INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH AND ANALYSIS

ISSN(print): 2643-9840, ISSN(online): 2643-9875

Volume 08 Issue 08 August 2025

DOI: 10.47191/ijmra/v8-i08-38, Impact Factor: 8.266

Page No. 4699-4705

# The Effect of Toss Compost and Npk Phonska Plus Fertilizer Doses (15:15:15) on the Growth and Yield of Rose Balsam (*Impatiens Balsamina* L.)

**I Nyoman Wira Sucipta[1*], I Gede Wijana[2], Ida Ayu Putri Darmawati[3]**

[1,2,3] Master' Degree inDryland Study Program, Faculty of Agriculture, Udayana University, Denpasar, Bali, Indonesia

Jl. P.B. Sudirman, Denpasar, 80234, Bali, Indonesia

**ABSTRACT:** One of the reasons why Rose balsam plants cannot produce optimally is due to poor soil conditions, so it is necessary to add compost to improve soil conditions and increase soil fertility and add NPK fertilizer to increase growth and yield. The purpose of this study was to obtain the effect of the best dose of compost and NPK fertilizer on the growth and yield of water hyacinth flowers. The study was conducted at the BPP, Klungkung District, Bali, for 4 months using a Completely Randomized Design (CRD) with a factorial pattern consisting of 2 factors. The first factor is the dose of compost fertilizer consisting of 4 levels, namely: 0 g/plant as a control, 50 g/plant, 100 g/plant and 150 g/plant. The second factor is the dose of NPK fertilizer consisting of 4 levels, namely: 0 g/plant as a control, 0.5 g/plant, 1 g/plant and 1.5 g/plant. The results of the study showed that the use of a dose of compost fertilizer 150 g/plant significantly affected plant height, flower emergence time, NPK fertilizer dose 1.5 g/plant significantly affected plant height, number of branches, stem diameter, flower emergence time, number of flowers, and total flower weight. The combination of compost fertilizer dose treatment of 150 g/plant with NPK fertilizer dose of 1.5 g/plant is the fastest time for flowers to appear, namely 63.67 DAP, while the highest number of flowers and total flower weight were found in the combination of compost fertilizer dose treatment of 100 g/plant with NPK fertilizer dose of 1.5 g/plant, namely 47 pieces and 44.11 g, respectively.

**KEYWORDS:** Rose balsam plants, compost, NPK fertilizer, growth, yield.

## I. INTRODUCTION

The Rose balsam plants (*Impatiens balsamina* L.) has colorful and varied flowers. Water hyacinth is widely grown due to the high demand for water hyacinth for Hindu worship in Bali. Furthermore, water hyacinth is a viable source of income for farmers, as evidenced by a feasibility analysis showing a ratio of total income to total costs greater than one, namely 2.91 > 1 [1]. The potential demand for water hyacinth is very high, but the soil quality of the land used for cultivation is declining.

Poor soil quality significantly impacts the growth and yield of Rose balsam plants, necessitating proper cultivation practices, including compost fertilization. Compost is made from organic materials such as leaf litter and other organic waste that have undergone decomposition or fermentation and are useful for meeting the nutrient needs of cultivated plants [2] One of the largest sources for composting is organic waste from households and markets. Organic waste generated by the community is a highly beneficial and essential organic material for plants. The collected organic material is then processed at the Local Waste Processing Center (LWPC) to become TOSS compost. The addition of compost can loosen the soil structure and increase soil pores, which in turn facilitates plant root development, thus affecting plant growth [3].

