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# Performance of Baby's Breath (*Gypsophila paniculata*) as Influenced by Different Concoctions and Rates of Inorganic Fertilizers

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Abstract

Baby's breath has value as an ornamental in floriculture and is a major export for several countries. To maintain the production of baby's breath, proper nutrient management by application of nutrient sources favorable for ornamental flowering plants is advised. Hence, this study was conducted to assess the performance of a baby's breath in terms of growth, yield, and return on investment as influenced by different concoctions and rates of inorganic fertilizers. An area of 100.80 $m^2$ was laid out into five blocks adopting the 4 × 4 factorial experiment in Randomized Complete Block Design (RCBD). The treatments were designated as follows: For factor A (concoction) – $C_0$-without concoction; $C_1$-fermented plant juice at 2 v/v%; $C_2$-fermented fruit juice at 2 v/v%; $C_3$-calcium phosphate at 5 v/v%, and factor B (inorganic fertilizer) – $F_0$-without fertilizer; $F_1$-90-60-60 N, $P_2O_5$, $K_2O$ $ha^{-1}$; $F_2$-45-30-30 N, $P_2O_5$, $K_2O$ $ha^{-1}$; $F_3$-25-15-15 N, $P_2O_5$, $K_2O$ $ha^{-1}$. The concoctions and the inorganic fertilizer at 25-15-15 N, $P_2O_5$, $K_2O$ $ha^{-1}$ both gave a significant plant height to the baby's breath at 28 DAP. The calcium phosphate at 5 v/v% plus 25-15-15 N, $P_2O_5$, $K_2O$ $ha^{-1}$ ($T_{15}$) was the best combination for improving the plant height of the baby's breath at 28 DAP, however, all fertilizers affected the baby's breath similarly to no fertilizer applied in terms of the production of suckers, flowers, and marketable flowers for three months of raising. Thus, the monetary return was negative.

**Keywords:** Concoctions, Growth and yield, *Gypsophila paniculata*, Inorganic fertilizer, Nutrient management, Organic foliar spray, Ornamental crop production.

## INTRODUCTION

Baby's breath (*Gypsophila paniculata*) in the family Caryophyllaceae is a perennial herb native to central and eastern Europe and central and Eastern Asia but is widely cultivated and distributed as an ornamental and cut flower plant all over the world (Korkmaz and Ozcelik, 2011). *Gypsophila* means 'gypsum loving' noting its habitat preference for calcareous soils. *Paniculata* refers to the inflorescence of this species, a pyramidal loosely branched flower cluster. The common name 'baby's breath' comes from the cloud-like appearance of the plant when this bears flowers (Charters, 2015).

Baby's breath has value as an ornamental in floriculture and is a major export for several countries (Vahoniya *et al*., 2018). It contributes to the floriculture that production has continuously increased over the last 20 years with average yearly growth of 6 to 9% and is considered an important sector for self-employment (Chawla *et al*., 2016). For the successful production of floricultural crops, proper soil and nutrient management are necessary for adequate plant nutrition (Atal *et al*., 2021). Floricultural crops need an adequate amount of nutrients for proper growth and flowering. The deficiency of nutrient elements can adversely affect the plant growth and development of flowers (Atal *et al*., 2021). The dearth of plant nutrients causes different alterations in the physiological and biochemical processes within the plant cell resulting in a reduction in growth and delay in development (Saxena and Diwakar, 2012).

There are a lot of organic fertilizers that can be applied to a baby's breath in combination with N, P and K, fertilizers (Islam *et al.,* 2012). Organic concoctions or bio-organic inputs [e.g. fermented plant juice (FPJ), fermented fruit juice (FFJ), and calcium phosphate or water-soluble calcium] have been found that helps maintain vigor in plants and resistance against pests, improve soil fertility and population of beneficial microorganisms, and induce flowering of plants. These concoctions can be applied as foliar spray or soil drench (DA-ATI, 2006; BDA, 2015). Foliar spray is proven to be the best way of nutrient application to crops (Biñas and Cagasan, 2018).

