INFOKUM
Volume 12 , Number 01, 2024, DOI 10.58471/infokum.v12i01
ESSN 2722-4635 (Online)
https://infor.seaninstitute.org/index.php/infokum

The Combination of Dosages of NPK Fertilizer and Concentration of Rabbit Liquid Organic Fertilizer on Yield And Quality of Cauliflower Plants (*Brassica oleracea* var. *Botrytis* L)

Nora Augustien
Agrotechnology Study Program, Faculty of Agriculture, Veterans National, Development University, East Java, Surabaya, Indonesia

Article Info
Keywords:
Cauliflower,
NPK,
Rabbit POC,
quality,
yield

ABSTRACT
Cauliflower (Brassica oleracea var. Botrytis L.) is a seasonal crop with high economic value and health benefits. The increasing demand for cauliflower that is greater than the rate of food production will increase the potential for a food crisis. This study aims to determine the combination of NPK fertilizer application with Rabbit Liquid Organic Fertilizer on the yield and quality of cauliflower. This study used a 2 Factorial Randomized Group Design of 4 levels each repeated 3 times so that there were 48 experimental units with each unit containing 3 polybags of sample plants. The first factor is the dose of NPK fertilizer consisting of 4 levels, namely 0 gr/plant (M0), 5 gr/plant (M1), 6.25 gr/plant (M2), and 7.5 gr/plant (M3). The second factor is the concentration of Rabbit POC 0 ml/L (K0), 30 ml/L (K1), 45 ml/L (K2), 60 ml/L (K3). The results of the study are: 1) There is a real interaction in the treatment of a combination of doses of NPK Fertilizer and Rabbit Liquid Organic Fertilizer on the mass weight of flowers; 2) the effect of NPK Fertilizer dose treatment of 7.5 grams/plant (M3) singly has a real effect on the parameters of plant crown diameter (77.06 cm) and a very real effect on the circumference of the flower mass (33.67 cm); 3) The dose treatment of 60 ml/L Rabbit Liquid Organic Fertilizer (K3) significantly influenced the parameters of per-plant crown diameter (78.19 cm) and had a very significant effect on the circumference of flower mass (33.54 cm).

Corresponding Author:
Nora Augustien
Agrotechnology Study Program, Faculty of Agriculture, Veterans National, Development University, East Java, Surabaya, Indonesia
nora_a@upnjatim.ac.id

INTRODUCTION

Cauliflower (Brassica oleracea var. Botrytis L.) is an annual plant belonging to the Brassicaceae family. This plant has high economic value because it contains the most thiocyanate and glucosinolate in the curd or flower mass. This content functions to neutralize harmful substances in metabolism in the liver (Wu et al., 2021). In 2018 demand for cabbage reached 1.45 kg/capita/year which is equivalent to 384,250 tons. Meanwhile, flowering cabbage production in 2018 only reached 152,122 tons. Consumption of

INFOKUM
Volume 12 , Number 01, 2024, DOI 10.58471/infokum.v12i01
ESSN 2722-4635 (Online)
https://infor.seaninstitute.org/index.php/infokum

cauliflower in Indonesia continues to increase every year accompanied by production of cauliflower plants in Indonesia which continues to fluctuate. Cauliflower productivity in 2020 was 204,238 tons, experiencing a decrease in 2021 of 203,385 (BPS, 2022). Therefore, efforts are needed to continue to increase the growth of cauliflower plants to meet market needs.

The public's need for cauliflower is increasing and greater than the rate of food production, which will increase the potential for a food crisis. Along with this, food security has a high urgency to be addressed, one of which is by optimizing urban agriculture with the concept of urban farming using polybags. Cultivating cauliflower plants in polybags can minimize land use because they can be placed in narrow areas or yards. Cultivating plants using this technique in urban areas can increase food security and independence (Nurjasmi R., et al., 2019). This shortens access to food and maintains environmental sustainability because it integrates narrow land with the application of appropriate technology. Apart from using cauliflower varieties that suit the regional topography, attention must be paid to applying fertilizer to cauliflower plants so that the plants can adapt and produce maximum production.

