was heavy rain and because of the application of treatments and side dress was not accomplished but then on the Sixteen (16) DAE, these activities were fulfilled. Attacked of cutworms was observed in the area. Spraying of pesticide was done to control and lessen the damage given by these insects.

Thirty-one (31) DAE, the treatments were sprayed from the leaves of the plants, then the sample plants were gathered measuring its height, the plants were gathered on the based up to the tip of the meristem and also Biological control. Trichogramma was applied. Thirty-four (34) DAE there is some insect pest that are not familiar they are sucking the leaves of the corn plants so spraying of Metarhizium was done to prevent these insect pests from invading the crops. Thirty-eight (38) DAE it was observed that on the first application of biological control the insect pest did not totally control, so the application of Biological control like earwig and application of Trichogramma was done the second time to prevent the insect pest from spreading. Forty-two (42) DAE the treatment three (3) that was sprayed with goat manure have their tassel. Forty-five (45) DAE was the application of treatments. Forty-six (46) DAE was the second application of earwig. Fifty-four (54) DAE the tassel of all the plants in every treatment was fully developed. Fifty-six (56) DAE the soil was very dry and the tasseling period was the critical stage, the whole experimental treatments were irrigated but then that was not enough soon fifty-eight (58) DAE second irrigation was performed. Sixty (60) DAE the plants are ready for the gathering of data was the gathering of data because it reaches its 60 days, gathering of data was done by measuring the base of the corn plants up to the first node of the tassel. At seventy-five (75) DAE the plants reach the soft dough stage, this time it was ready for harvest.

*Average Plant Height*

Plant Height (cm) at 30 and 60 Days after Planting (DAP). The plant height of glutinous corn at 30 and 60 days after planting as influenced by fermented goat manure and carrageenan as a liquid fertilizer supplemented with the recommended rate of fertilizer is presented in Table 1. The result showed significant differences were observed on the height of the plant at 30 days after emergence. Wherein the plants applied with fermented goat manure (T3) produce the tallest plants having the mean value of 72.13cm. These were followed by the application of carrageenan T2 with the mean value of 70. 60. Shortest plant was found on the control plant (T1) with the mean value of 67.67 centimeters.

As to the Plant height at 60 DAE, the table 1 shows that Treatment 2 and treatment 3 do not significantly difference to each other. The T2 or the Carrageenan was the tallest at 60 days after emergence at 184.98cm and followed by the T3 or the Fermented goat manure with the plant height at 184.83cm while the control showed the shortest plant height at 60 days after emergence with the plant height of

179.73cm. However, the table states that all the treatments are significantly differenced. Coefficient variation was 1.06%.

The variation in plant height is attributed to the application of seaweed emulsion. Seaweed products exhibit growth-stimulating activities, and the use of seaweed formulations as biostimulants in crop production is well established. Biostimulants are defined as "materials, other than fertilizers, that promote plant growth when applied in small quantities" and are also referred to as "metabolic enhancers" (Zhang and Schmidt 1997).

This is also associated with the findings of M.A. Awodun, L.I. Omonijo and S.O Ojeniyi (2007), it was stated that the goat manure is relatively high in organic matter, N and P compared with K, Ca and Mg. Goat manure treatments increased soil N, P, K, Ca, and pH and leaf N, P, K, Ca and Mg of pepper. Growth and yield parameters such as leaves and branches, plant height, stem girth, number and weight of fruits were significantly ($p>0.05$) increased by goat manure treatments.

**Table 1.** Plant Height (cm) of Growth and Yield performance of glutinous corn as supplemented with carrageenan and Fermented Goat Manure as liquid fertilizer.

| Treatments | Plant Height (cm) | |
|---|---|---|
| | 30DAP | 60 DAP |
| T1- Control | 67.67 c | 179.73 b |
| T2- Carrageenan | 70.60 b | 184.98 a |
| T3- Fermented Goat Manure | 72.13 a | 184.83 a |
| ANOVA RESULT | ** | ** |
| C.V. (%) | 0.46 | 1.06 |

Note: Means with common letter/s are not significantly different from each other using DMRT.