Foliar-applied nutrients are lipid-insoluble ions and, therefore, enter the plant metabolism following an aqueous pathway through a leaf's cuticular wax or the stomata. The ultimate parameter controlling the penetration of foliar-applied substances is the intrinsic permeability of the leaf surface. This is a passive process driven by concentration gradients (Fernandez and Eichert, 2009) and stimulated by light and soil moisture (Fageria *et al*., 2009).

Since the study on the effect of different concoctions or fermented foliar fertilizer integrated with inorganic fertilizer application on the performance of baby's breath was infrequent, hence, this study.

## MATERIALS AND METHODS

### Experimental layout and treatments

The 100.80 $m^2$ field experiment was laid out into five blocks adopting the 4 x 4 factorial experiment in Randomized Complete Block Design (RCBD). There were 16 plots in each block and a total of 80 plots in the experiment. The distance between plots and blocks was 30 cm and 50 cm, respectively. The study used 12 plants in each treatment (Fig. 1). The experimental area was laid out based on the following factors and treatment combinations:

| **Factor A. Concoctions** | **Factor B. Rate inorganic fertilizers** |
|---|---|
| $C_0$ - no concoctions | $F_0$ - no fertilizers |
| $C_1$ - fermented plant juice | $F_1$ - 90-60-60 (N-$P_2O_5$-$K_2O$) |
| $C_2$ - fermented fruit juice | $F_2$ - 45-30-30 (N-$P_2O_5$-$K_2O$) |
| $C_3$ - calcium phosphate | $F_3$ - 25-15-15 (N-$P_2O_5$-$K_2O$) |

The treatment combinations were as follows:

$T_0$ - ($C_0F_0$) - control
$T_1$ - ($C_0F_1$) - no concoctions, 90-60-60 (N-$P_2O_5$-$K_2O$)
$T_2$ - ($C_0F_2$) - no concoctions, 45-30-30 (N-$P_2O_5$-$K_2O$)
$T_3$ - ($C_0F_3$) - no concoctions, 25-15-15 (N-$P_2O_5$-$K_2O$)
$T_4$ - ($C_1F_0$) - fermented plant juice (2 v/v%), no fertilizer
$T_5$ - ($C_1F_1$) - fermented plant juice (2 v/v%), 90-60-60 (N-$P_2O_5$-$K_2O$)
$T_6$ - ($C_1F_2$) - fermented plant juice (2 v/v%), 45-30-30 (N-$P_2O_5$-$K_2O$)
$T_7$ - ($C_1F_3$) - fermented plant juice (2 v/v%), 25-15-15 (N-$P_2O_5$-$K_2O$)
$T_8$ - ($C_2F_0$) - fermented fruit juice (2 v/v%), no fertilizer
$T_9$ - ($C_2F_1$) - fermented fruit juice (2 v/v%), 90-60-60 (N-$P_2O_5$-$K_2O$)
$T_{10}$ - ($C_2F_2$) - fermented fruit juice (2 v/v%), 45-30-30 (N-$P_2O_5$-$K_2O$)
$T_{11}$ - ($C_2F_3$) - fermented fruit juice (2 v/v%), 25-15-15 (N-$P_2O_5$-$K_2O$)
$T_{12}$ - ($C_3F_0$) - calcium phosphate (5 v/v%), no fertilizer
$T_{13}$ - ($C_3F_1$) - calcium phosphate (5 v/v%), 90-60-60 (N-$P_2O_5$-$K_2O$)
$T_{14}$ - ($C_3F_2$) - calcium phosphate (5 v/v%), 45-30-30 (N-$P_2O_5$-$K_2O$)
$T_{15}$ - ($C_3F_3$) - calcium phosphate (5 v/v%), 25-15-15 (N-$P_2O_5$-$K_2O$)

**Garden bed preparation**

Five raised garden beds, at 12 m × 1 m, was created. The garden bed was twelve square meters. The soil was pulverized using a hoe and garden trowel.