Many people use inorganic fertilizers such as NPK fertilizer to increase plant growth because it is easy to obtain, fast and practical rather than using organic fertilizer. In fact, continuous use of chemical fertilizers can cause a decrease in soil quality and productivity and affect the growth and quality of plant products due to the residue left behind. One effort that can be made is to combine the use of inorganic fertilizers such as NPK combined with liquid organic fertilizer (POC). Utilizing the potential nutrients in solid and liquid rabbit droppings originating from the environment can increase broccoli plant production results including flower mass diameter, flower weight per plant, and flower weight per plot (Manik F., et al., 2021). This research aims to determine the combination of application of NPK fertilizer with Rabbit Liquid Organic Fertilizer on the yield and quality of cauliflower.

METHODS

This land is located on Jalan Banyu Urip, Gempolkurung Village, Menganti District, Gresik Regency, East Java Province. This research location has regional characteristics such as an altitude of approximately 11 meters above sea level with a land slope of 0-8%, air temperature ranging from 24 oC - 33 oC, air humidity between 65% - 96%, average wind speed 12 - 23 km/hour , and average rainfall is 22.38 mm per day. This research used a RAK 2 Factorial experimental design with 4 levels each which was repeated 3 times so that there were 48 experimental units with each unit containing 3 polybags sample plants. The first factor is the dose of NPK fertilizer which consists of 4 levels, namely 0 gr/plant, 5 gr/plant, 6.25 gr/plant, and 7.5 gr/plant. The second factor is the Rabbit POC concentration of 0 ml/L, 30 ml/L, 45 ml/L, 60 ml/L.

Making Rabbit POC requires rabbit feces, urine, fish waste meal, kettle ash, effectiveness of microorganisms 4 (EM4), molasses, coconut water with an ingredient ratio of 4kg : 8l : 1kg : 2.5kg : 1lt : 1lt : 1lt in 40 liters of water. All ingredients for making Rabbit

INFOKUM
Volume 12 , Number 01, 2024, DOI 10.58471/infokum.v12i01
ESSN 2722-4635 (Online)
https://infor.seaninstitute.org/index.php/infokum

POC fertilizer are fermented for 21 days. Indicators of successful liquid organic fertilizer include a white layer on the surface, a characteristic fermentation odor, no bubbles, a brown color and a pH ranging from 4-9. Dilution of Rabbit POC is adjusted to the level of treatment which is then applied by spraying. The dose of Mutiara NPK fertilizer is given according to the treatment level 1 day after application of Rabbit POC. Fertilizer application is done in a circle.

Table 1. Results of Rabbit Liquid Organic Fertilizer Test Parameters after 21 days of Fermentation.

No.	Parameter	Nilai	Satuan
1.	C-Organic	0.48	%
2.	pH	6.1	-
3.	Macro Nutrients		
	Nitrogen	0.38	%
	Phosphorus	0.26	%
	Potassium	0.54	%
	Calcium	0.42	%
	Magnesium	0.35	%

Maintenance carried out in this research is preparation of planting media,seeding for 21 HST (Days After Sowing), fertilizing, planting, replanting, watering, pruning lateral shoots, pest and disease control, weed control and harvesting carried out after 58 HST (Days After Planting). The measurement parameters for the experiment included plant crown diameter at 28 HST, flower mass circumference at age, flower mass weight, crispness. Data from observations for each parameter were then analyzed using the F test at the 5% level. If differences appear, the BNJ test will be continued at the 5% level to compare the average values of all experimental units.

RESULT AND DISCUSSION

Plant Crown Diameter (cm)

Crown diameter is one of the factors that influences plant production. The width of the canopy is measured at the diameter of the widest leaf so that the wider the leaf, the more it will receive sunlight. The results of the analysis of the 5% BNJ test data showed that there was no significant interaction between the interaction of NPK fertilizer dose and Rabbit POC concentration on the crown diameter of cauliflower plants. The treatment of NPK fertilizer dosage and Rabbit POC concentration as a single factor showed a significantly different effect on the crown diameter of cauliflower plants. Data on the average crown diameter of cauliflower plants due to the influence of NPK and Rabbit POC fertilizer doses are presented in table 2.

INFOKUM
Volume 12 , Number 01, 2024, DOI 10.58471/infokum.v12i01
ESSN 2722-4635 (Online)
https://infor.seaninstitute.org/index.php/infokum

Table 2. Average Diameter of Plant Crowns Due to the Combination of NPK Fertilizer Doses and Rabbit POC Concentrations.