*Length of Unhusked and Husked Ear (cm).*

The length of husk and unhusked ear of Growth and Yield performance of glutinous corn as supplemented with carrageenan and Fermented Goat Manure as liquid fertilizer shown in Table 2. The significant result was revealed on the length of husked ear per sample area wherein the longest husked ear was obtained by the plants applied with fermented goat manure (T3), next in rank was obtained by the application of carrageenan (T2) while control got the shortest length of the husked ear. The coefficient of variation was 1.15%.

Similarly, the growth parameters shows that the plants that are treated with Fermented goat manure (T3) have the longest length of unhusked ear with a mean of 17.92 cm followed by (T2) carrageenan with a mean of 16.75 cm and control (T1) was the shortest among the three treatments with a mean of 15.53 cm. Nonetheless, there were significant differences between the tested treatments. The Coefficient variation was 2.55%.

The result associated with the findings of Jabran and Ullah (2007) stated that's vegetative development, the fresh and dry weight of the plant tissues, plant height flowering commencement, flower numbers, fruit initiation, fruit size and fruit weight is positively influenced by foliar feeding eventually resulting in better quality and quantity of produce. And also the findings were associated with the findings of Ojeniyi, S.O.,

Akanni, D.A., Awodun, M.A., stated that the growth and fruit yield of tomato were significantly increased by goat manure treatments. Leaf K, Ca and Mg, plant height number of branches, leaf area, root length, the number of fruits and fruit diameter increased with the level of goat manure, and they concluded that goat manure is suitable for improving soil physical and chemical properties and growth and yield of tomato.

**Table 2.** Length (cm) of Husk and Unhusked of Growth and Yield performance of glutinous corn as supplemented with carrageenan and Fermented Goat Manure as liquid fertilizer.

| Treatments | Length of Corn Ear (cm) | |
|---|---|---|
| | Unhusked | Husked |
| T1- Control | 25.03 c | 15.53 c |
| T2- Carrageenan | 26.87 b | 16.75 b |
| T3- Fermented Goat Manure | 27.7 a | 17.92 a |
| ANOVA RESULT | * | * |
| C.V. (%) | 1.15 | 2.55 |

Note: Means with common letter/s are not significantly different from each other using DMRT.

*The diameter of Husked and Unhusked Ear (mm).*

The length of husk and unhusked ear of Growth and Yield performance of glutinous corn as supplemented

with carrageenan and Fermented Goat Manure as liquid fertilizer (Table 3). Result showed the plants that are treated with Carrageenan (T2) have the widest diameter with a total mean of 55.77mm followed by the plants treated with Fermented goat manure (T3) with a mean of 54.03mm while the control (T1) has the narrowest in terms of diameter with a mean of 52.33mm. However, there was a significant difference between the tested treatments.

The coefficient variation was 0.2892%. The ear diameter of the Unhusked ear was significantly influenced by carrageenan and Fermented goat manure. The the plants that are treated with Fermented goat manure (T3) have the widest among the impost treatments with a mean of 44.27% followed by the plants that are treated with carrageenan with a mean of 43.93% while the plants that control (T1) got the narrowest diameter with a mean of 40.9%. The coefficient variation was 1.29%.

The result of the study implied that seaweed emulsion from seaweeds emulsion proved plays a very important role in brain development of glutinous corn because it composed the macro and micro elements (BIOTECH, 2014). As the findings of Dongyang L. *et al* (2001) mentioned that fermented seaweed extract power can enhance plant vigor, improve quality of crop products, and increase yield. The fermented seaweed extract contains a lot of nutrients which are easy to be absorbed and transformed by plants, and it promotes the growth of plants.