**Preparation of the concoctions**

The procedures for preparing different concoctions or bio-organic inputs outlined by DA-ATI (2006) and BDA (2015) were followed.

**Planting**

Right after acquiring the planting materials, planting was done at a row and hill spacing of 25 cm x 20 cm, and the newly planted baby's breaths were watered immediately and regularly. Planting was done late in the afternoon.

**Application of inorganic fertilizers and organic concoctions**

The appropriate amount of fertilizer materials were dissolved in water and fertilizer solution was applied as a soil drench. The first application was applied as a starter solution or basal application and the second or last application was at 28 days after planting.

The following dilutions were used in a foliar application of different concoctions; 2 v/v% or 20 ml of fermented plant juice or fermented fruit juice for 1 liter of water and 5 v/v% or 50 ml of calcium phosphate in 1 liter of water. The dilutions used were adopted from the farmer's guide outlined by DA-ATI (2006). The first application was 7 days after planting and was repeated every 7 days.

**Data gathered**

Data on plant height, number of suckers, flowers, and marketable flowers were gathered at 14, 28, 42, 56, 70, and 84 days after planting. The methods for gathering the data are shown below.

a. Plant height (cm) per plant - This was determined by measuring the height of the 12 representative plants from the base to the tip of the longest part of the plant using a meter stick.
b. Number of suckers per plant - The number of suckers was determined by manually counting the suckers in each representative plant.
c. Number of flowers per plant - This was determined by counting the number of flowers in each representative plant.

d. Number of marketable flowers per plant - This was determined by counting the number of marketable flowers per plant. The marketable flowers were determined using the criteria below:

i. Well-developed and large inflorescence or flower cluster,

ii. With less than 10 percent damage from pests and diseases.

Fig.1. The experimented baby's breath.

## Statistical analysis

Analysis of variance was performed for each parameter mentioned above, and treatment means with significant differences were compared using Tukey's Honestly Significant Difference (HSD) Test. Statistical analyses were done using the Statistical Tool for Agricultural Research (STAR Version 2.0.1).

## Actual itemized expenses

The actual itemized expenses were obtained by adding all the expenses incurred in each treatment during the conduct of the study which includes the supplies, materials, and labor costs.

## Cost and return analysis

The gross income in each treatment was obtained by multiplying the weight of marketable flowers by the price based on the current market price per kilogram of baby's breaths. The net income was then computed as the gross income less the expenses. The percentage return on capital (ROC) was computed by dividing the net income by the total expenses multiplied by 100 as shown in the formula below:

$$\text{ROC} = \frac{\text{Net income}}{\text{Total expenses}} \times 100$$

Fig. 2. The harvested baby's breath.

## RESULTS AND DISCUSSION

### Plant height

The plant height (cm) of the baby's breath as applied with different concoctions and the rates of inorganic fertilizers is presented in table 1 and Fig. 2. In factor A, the result revealed that among the different concoctions, the baby's breath that had received no concoctions ($C_0$) showed the shortest plant height (10.47 cm) at 28 days after planting compared to the treated plants. Furthermore, in factor B, baby's breath in $F_3$ (applied with inorganic fertilizer at 25-15-15 N, $P_2O_5$,$K_2O$) obtained the highest plant height of 11.26 cm compared to baby's breath in $F_1$ (applied with inorganic fertilizer at 90-60-60 N,$P_2O_5$,$K_2O$) and $F_0$ (no inorganic fertilizer applied). This implies that the application of organic concoctions and inorganic fertilizer at a rate of 25-15-15 (N,$P_2O_5$,$K_2O$) helps improve the growth of the baby's breath based on the increased plant height. This result agreed with the claim that fermented plant juice helps maintain vigor in plants and resistance against pests, thus this contributed to the development of plant height (DA-ATI, 2006). This might also be due to enzymes and growth hormones present in concoction products that could enhance the plant growth most especially the plant height of the crop (BDA, 2015). Moreover, concoction products were also found a good source of potassium which can speed up plant absorption. In the case of calphos, Radha and Karthikeyan (2019) reported that it increases the nutritional intake of plants. Several researchers revealed that the powdered eggshell used in calphos enhances the growth of many crops.