Long-term use of compost can increase land productivity and prevent land degradation. However, common problems faced by organic compost fertilizer are low nutrient content, low solubility, relatively longer time to produce available nutrients that are ready to be absorbed by plants, and plant response to organic fertilizer is not as good as the application of inorganic fertilizers [4]. According to [5] and [6] NPK Phonska Plus fertilizer (15:15:15) is a compound fertilizer containing primary macronutrients needed by plants. [7] in their research found that there is an interaction between the treatment of compost and NPK fertilizer (16:16:16) on the growth of sunflower plants (Heliantus annuus L.) namely at a dose of 30 tons/ha of compost and 400 kg/ha of NPK fertilizer gave the best effect on the growth and yield of sunflower plants (Heliantus annuus L.). In connection with the existing problems, this research is expected to provide information in efforts to determine the appropriate dosage of compost and NPK fertilizer for the growth and yield of Rose balsam plants.

## II. MATERIALS AND METHODS

The research was conducted at the Agricultural Extension Center (BPP) of Klungkung District owned by the Klungkung Regency Agriculture Service with an altitude of 168 m above sea level. The research period was carried out for 4 months. The materials used in this study were Rose balsam seeds sourced directly from farmers' fields, TOSS compost, NPK Phonska Plus fertilizer (15:15:15) and 40x40 polybags. The tools used included hoes, buckets, sifting tools, stationery, notebooks, photo cameras, rulers or meters, vernier calipers, calculators, digital scales, scissors and trays.

This study used a Completely Randomized Design (CRD) with a factorial pattern consisting of 2 factors. The first factor was the compost fertilizer dosage consisting of 4 levels, namely: 0 g/plant as a control, 50 g/plant, 100 g/plant and 150 g/plant. The second factor was the NPK fertilizer dosage consisting of 4 levels, namely: 0 g/plant as a control, 0.5 g/plant, 1 g/plant and 1.5 g/plant. Thus, there were 16 treatments, each of which was repeated 3 times, resulting in 48 experimental plant samples. Observation variables for plant growth and yield included plant height, number of branches, stem diameter, flowering time, number of flowers, and total flower weight. Observation data obtained were analyzed using Analysis of Variance (ANOVA). If a single significant effect was found, a further Least Significant Difference (LSD) test was conducted at a 5% error level. If an interaction was found, a Duncan's Multiple Range Test was conducted at a 5% level.

## III. RESULTS

The effect of TOSS Center compost and NPK Plus (15:15:15) fertilizer dosage treatment on Rose balsam plant growth and yield variables can be seen in Table 1. The results of the analysis show that based on a single factor, compost fertilizer has a significant effect on the variables of plant height and weight and has a very significant effect on the variable of flower emergence time. While based on a single factor, NPK fertilizer has a very significant effect on the variables of plant height, number of branches, stem diameter, flower emergence time, number of flowers and total flower weight. The interaction between the combination treatment of compost and NPK fertilizer that has a significant effect is found in the variables of flower emergence time and number of flowers, while a very significant interaction is found only in the variable of total flower weight.

**Table 3.1. The effect of TOSS compost and NPK Plus (15:15:15) fertilizer on the growth and yield of Rose balsam plants.**

| No. | Variabel | Perlakuan | | K*P |
|---|---|---|---|---|
| | | K | P | |
| 1 | Plant height | * | ** | ns |
| 2 | Number of branches | ns | ** | ns |
| 3 | Stem diameter | ns | ** | ns |
| 4 | Flowering time | ** | ** | * |
| 5 | Number of flowers | ns | ** | * |
| 6 | Total flower weight | ns | ** | ** |

Description: * : Significantly affected (P < 0,05)

**: Very significantly affected (P < 0,01)

### 3.1. Plant Height

The results of the analysis based on a single factor on the compost fertilizer dose treatment (K) showed that in the variable plant height, higher results were shown at the K3 level, namely 69.75 cm and were significantly different from other levels, while the lowest plant height results were at the K1 level, namely 61.67 cm and were not significantly different from K0 and K2. Meanwhile, the NPK fertilizer dose treatment (P) showed higher results at the P3 level, namely 71.25 cm and were significantly different from other levels. while the lowest plant height results were at the P2 level, namely 61.17 cm and were not significantly different from P0 and P1 (Table 2.).