**Table 3.** Diameter (mm) of Husk and Unhusked of Growth and Yield performance of glutinous corn as supplemented with carrageenan and Fermented Goat Manure as liquid fertilizer.

| Treatments | The diameter of Corn Ear (cm) | |
|---|---|---|
| | Unhusked | Husked |
| T1- Control | 52.33 c | 40.9 b |
| T2- Carrageenan | 55.77 a | 43.93 a |
| T3- Fermented Goat Manure | 54.03 b | 44.27 a |
| ANOVA RESULT | * | * |
| C.V. (%) | 0.29 | 1.29 |

Note: Means with common letter/s are not significantly different from each other using DMRT

*The weight of Husked and Unhusked Ear (g)*

The weight of husked and Unhusked Growth and Yield performance of glutinous corn as supplemented with carrageenan and fermented goat manure is shown in Table 4. that the plants that are treated or sprayed with fermented goat manure (T3) had the heaviest weight of husked ear with a mean of 282.46 followed by the carrageenan (T2) with a mean of 264.62 while the lightest among the impost treatments is the control with a mean of 247.27. The treatments show that there was significant different with the impost treatments. The coefficient variation was 3.53%. Likewise, a significant result was observed on the ear weight of unhusked ear wherein the plants treated with Fermented goat manure (T3) had the heaviest weight of unhusked ear with a mean of 164.44 followed by the plants treated with carrageenan with a mean of 160.47 and the control (T1) was the lightest in terms of weight of unhusked ear with a mean of 154.11. The result of the study proved the findings of DOST-PCAARRD (2016) that Carrageenan plant growth promoter (PGP), extracted from red edible seaweeds is beneficial to increased crop yield and also proved the findings of Ojeniyi, S.O., Akanni, D.A., Awodun, M.A., that goat manure is suitable for improving soil physical and chemical properties and growth and yield.

According to Ano and Ubochi (2007) had shown that GM improved N, P, K, Ca, Mg and CEC status of soil and also reduced the exchangeable acidity (EA) of soil that can enhance the growth of plants.

**Table 4.** Weight (g) of Husked and Unhusked of Growth and Yield performance of glutinous corn as supplemented with carrageenan and Fermented Goat Manure as liquid fertilizer.

| Treatments | Weight of Corn Ear (cm) | |
|---|---|---|
| | Unhusked | Husked |
| T1- Control | 247.27 c | 154.11 b |
| T2- Carrageenan | 264.62 b | 160.47 a |
| T3- Fermented Goat Manure | 282.46 a | 164.44 a |
| ANOVA RESULT | * | * |
| C.V. (%) | 3.53 | 1.18 |

Note: Means with common letter/s are not significantly different from each other using DMRT.

*Projected Yield (tons) per Hectare*

Table 5 showed that plants that were treated with Fermented goat manure (T3) got the highest yield (tons) per hectare with an average of 15.06 tons, followed by Carrageenan (T2) with an average of 14.11 tons per hectare and the plants that were Control (T1) got the lowest average of 13.9 tons per hectare.

**Table 5.** Computed Yield of Unhusked ear per hectare of Growth and Yield performance of glutinous corn as supplemented with carrageenan and Fermented Goat Manure as liquid fertilizer.

| Treatments | Computed Unhusked Ear Yield/ha (Tons) |
|---|---|
| T1- Control | 13.19 |
| T2- Carrgeenan | 14.11 |
| T3- Fermented Goat Manure | 15.06 |

*Cost and Return Analysis*

The cost and return analysis of one hectare of glutinous corn production are shown in Table 6. The return of investment obtained in the different treatments are arranged in descending order: Treatment 3 had 400.92 percent and Treatment 2 had 363.57 percent the lowest was obtained by Treatment 1 with 343.98 percent. In this result means that the nutrient content of T3 (Fermented Goat Manure) was greatly affected the growth and yield of the plants especially in corn and also T2 (Carrageenan) was given a significant result to the yield of the plants.

**Table 6**. Cost and Return Analysis.

| Treatments | Cost of Production | | GROSS INCOME | | ROI | |
|---|---|---|---|---|---|---|
| | Php | USD | Php | USD | Php | USD |
| T1- Control | 1336.66 | $25.70 | 5934.56 | $114.12 | 343.98 | $6.61 |
| T2- Carrageenan | 1369.99 | $26.34 | 6350.81 | $122.13 | 363.57 | $6.99 |
| T3- Fermented goat manure | 1353.33 | $26.02 | 6779.04 | $130.36 | 400.92 | $7.71 |