However, as the days increase, all treatments became similar to each other in terms of plant height. It might be due to the nutrients released by all treatments that already affect the plant height growth of the baby's breath. It only indicates that the best day in determining the difference between the plant height of the baby's breath is at 28 days after planting in the consideration of the use of these treatments.

Thus, this revealed that the baby's breath was affected by the fertilizers at 28 DAP only wherein the baby's breath in $T_{15}$ (applied with calcium phosphate at 5 v/v% plus 25-15-15 N-$P_2O_5$-$K_2O$) obtained the highest plant height with a mean of 11.54 cm compared to the significantly lowest plant height of 10.31 cm and 10.21 cm in $T_0$ (control) and $T_1$ (no concoctions plus 90-60-60 N-$P_2O_5$-$K_2O$), respectively.

Table 1. Summary of the plant height (cm) of baby's breath applied with different concoctions and rate of inorganic fertilizers.

| | Days after planting | | | | | |
|---|---|---|---|---|---|---|
| | **14** | **28** | **42** | **56** | **70** | 84 |
| **Factor A - Concoctions** | | | | | | |
| $C_0$ | 8.94 | 10.47$^{b}$ | 13.59 | 16.95 | 19.45 | 21.11 |
| $C_1$ | 9.35 | 11.01$^{a}$ | 13.14 | 17.44 | 19.74 | 21.37 |
| $C_2$ | 9.13 | 10.97$^{a}$ | 13.17 | 16.82 | 19.03 | 20.75 |
| $C_3$ | 9.16 | 11.30$^{a}$ | 13.41 | 16.89 | 19.18 | 20.95 |
| p-value | 0.1775$^{ns}$ | 0.0001** | 0.7283$^{ns}$ | 0.2843$^{ns}$ | 0.1105$^{ns}$ | 0.1264$^{ns}$ |
| **Factor B – Rate of inorganic fertilizer** | | | | | | |
| $F_0$ | 9.05 | 10.72$^{b}$ | 13.05 | 16.96 | 19.32 | 20.89 |
| $F_1$ | 9.02 | 10.78$^{b}$ | 13.47 | 16.89 | 19.02 | 20.82 |
| $F_2$ | 9.19 | 11.00$^{ab}$ | 13.39 | 17.31 | 19.48 | 21.00 |
| $F_3$ | 9.32 | 11.26$^{a}$ | 13.40 | 16.93 | 19.58 | 21.47 |
| p-value | 0.3187$^{ns}$ | 0.0118* | 0.7917$^{ns}$ | 0.6084$^{ns}$ | 0.2907$^{ns}$ | 0.0693$^{ns}$ |
| **Interaction of factor A and factor B** | | | | | | |
| **Treatment** | **Days after planting** | | | | | |
| | **14** | **28** | **42** | **56** | **70** | **84** |
| $T_0$ | 8.79 | 10.31$^{b}$ | 13.26 | 16.92 | 19.55 | 20.89 |
| $T_1$ | 8.74 | 10.21$^{b}$ | 14.99 | 16.80 | 18.36 | 20.70 |
| $T_2$ | 8.83 | 10.34$^{ab}$ | 12.64 | 17.49 | 19.79 | 21.08 |
| $T_3$ | 9.41 | 11.02$^{ab}$ | 13.47 | 16.57 | 20.09 | 21.77 |
| $T_4$ | 9.25 | 10.70$^{ab}$ | 12.84 | 17.18 | 19.51 | 20.86 |
| $T_5$ | 9.30 | 11.02$^{ab}$ | 13.22 | 17.25 | 19.83 | 21.27 |
| $T_6$ | 9.47 | 11.30$^{ab}$ | 13.59 | 17.43 | 19.45 | 21.32 |
| $T_7$ | 9.37 | 11.04$^{ab}$ | 12.90 | 17.88 | 20.18 | 22.02 |
| $T_8$ | 9.18 | 10.61$^{ab}$ | 12.64 | 16.52 | 19.07 | 20.74 |
| $T_9$ | 8.92 | 10.56$^{ab}$ | 12.44 | 16.78 | 18.89 | 20.68 |
| $T_{10}$ | 9.22 | 11.28$^{ab}$ | 14.10 | 17.27 | 19.22 | 20.60 |
| $T_{11}$ | 9.18 | 11.43$^{ab}$ | 13.52 | 16.72 | 18.94 | 20.96 |
| $T_{12}$ | 9.00 | 11.27$^{ab}$ | 13.46 | 17.22 | 19.16 | 21.06 |
| $T_{13}$ | 9.09 | 11.35$^{ab}$ | 13.22 | 16.72 | 18.99 | 20.63 |
| $T_{14}$ | 9.24 | 11.06$^{ab}$ | 13.24 | 17.04 | 19.47 | 20.98 |
| $T_{15}$ | 9.33 | 11.54$^{a}$ | 13.72 | 16.57 | 19.09 | 21.14 |
| p-value | 0.6800$^{ns}$ | 0.0009** | 0.5228$^{ns}$ | 0.8411$^{ns}$ | 0.2839$^{ns}$ | 0.3350$^{ns}$ |
| CV (%) | 6.23 | 4.96 | 10.79 | 6.45 | 5.01 | 3.95 |