### 3.2. Number of Branches

The results of the analysis based on a single factor on the compost fertilizer dose treatment (K) showed that in the variable number of branches the highest results were shown at the K3 level, namely 6.08 pieces and were not significantly different from other levels, while the lowest number of branches was at the K2 level, namely 5.17 pieces and were not significantly different from others. Meanwhile, in the NPK fertilizer dose treatment (P), the number of branches showed higher results at the P3 level, namely

6.83 pieces which were significantly different from the P2 level and were not significantly different from other levels. while the lowest number of shoots was at the P0 level, namely 4.75 pieces and were not significantly different from others (Table 2.).

### 3.3. Stem Diameter

The results of the analysis based on a single factor on the compost fertilizer dose treatment (K) showed that in the highest stem diameter variable, the results were shown at the K1 level, which was 1.69 cm and was not significantly different from the other levels, while the lowest stem diameter was at the K2 level, which was 1.58 cm and was not significantly different from the others. Meanwhile, in the NPK fertilizer dose treatment (P), the stem diameter showed higher results at the P3 level, which was 1.81 cm and was significantly different from the other levels. while the lowest stem diameter results were at the P0 level, which was 1.54 cm and was not significantly different from P1 and P2. (Table 2.).

**Table 3.2. Treatment of compost and NPK fertilizer doses on plant height, number of branches, and stem diameter**

| Treatment | Observation Variables | | |
|---|---|---|---|
| | Plant height (cm) | Number of branches (pieces) | Stem diameter (cm) |
| K0 | 63,42 b | 6,00 a | 1,68 a |
| K1 | 61,67 b | 5,17 a | 1,61 a |
| K2 | 63,00 b | 5,58 a | 1,58 a |
| $K_3$ | 69,75 a | 6,08 a | 1,69 a |
| BNT 5% | 5,32 | ns | ns |
| P0 | 61,92 b | 4,75 c | 1,54 b |
| P1 | 63,50 b | 5,33 b | 1,63 b |
| P2 | 61,17 b | 5,92 a | 1,58 b |
| $P_3$ | 71,25 a | 6,83 a | 1,81 a |
| BNT 5% | 5,32 | 1,03 | 0,12 |

Description: Numbers followed by the same letter indicate no significant difference based on the 5% BNT test.

### 3.4. Flowering Time

The results of the analysis based on a single factor on the compost fertilizer dose treatment (K) showed that the variable of flower emergence time showed faster results at the K3 level, which was 66 DAP and was significantly different from other levels, while the slowest flower emergence time was at the K0 level, which was 68.33 DAP and was significantly different from the others. Meanwhile, in the NPK fertilizer dose treatment (P), the flower emergence time showed faster results at the P3 level, which was 65.50 DAP and was significantly different from the other levels. while the results of the slowest flower emergence time were at the P0 level, which was 68.17 DAP, which was not significantly different from P1 and significantly different from the others (Table 3.).

### 3.5. Number of Flowers

The results of the analysis based on a single factor on the compost fertilizer dose treatment (K) showed that in the variable number of first flowers the highest results were shown at the K0 level, which was 5.67 pieces and was not significantly different from the other levels, while the lowest number of flowers was at the K1, K2 and K3 levels, which was 5.50 pieces and was not significantly different from the others. Meanwhile, in the NPK fertilizer dose treatment (P), the number of flowers showed higher results at the P3 level, which was 6.33 pieces and was significantly different from the other levels. while the lowest number of flowers was at the P1 level, which was 5.08 pieces and was not significantly different from P0 and P2 (Table 3.).

### 3.6. Total Flower Weight

The results of the analysis based on a single factor on the compost fertilizer dose treatment (K) showed that in the total flower weight variable the highest results were shown at the K3 level, which was 34.24 g and was not significantly different from the other levels, while the lowest total flower weight was at the K1 level, which was 33.04 g and was not significantly different from the others. Meanwhile, in the NPK fertilizer dose treatment (P), the total flower weight showed higher results at the P3 level, which was 38.62 g and was significantly different from the other levels. while the lowest total flower weight results were at the P1 level, which was 29.98 g and was significantly different from P0 and P2 (Table 3.).