Treatment	Average Header Diameter (cm)
Pearl NPK Dosage	
M0 (0 gram)	71.85 a
M1 (5 gram)	74.93 ab
M2 (6 gram)	75.81 ab
M3 (7.5 gram)	77.06 b
BNJ 5%	4.94
Rabbit POC Concentration	
K0 (0 ml/L)	72.03 a
K1 (30 ml/L)	73.85 ab
K2 (45 ml/L)	75.58 ab
K3 (60 ml/L)	78.19 b
BNJ 5%	4.94

Information: tn (no significant effect), HST (Day After Planting); Numbers in columns and rows followed by the same letter show no significant difference according to the BNJ 5% follow-up test.

Providing a combination of NPK and POC Rabbit fertilizers affects the diameter of the plant canopy. These two factors have an influence separately and do not synergize with each other to influence the diameter of the plant canopy. The diameter of the plant canopy due to the NPK fertilizer dosage factor has a significantly different effect at each level. The largest plant canopy diameter due to the influence of a single factor of NPK fertilizer dose was obtained by treatment M3 (7.5 gr/plant) at 77.06 cm which was significantly different from treatment M0 (0 gr/plant) at 71.85 cm but not significantly different from M1 and M2. There was an increase in the M3 level of 6.76% when compared to the M0 level (control). NPK fertilizer at the M3 level (7.5 gr/plant) is thought to be able to provide the nutrients needed by plants in the vegetative phase, such as formation of crown diameter. This can also be influenced by the nitrogen content in NPK fertilizer which is needed for the formation of amino acids as constituents of chlorophyll thereby increasing photosynthetic activity which results in the development of the meristematic tissue of leaves and stems (Puspitaeni, I., and Yakop, U. M, 2023)

The growth and development of leaves affects the width of the crown diameter. The number of leaves on cauliflower plants increases with increasing plant height because the leaves are located at the stem nodes. The diameter of the plant canopy due to the single factor Rabbit POC concentration also has a significantly different effect at each level. The largest crown diameter was shown in treatment K3 (30 ml/L) at 78.19 cm which was significantly different from treatment K0 at 72.03 cm but not significantly different from

INFOKUM
Volume 12 , Number 01, 2024, DOI 10.58471/infokum.v12i01
ESSN 2722-4635 (Online)
https://infor.seaninstitute.org/index.php/infokum

K1 and K2. There was an increase in the K3 level of 7.88% when compared to the K0 level (control). Providing POC fertilizer sprayed on the leaves causes the turgor pressure on the leaves to increase, which then opens the stomata and the plant absorbs the fertilizer more quickly and effectively (Suryani, R., 2019). Therefore, the crown diameter of the K3 level Rabbit POC factor is greater than that of the M3 level NPK fertilizer factor. The photosynthesis process will be more optimal to produce more photosynthesis and high productivity. The optimal canopy width formed in the vegetative phase of cauliflower plants will accumulate results. The photosynthate is in the generative phase for the formation and enlargement of the cauliflower mass.

Flower or Curd Mass Circumference (cm)

The results of the analysis of the 5% BNJ test data showed that there was no real interaction between the interaction of NPK fertilizer dose and Rabbit POC concentration on the flower mass circumference (curd) of cauliflower plants. The treatment of NPK fertilizer dosage and Rabbit POC concentration as a single factor showed a very significant difference in effect on the flower mass circumference (curd) of cauliflower plants. Data on the average flower mass circumference (curd) of cauliflower plants due to the influence of NPK and POC Rabbit fertilizer doses are presented in table 3.

Tabel 3. Average Circumference of Flower Mass Due to Combination of NPK Fertilizer Dosage and Rabbit POC Concentration

Treatment	Average Header Diameter
Pearl NPK Dosage	
M0 (0 gram)	28.68 a
M1 (5 gram)	30.92 ab
M2 (6 gram)	31.99 bc
M3 (7.5 gram)	33.67 c
BNJ 5%	2.54
POC Rabbit Concentration	
K0 (0 ml/L)	29.15 a
K1 (30 ml/L)	30.31 ab
K2 (45 ml/L)	32.25 bc
K3 (60 ml/L)	33.54 c
BNJ 5%	2.54

Information: tn (no significant effect), HST (Day After Planting); Numbers in columns and rows followed by the same letter show no significant difference according to the BNJ 5% follow-up test

The increase in the circumference of the flower mass is caused by the process of cell division and enlargement of the size of the cells in the flower organs. This process requires the contribution of the nutrient potassium in photosynthesis. The treatment with the longest flower mass circumference due to the influence of a single factor of NPK fertilizer dose was obtained by the M3 treatment (7.5 gr/plant) of 33.67 cm which was not significantly different from the M2 treatment (6.25 gr/plant) of 33.67 cm.