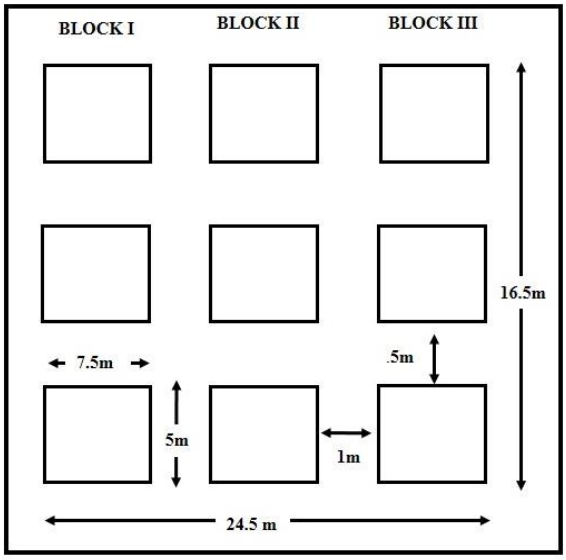
**Conclusion and recommendation**

Generally, this study was conducted to evaluate the efficacy of carrageenan and fermented goat manure as liquid fertilizer supplemented with the recommended rate of fertilizer on glutinous corn production. Specifically, it was conducted to evaluate the growth and yield of glutinous corn with addition of fermented goat manure and carrageenan as a liquid fertilizer combined with the recommended rate of fertilizer, Identify the optimum combination fermented goat manure and carrageenan as a liquid fertilizer supplemented to the recommended rate of fertilizer effective for corn production and evaluate which of the combination of fermented goat manure and carrageenan as a liquid fertilizer supplemented to the recommended rate of fertilizer has the highest return on investment. The study was conducted at the Cagayan State University – Gonzaga, Cagayan from January 2018 to May 2018. The different treatments used were $T_1$ – Control, $T_2$ – Carrageenan, and $T_3$ – Fermented Goat Manure. The experiment was laid out in Randomized Complete Block Design with three replications. The result of the study are summarized as follows: 1.) The height of plants at 30 and 60 days after emergence was affected by the application of carrageenan and fermented goat manure. However, it was observed that the application of fermented goat manure obtained the tallest plants at 30 days after emergence; 2.) Longest husked and unhusked ear were obtained by the plants applied with fermented goat manure; 3.) The diameter of the husked and unhusked ear was affected by the application of carrageenan and fermented goat manure; 4.) Heaviest husked and unhusked ear was obtained by the application of fermented goat manure; 5.) The application of fermented goat manure per hectare had the highest husked and unhusked ear yield per sampling area; 6). Highest return on investment was obtained by the application of fermented goat manure per hectare with 400.92 percent.

The application of carrageenan and fermented goat manure produced the tallest plants, longest ear length and widest diameter of ear yield per sampling area. However, the application of fermented goat manure produced the heaviest ear and highest computed yield per hectare as well as it obtained the highest return on investment with 400.92 percent.

The application of carrageenan and fermented goat manure was strongly recommended because it obtained the highest green corn ear yield and highest return on investment. The same study will be conducted during the dry and wet season.

Experimental Layout Randomized Complete Block Design (RCBD)




**Legend**

Treatments

T1 – Control + Recommended Rate

T2 – Recommended Rate + 22.5ml Carrageenan and 1.2 L of water

T3 – Recommended Rate + 22.5ml Fermented Goat Manure and 1.2 L of water

Total Area . . . . . 404.25 square meters

Plot Size . . . . . .. . 5m x 7.5m

Distance between Plots . 0.5m

Distance between Blocks .1m

**Procedure in Making Fermented Goat Manure**

*Materials Needed*

| | |
|---|---|
| 1 kg fresh goat manure | Manila paper |
| 2 kg of water | String/ garter |
| Container or pail | Sack/ net |

**Procedure**

1. Collect fresh goat manure from goat barn every morning to assure it is fresh.
2. Put the collected manure into the sack and tie it properly.
3. Add water in the pail together with the collected manure.
4. Cover the pail with Manila paper and tie it with a garter to secure.
5. The pail in a cool and dry place. Keep away from sunlight and rain. Leave it there for 15 days.

After 15 days, separate the liquid from the solids. The liquid is the goat manure tea.

**Notes**

The ratio of the fresh goat manure and water is 1:2kg. 2part of water in every 1 part of fresh goat manure.

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