**Table 3.3. Treatment of compost and NPK fertilizer doses on flower emergence time, number of flowers, and total flower weight**

| Treatment | Observation Variables | | |
|---|---|---|---|
| | Flowering time (DAP) | Number of flowers (buah) | Total flower weight (g) |
| K0 | 68,33 a | 36,58 a | 33,23 a |
| K1 | 67,33 b | 35,75 a | 33,04 a |
| K2 | 66,75 c | 36,17 a | 33,46 a |
| $K_3$ | 66,00 d | 37,33 a | 34,24 a |
| BNT 5% | 0,53 | ns | ns |
| P0 | 68,17 a | 34,58 b | 32,12 b |
| P1 | 67,83 a | 33,33 b | 29,98 c |
| P2 | 66,92 b | 36,17 b | 33,24 b |
| $P_3$ | 65,50 c | 41,75 a | 38,62 a |
| BNT 5% | 0,53 | 3,07 | 2,89 |

Description: Numbers followed by the same letter indicate no significant difference based on the 5% BNT test.

**3.7. Combination Interaction**

The results of statistical analysis on all growth and yield variables showed an interaction between the single factor treatment of compost (K) and NPK (P) fertilizers on the variable of flower emergence time presented in Table 4. At the P0 treatment level, the fastest flower emergence time was shown by the K3 level, which was 67 DAP, significantly different from the other levels and the lowest was shown by the K0 level, which was 69.67 DAP. At the P1 treatment level, the fastest flower emergence time was shown by the K2 level, which was 67.33 DAP, significantly different from the other levels and the lowest was shown by the K0 level, which was 68.67 DAP. At the P2 treatment level, the fastest flower emergence time was shown by the K3 level, which was 65.67 DAP, significantly different from the other levels and the lowest was shown by the K0 and K1 levels, which were 67.67 DAP. At the P3 treatment level, the fastest flower emergence time was shown by the K3 level, which was 63.67 DAP, significantly different from the other levels and the lowest was shown by the K0 level, which was 67.33 DAP. The fastest flower emergence time was shown by the combination of compost fertilizer treatment with a dose of 150 g/plant and NPK fertilizer with a dose of 1.5 g/plant, which was 63.67 DAP. Meanwhile, the slowest flower emergence time was shown by the combination of compost fertilizer treatment with a control dose of 0 g/plant and NPK fertilizer with a control dose of 0 g/plant, which was 69.67 DAP
(Table 4.)

**Table 3.4. Interaction between the combination of compost (K) and NPK (P) fertilizer treatments on the time of flower emergence**

| Perlakuan | P0 | $P_1$ | $P_2$ | P3 |
|---|---|---|---|---|
| K0 | 69,67 a<br>A | 68,67 b<br>A | 67,67 c<br>A | 67,33 c<br>A |
| K1 | 68,00 a<br>B | 67,67 b<br>B | 67,67 b<br>A | 66,00 c<br>B |
| K2 | 68,00 a<br>B | 67,33 b<br>B | 66,67 c<br>B | 65,00 d<br>C |
| K3 | 67,00 b<br>C | 67,67 a<br>C | 65,67 c<br>C | 63,67 d<br>C |
| BNT 5% | 0,53 | | | |

Description: Capital letters are read vertically, lowercase letters are read horizontally. Numbers followed by the same letter indicate no significant difference based on the 5% BNT test.