In each column, means with the similar letters are not significantly different at 5% level of probability using HSD test. $^{*}$, $^{**}$ and $^{ns}$: Significant at $P < 0.05$, $P < 0.01$ and insignificant, respectively.

## Number of suckers

The number of suckers of baby's breath as applied with different concoctions and the rates of inorganic fertilizers is presented in table 2. Results revealed that both concoctions and inorganic fertilizers showed a similar effect to untreated plants. This might be due to the fertility of the soil and the favorable condition for the growth of the baby's breath during the conduct

of the study. Likewise, the number of suckers of baby's breath was statistically similar among all treatments regardless of the combinations. This result suggests that the number of suckers is not affected by different concoctions and the rates of inorganic fertilizers except at 84 days, however still statistically similar to each other.

Table 2. Summary of the number of suckers of baby's breath applied with different concoctions and rates of inorganic fertilizers.

| | Days after planting | | | | | |
|---|---|---|---|---|---|---|
| | **14** | **28** | **42** | **56** | **70** | **84** |
| **Factor A – Concoctions** | | | | | | |
| $C_0$ | 2.55 | 4.95 | 6.58 | 6.73 | 7.04 | 8.64 |
| $C_1$ | 2.66 | 5.20 | 6.83 | 6.83 | 7.32 | 9.09 |
| $C_2$ | 2.75 | 5.33 | 6.87 | 7.04 | 7.57 | 9.03 |
| $C_3$ | 2.62 | 4.94 | 6.90 | 7.11 | 7.79 | 9.30 |
| p-value | $0.3740^{ns}$ | $0.2633^{ns}$ | $0.1649^{ns}$ | $0.6298^{ns}$ | $0.3860^{ns}$ | $0.0525^{ns}$ |
| **Factor B – Rate of inorganic fertilizer** | | | | | | |
| $F_0$ | 2.78 | 5.12 | 6.86 | 7.21 | 7.45 | 9.07 |
| $F_1$ | 2.65 | 5.01 | 6.66 | 7.33 | 7.75 | 9.10 |
| $F_2$ | 2.60 | 5.28 | 6.74 | 6.60 | 6.94 | 8.78 |
| $F_3$ | 2.55 | 5.02 | 6.92 | 6.56 | 7.58 | 9.10 |
| p-value | $0.3740^{ns}$ | $0.4957^{ns}$ | $0.9289^{ns}$ | $0.0714^{ns}$ | $0.0719^{ns}$ | $0.4822^{ns}$ |
| **Interaction of factor A and factor B** | | | | | | |
| **Treatment** | Days after planting | | | | | |
| | **14** | **28** | **42** | **56** | **70** | **84** |
| $T_0$ | 2.88 | 4.82 | 6.50 | 7.62 | 7.75 | $8.77^{a}$ |
| $T_1$ | 2.35 | 4.65 | 6.73 | 6.57 | 6.50 | $8.13^{a}$ |
| $T_2$ | 2.52 | 5.00 | 6.70 | 6.68 | 6.40 | $8.22^{a}$ |
| $T_3$ | 2.43 | 5.35 | 6.38 | 6.05 | 7.50 | $9.43^{a}$ |
| $T_4$ | 2.68 | 5.30 | 6.87 | 7.40 | 7.23 | $8.40^{a}$ |
| $T_5$ | 2.85 | 5.05 | 6.90 | 7.57 | 8.00 | $9.72^{a}$ |
| $T_6$ | 2.37 | 5.40 | 6.70 | 6.03 | 6.45 | $8.90^{a}$ |
| $T_7$ | 2.75 | 5.07 | 6.85 | 6.30 | 7.58 | $9.35^{a}$ |
| $T_8$ | 2.92 | 5.38 | 7.22 | 6.70 | 7.33 | $9.56^{a}$ |
| $T_9$ | 2.88 | 5.40 | 6.28 | 7.60 | 7.72 | $9.35^{a}$ |
| $T_{10}$ | 2.95 | 5.47 | 6.65 | 6.30 | 7.35 | $8.66^{a}$ |
| $T_{11}$ | 2.27 | 5.08 | 7.33 | 7.57 | 7.88 | $8.55^{a}$ |
| $T_{12}$ | 2.63 | 4.98 | 6.85 | 7.13 | 7.48 | $9.53^{a}$ |
| $T_{13}$ | 2.52 | 4.95 | 6.72 | 7.58 | 8.77 | $9.22^{a}$ |
| $T_{14}$ | 2.57 | 5.23 | 6.93 | 7.40 | 7.57 | $9.37^{a}$ |
| $T_{15}$ | 2.77 | 4.58 | 7.12 | 6.32 | 7.35 | $9.07^{a}$ |
| p-value | $0.2453^{ns}$ | $0.6411^{ns}$ | $0.8811^{ns}$ | $0.3464^{ns}$ | $0.1352^{ns}$ | 0.0408* |
| CV (%) | 16.63 | 13.07 | 12.12 | 18.57 | 14.89 | 9.09 |

In each column, means with the similar letters are not significantly different at 5% level of probability using HSD test. $^{*}$, $^{**}$ and $^{ns}$: Significant at $P < 0.05$, $P < 0.01$ and insignificant, respectively.

## Number of flowers

The number of flowers of the baby's breath as applied with different concoctions and the rates of inorganic fertilizers is presented in table 3. Results revealed that the number of flowers of the baby's breath was not significantly affected by the application of different concoctions and rates of inorganic fertilizers. This was probably due to the short period of the study and the

plants did not reach the peak of flower production, hence the effect of the application of organic concoctions and inorganic fertilizers at different rates could not be seen. Therefore there are no significant effects between factor A and factor B. However, DA-ATI, 2006 reported that the calphos with the use of eggshell and kuhol shell as well as the concoctions + inorganic fertilizers induce flowering in ornamental plants. There is a tendency that the flowering performance of the baby's breath will be significant for those applied with the above-mentioned fertilizers if the study reached four months and beyond. The peak of flowering production of a baby's breath is in the four to eight months (www.ornamentalgardening.com) whereas the duration of the study is just three months.