The results of statistical analysis on all growth and yield variables showed an interaction between the single factor treatment of compost (K) and NPK (P) fertilizer on the number of flowers variable presented in Table 5. At the P0 treatment level, the highest number of flowers was shown by the K3 level, namely 39.33 pieces, significantly different from other levels and the lowest was shown by the K2 level, namely 30.33 pieces. At the P1 treatment level, the highest number of flowers was shown by the K0 level, namely 34 pieces, significantly different from other levels and the lowest was shown by the K1 level, namely 32.67 pieces. At the P2 treatment level, the highest number of flowers was shown at the K0 level, namely 41 pieces, significantly different from other levels and the lowest was shown by the K2 level, namely 33.67 pieces. At the P3 treatment level, the highest number of flowers was shown by the K2 level, namely 47 pieces, not significantly different from the K1 and K3 levels and the lowest was shown by the K0 level, namely 37.33 pieces. The highest number of flowers was shown by the combination of compost fertilizer at a dose of 100g/plant and NPK fertilizer at a dose of 1.5g/plant, namely 47 flowers. Meanwhile, the lowest number of flowers was shown by the combination of compost fertilizer at a dose of 100g/plant and NPK fertilizer at a control dose of 0g/plant, namely 30.33 flowers.

**Table 3.5. Interaction between the combination of compost (K) and NPK (P) fertilizer treatments on the number of flowers**

| Perlakuan | P0 | $P_1$ | $P_2$ | P3 |
|---|---|---|---|---|
| K0 | 34,00 c<br>B | 34,00 c<br>A | 41,00 a<br>A | 37,33 b<br>C |
| K1 | 34,67 b<br>B | 32,67 b<br>A | 35,00 b<br>B | 40,67 a<br>B |
| K2 | 30,33 c<br>C | 33,67 b<br>A | 33,67 b<br>B | 47,00 a<br>A |
| K3 | 39,33 a<br>A | 33,00 b<br>A | 35,00 b<br>B | 42,00 a<br>B |
| BNT 5% | 3,07 | | | |

Description: Capital letters are read vertically, lowercase letters are read horizontally. Numbers followed by the same letter indicate no significant difference based on the 5% BNT test.

The results of statistical analysis on all plant growth variables showed an interaction between the single factor treatment of compost fertilizer (K) and NPK fertilizer (P) on the total flower weight variable presented in Table 6. At the P0 treatment level, the highest total flower weight was shown by the K3 level, namely 36.50, which was not significantly different from the K1 level and significantly different from K0 and K2, while the lowest was shown at the K2 level, namely 27.31 g. At the P1 treatment level, the highest total flower weight was shown by the K2 level, namely 30.97 g, which was significantly different from the other levels, and the lowest was shown at the K0 level, namely 29.34 g. At the P2 treatment level, the highest total flower weight was shown at the K0 level, namely 38.37 g, which was significantly different from the other levels, and the lowest was shown at the K2 level, namely 31.43 g. At the P3 treatment level, the highest number of flowers was shown by the K2 level, which was 44.11 g, which was not significantly different from the K3 level and significantly different from the K0 and K1 levels, while the lowest was shown by the K0 level, which was 33.53 g. The highest total flower weight was shown by the combination of compost fertilizer treatment with a dose of 100 g/plant and NPK fertilizer with a dose of 1.5 g/plant, which was 44.11 g. While the lowest number of flowers was shown by the combination of compost fertilizer treatment with a dose of 100 g/plant and NPK fertilizer with a control dose of 0 g/plant, which was 27.31 g.

**Table 3.6. Interaction between the combination of compost (K) and NPK (P) fertilizer treatments on total flower weight**

| Perlakuan | P0 | $P_1$ | $P_2$ | P3 |
|---|---|---|---|---|
| K0 | 31,67 b<br>B | 29,34 c<br>A | 38,37 a<br>A | 33,53 b<br>C |
| K1 | 33,02 b<br>B | 30,24 b<br>A | 31,45 b<br>B | 37,45 a<br>B |
| K2 | 27,31 c<br>C | 30,97 b<br>A | 31,43 b<br>B | 44,11 a<br>A |

| | | | | |
|---|---|---|---|---|
| K3 | 36,50 b<br>A | 29,36 c<br>A | 31,69 c<br>B | 39,40 a<br>B |
| BNT 5% | 2,89 | | | |

Description: Capital letters are read vertically, lowercase letters are read horizontally. Numbers followed by the same letter indicate no significant difference based on the 5% BNT test.