Table 3. Summary of the number of flowers of baby's breath applied with different concoctions and rates of inorganic fertilizers.

| | Days after planting | |
|---|---|---|
| | **70** | **84** |
| **Factor A - Concoctions** | | |
| $C_0$ - control | 0.11 | 0.34 |
| $C_1$ - fermented plant juice | 0.13 | 0.30 |
| $C_2$ - fermented fruit juice | 0.11 | 0.32 |
| $C_3$ - calcium phosphate | 0.13 | 0.28 |
| p-value | $0.9859^{ns}$ | $0.9684^{ns}$ |
| **Factor B – Rate of inorganic fertilizer** | | |
| $F_0$ - control | 0.10 | 0.31 |
| $F_1$ - 90-60-60 (NPK) | 0.17 | 0.24 |
| $F_2$ - 45-30-30 (NPK) | 0.10 | 0.38 |
| $F_3$ - 25-15-15 (NPK) | 0.11 | 0.30 |
| p-value | $0.7822^{ns}$ | $0.7726^{ns}$ |
| **Interaction of factor A and factor B** | | |
| | **Days after planting** | |
| | **70** | **84** |
| $T_0$ | 0.15 | 0.52 |
| $T_1$ | 0.07 | 0.03 |
| $T_2$ | 0.05 | 0.65 |
| $T_3$ | 0.17 | 0.15 |
| $T_4$ | 0.00 | 0.32 |
| $T_5$ | 0.37 | 0.43 |
| $T_6$ | 0.10 | 0.23 |
| $T_7$ | 0.07 | 0.20 |
| $T_8$ | 0.10 | 0.27 |
| $T_9$ | 0.25 | 0.45 |
| $T_{10}$ | 0.03 | 0.17 |
| $T_{11}$ | 0.07 | 0.38 |
| $T_{12}$ | 0.13 | 0.15 |
| $T_{13}$ | 0.00 | 0.03 |
| $T_{14}$ | 0.23 | 0.45 |
| $T_{15}$ | 0.15 | 0.47 |
| p-value | $0.7125^{ns}$ | $0.5052^{ns}$ |
| CV (%) | 208.71 | 134.11 |

In each column, means with the similar letters are not significantly different at 5% level of probability using HSD test. $^{ns}$: insignificant.

## Marketable flowers

The number of marketable flowers of baby's breath as applied with different concoctions and the rates of inorganic fertilizers is shown in table 4. The result revealed that the number of marketable flowers of the baby's breath was not affected by different concoctions and rates of inorganic fertilizers. This can be attributed to the number of flowers which are also not significantly different from each other among treatments. comparable among all treatments. Therefore there are no interaction effects between factor A and factor B.

Table 4. Summary of the number marketable flowers of baby's breath applied with different concoctions and rate of inorganic fertilizers.

| | Day after planting | |
|---|---|---|
| | **70** | **84** |
| **Factor A - Concoctions** | | |
| $C_0$ - control | 1.10 | 3.45 |
| $C_1$ - fermented plant juice | 1.35 | 3.10 |
| $C_2$ - fermented fruit juice | 1.20 | 3.35 |
| $C_3$ - calcium phosphate | 1.35 | 3.00 |
| p-value | 0.9865$^{ns}$ | 0.9853$^{ns}$ |
| **Factor B – Rate of inorganic fertilizer** | | |
| $F_0$ - control | 1.05 | 3.25 |
| $F_1$ - 90-60-60 (NPK) | 1.75 | 2.55 |
| $F_2$ - 45-30-30 (NPK) | 1.10 | 4.00 |
| $F_3$ - 25-15-15 (NPK) | 1.10 | 3.10 |
| p-value | 0.7918$^{ns}$ | 0.7532$^{ns}$ |
| **Interaction of factor A and factor B** | | |
| | **Days after planting** | |
| | 70 | 84 |
| $T_0$ | 1.6 | 5.2 |
| $T_1$ | 0.6 | 0.4 |
| $T_2$ | 0.6 | 6.6 |
| $T_3$ | 1.6 | 1.6 |
| $T_4$ | 0 | 3.2 |
| $T_5$ | 3.8 | 4.8 |
| $T_6$ | 1 | 2.4 |
| $T_7$ | 0.6 | 2 |
| $T_8$ | 1.2 | 3 |
| $T_9$ | 2.6 | 4.6 |
| $T_{10}$ | 0.4 | 1.8 |
| $T_{11}$ | 0.6 | 4 |
| $T_{12}$ | 1.4 | 1.6 |
| $T_{13}$ | 0 | 0.4 |
| $T_{14}$ | 2.4 | 5.2 |
| $T_{15}$ | 1.6 | 4.8 |
| p-value | 0.6635$^{ns}$ | 0.4933$^{ns}$ |
| CV (%) | 203.09 | 131.04 |