**IV. DISCUSSION**

The results of the 5% BNT test of compost fertilizer treatment on Rose balsam plant growth variables including plant height, number of leaves, number of branches, and stem diameter showed that the K3 treatment level on average gave higher values compared to other treatment levels, respectively 69.75 cm; 6.08 pieces and 1.69 cm. The K3 treatment level, namely the compost fertilizer treatment with a dose of 150 g/plant, had a significant effect on plant height growth, this is in accordance with [8] research which stated that the compost fertilizer dose had a significant effect on plant height growth. The best compost fertilizer dose treatment for Rose balsam plant height growth was 150 g/plant. The high nitrogen (N) nutrient content in compost fertilizer affects plant height growth, because nitrogen plays an important role in the vegetative growth period and protein formation, this is in accordance with the statement of [9], that nitrogen elements play an important role in the formation of green leaves in the process of photosynthesis, forming proteins, fats and other organic compounds.

The results of the 5% BNT compost fertilizer test on Rose balsam plant yield variables including flower emergence time, number of flowers and total flower weight showed that the K3 treatment level on average gave higher values compared to other treatment levels, respectively 66 DAP; 37.33 pieces and 34.24 g. The K3 treatment level, namely the compost fertilizer treatment with a dose of 150 g/plant, had a very significant effect on the flower emergence time. The best compost fertilizer dose treatment for the results of the flower emergence time of Rose balsam plants was 150 g/plant. The high nutrient content of phosphorus (P) and potassium (K) contained in the compost fertilizer affected the results of the flower emergence time, because phosphorus and potassium play an important role in the generative period. The P nutrient element functions to stimulate root growth, while the K nutrient element plays a role in the activity of cell division, the assimilation process and accelerates the flowering process [10].

The results of the 5% BNT test of NPK fertilizer treatment on growth variables including plant height, number of branches, and stem diameter showed that the P3 treatment level gave an average higher value compared to other treatment levels, respectively 71.25 cm; 6.83 pieces and 1.81 cm. The P3 treatment level, namely the NPK fertilizer treatment with a dose of 1.5 g/plant, had a very significant effect on the growth of plant height, number of branches and stem diameter. If the dose of NPK fertilizer given increased, plant growth also tended to increase, so that the best dose of NPK fertilizer was 1.5 g/plant. The N element plays an important role in the formation of green leaves which are useful in the process of photosynthesis. The process of photosynthesis is the process of changing inorganic substances into organic substances, namely the change of $CO_2$ and $H_2O$ by green leaf substances with the help of sunlight converted into carbohydrates, oxygen ($O_2$) and energy [11]. The results of photosynthesis are used for plant growth and the formation of plant tissues including the growth of plant height, number of branches, and diameter of plant stems.

The results of the 5% BNT test of NPK fertilizer treatment on yield variables including flower emergence time, number of flowers and total flower weight showed that the P3 treatment level gave an average higher value compared to other treatment levels, respectively 65.50 DAP; 41.75 pieces; 38.62 g. At the P3 treatment level, the NPK fertilizer treatment with a dose of 1.5 g/plant had a significant effect on the dry weight of the flower oven and had a very significant effect on the flower emergence time, number of flowers and total flower weight. If the dose of NPK fertilizer given increased, it would provide a plant yield that tended to increase as well, so that the best dose of NPK fertilizer was 1.5 g/plant to increase plant yield. Phosphorus P nutrients function as a source and transfer of energy in plants. Adenosine diphosphate (ADP) and Adenosine diphosphate (ATP) are highenergy phosphate compounds that control many reactions in plants such as photosynthesis, respiration, protein and amino acid synthesis, and channel nutrients through plant cells [12]. Potassium K nutrients function in plant physiological processes, such as enzyme activity, regulating cell turgor, photosynthesis, channeling photosynthesis results, channeling nutrients and water, regulating stomata, helping starch formation, increasing stem durability and strengthening and improving yield quality [13].

Based on the results of the research on the combination of treatments, there is an interaction between compost and NPK fertilizer treatments that have a significant effect on the time of flower emergence, the number of flowers and the total weight of flowers. The fastest flower emergence time was found in the combination of compost fertilizer treatment with a dose of 150 g/plant and NPK fertilizer with a dose of 1.5 g/plant, namely 63.67 DAP. while the highest number of flowers and total weight of flowers were

found in the combination of compost fertilizer treatment with a dose of 100 g/plant and NPK fertilizer with a dose of 1.5 g/plant, namely 47 pieces and 44.11 g, respectively.

## V. CONCLUSION

1) TOSS compost significantly affected plant height and flowering time. The maximum plant height was 69.75 and the fastest flowering time was 63.67 DAP at a compost dose of 150 g/plant.

2) NPK Phonska Plus fertilizer (15:15:15) significantly affected all growth and yield variables of water hyacinth plants. The total flower weight was heaviest at the best dose of 1.5 g/plant.

3) A significant interaction occurred between flower emergence time, flower number, and total flower weight. A compost fertilizer dose of 100 g/plant + NPK fertilizer of 1.5 g/plant was the best fertilization combination for maximum total flower weight.

## REFERENCES

1) Rahmawati, A, and Hartanti, DAS. 2021. Feasibility analysis of water hyacinth (Impatiens balsamina. L.) farming in Dukuh Klopo Village, Peterongan District, Jombang Regency. Agrosaintifika Journal: Journal of Agricultural Sciences. 3(2). e-ISSN: 2655-6391
2) Alex, S. 2020. Successfully Processing Organic Waste into Organic Fertilizer. Pustaka Baru Press. Yogyakarta.
3) Widodo, KH, and Kusuma, Z, 2018. The Effect of Compost on Soil Physical Properties and Corn Plant Growth in Inceptisols. Journal of Soil and Land Resources 5(2):959-967, e-ISSN: 2549-9793
4) Mardiansyah, 2010. Study on the Potential of MHR Bionutrients Applied to Mustard Greens (Brassica juncea L.). Thesis. Faculty of Mathematics and Natural Sciences, University of Indonesia. Bandung. Unpublished.
5) Widowati, LR. Hartatik, W. Setyorini, D., and Trisnawati, Y. 2022. Organic Fertilizer Made Easily, Yielding Abundant Crops.
6) Ministry of Agriculture, Republic of Indonesia. Bogor.
7) Petrokimia, 2023. https://petrokimia-gesik.com/product/phonska-plus
8) Jaenudin A, Surawinata.J, and Maryuliyanna. 2016. The Effect of a Combination of Compost and NPK (16:16:16) on the Growth and Yield of Sunflower (Hellianthus annuus L.) Plants. AGROSWAGATI Journal 4(2):438
9) Arifin M, Nurhayati, Kurniawan T. 2024. The Effect of NPK Fertilizer and Compost on the Growth and Yield of Shallots (Allium ascalonicum L.) Plants. Floratek Journal 19(1):1-2.
10) Lingga and Marsono. 2009. Fertilizer and Fertilization. Jakarta: PT. Penebar Swadaya.
11) Simamora, J.A., Rauf, A., Marpaung, P., and Jamilah. 2016. Improvement of Paddy Field Soil Chemical Properties Due to the Application of Organic Matter to Watermelon (Citrullus lanatus) Plants. Agroecotechnology Journal. 4(4): 2196-2201.
12) Harjadi. 1989. Fundamentals of Horticulture. Department of Cultivation, Faculty of Agriculture, Bogor Agricultural University. Bogor.
13) Boroomand, N and Grough. 2012. Macroelements Nutrition (NPK) of Medicinal Plants. J Med. Plants Research. 6(12).
14) Hardjowigeno S. 2010. Soil Science. Akademika Pressindo. Jakarta.