In each column, means with the similar letters are not significantly different at 5% level of probability using HSD test.
$^{ns}$: insignificant.

## Cost and return analysis

The cost and return analysis is presented in table 5. The assumed price of a baby's breath was 50 pesos per kilogram. The result shows that the production of baby's breath is very unprofitable across all treatments as shown by the incredible deficit in return on capital. The very plausible reason that can be thought of is the short duration of the study resulted in few flowers harvested.

Table 5. Cost and return analysis of the baby's breath as applied with different concoctions and rates of inorganic fertilizers.

| Treatments | Total weight (g) of marketable flowers | Gross income | Net income | Total production cost | ROC (%) |
|---|---|---|---|---|---|
| $T_0$ | 144.5 | 21.68 | (765.83) | 787.50 | (97.25) |
| $T_1$ | 137.0 | 20.55 | (847.25) | 867.80 | (97.63) |
| $T_2$ | 97.0 | 14.55 | (839.35) | 853.90 | (98.30) |
| $T_3$ | 157.5 | 23.63 | (823.66) | 847.29 | (97.21) |
| $T_4$ | 182.0 | 27.30 | (1,001.70) | 1,029.00 | (97.35) |
| $T_5$ | 100.8 | 15.12 | (1,094.18) | 1,109.30 | (98.64) |
| $T_6$ | 257.0 | 38.55 | (1,056.85) | 1,095.40 | (96.48) |
| $T_7$ | 224.5 | 33.68 | (1,055.11) | 1,088.79 | (96.91) |
| $T_8$ | 178.5 | 26.78 | (1,028.48) | 1,055.25 | (97.46) |
| $T_9$ | 188.5 | 28.28 | (1,107.28) | 1,135.55 | (97.51) |
| $T_{10}$ | 163.5 | 24.53 | (1,097.13) | 1,121.65 | (97.81) |
| $T_{11}$ | 232.5 | 34.88 | (1,080.16) | 1,115.04 | (96.87) |
| $T_{12}$ | 61.0 | 9.15 | (992.30) | 1,001.45 | (99.09) |
| $T_{13}$ | 69.5 | 10.43 | (1,071.33) | 1,081.75 | (99.04) |
| $T_{14}$ | 154.2 | 23.13 | (1,044.72) | 1,067.85 | (97.83) |
| $T_{15}$ | 279.5 | 41.93 | (1,019.31) | 1,061.24 | (96.05) |
| Entire Experiment | 2627.5 | 394.13 | (15,924.64) | 16,318.76 | (97.58) |

Current market price = Php 150.00/ kg or Php O.15/ grams

## CONCLUSION AND RECOMMENDATION

The application of both concoctions and the inorganic fertilizer at a rate of 25-15-15 N, $P_2O_5$, $K_2O$ are the bests for improving the plant height of the baby's breath at 28 DAP. The combination of calcium phosphate at 5 v/v% and 25-15-15 N, $P_2O_5$, $K_2O$ significantly enhances the plant height of the baby's breath up to 11.5 cm at 28 DAP. However, the concoctions and inorganic fertilizers regardless of sources and rates, respectively have similar effects to those applied with no fertilizer in terms of the number of suckers, flowers, and marketable flowers.

It is also concluded that the raising of the baby's breath for more or less three months only can result in a negative return on investment. Therefore it is recommended that four months and beyond may be spent using the same treatments for further evaluation of their effects on growth as well as the monetary returns.

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