INFOKUM
Volume 12 , Number 01, 2024, DOI 10.58471/infokum.v12i01
ESSN 2722-4635 (Online)
https://infor.seaninstitute.org/index.php/infokum

31.99 cm but significantly different between treatments M0 (0 gr/plant) and M1 (5 gr/plant). There was an increase in the mass circumference of cauliflower at the M3 level (7.5 gr/plant) by 14.82% when compared to the M0 level (control). The increase in flower mass circumference is caused by the potassium element in NPK fertilizer which plays a role in the translocation of photosynthesis from source organs such as leaves to sink organs, namely flower mass organs. Increasing treatment to M3 level further encourages photosynthate translocation to direct development towards flower mass formation. According to Sitompul, H. F., et al (2014), the resulting photosynthate will be broken down through the respiration process to produce energy which is used to carry out activities such as cell division and enlargement. Cell activity in the sub-apical meristem will produce bolting and form new mass of cauliflower florets.

As the photosynthesis process continues to increase, it will produce more photosynthesis, which will affect the shape of the flower mass, including the organs storage of food reserves in cauliflower plants. The treatment with the longest flower mass circumference (curd) due to the influence of a single factor of Rabbit POC concentration was obtained by the K3 treatment of 33.54 cm, which was significantly different from the K0 level treatment of 72.03 cm but not significantly different from the treatment at the K2 level of 32. 25 cm. There was an increase in the mass circumference of cauliflower at the K3 level by 13.08% when compared to the K0 level (control). This is thought to be because the nutrient content in Rabbit POC can be absorbed and utilized by plants optimally so that they are able to carry out metabolic processes more efficiently. According to Indriani, S. (2021), rabbit manure contains greater nutrient elements than livestock such as horses, buffalo, cows, sheep, pigs and chickens.

Flower Mass Weight

The results of the 5% BNJ data analysis showed that there was a significantly different interaction between the interaction of NPK fertilizer dose and Rabbit POC concentration on the wet weight of the flower mass of cauliflower plants. Treatment of NPK fertilizer dose and Rabbit POC concentration each as a single factor showed a very significant difference in effect on the flower mass (curd) weight of cauliflower plants. The average flower mass weight (curd) of cauliflower plants due to the influence of NPK fertilizer dosage and Rabbit POC concentration is presented in table 4.

Table 4. Average Mass Weight of Flowers Due to the Combination of NPK Fertilizer Doses and Rabbit POC Concentrations

Treatment	Factor K			
Factor M	K0	K1	K2	K3
M0	150.58 a	157.47 ab	159.62 abc	161.30 abc
M1	164.23 abc	168.62 abcd	180.75 abcd	244.17 f
M2	185.53 abcd	196.52 cde	203.89 de	249.96 f
M3	191.68 bcd	232.44 ef	246.82 f	258.74 f
BNJ 5%	M = 18.70	K = 18.70	MK = 37.41	

Information : tn (no real effect); Numbers in columns and rows followed by the same letter show no significant difference according to the BNJ 5% follow-up test.

INFOKUM
Volume 12 , Number 01, 2024, DOI 10.58471/infokum.v12i01
ESSN 2722-4635 (Online)
https://infor.seaninstitute.org/index.php/infokum

The results of the 5% BNJ test data analysis showed that the M3K3 treatment (7.5 gr/plant NPK and 60 ml/L Kotciplus) was very significantly different from the M0K0 treatment (control). The implementation of the M3K3 combination was not significantly different from the combinations M1K3 (5 gr/plant NPK and 60 ml/L), M2K3 (6.25 gr/plant NPK and 60 ml/L Kotciplus), M3K1 (7.5 gr/plant NPK and 30 ml/L) and M3K2 (7.5 gr/plant NPK and 45 ml/L). There was an increase in the mass weight of cauliflower at the M3K3 level (7.5 gr/plant NPK and 60 ml/L Kotciplus) by

41.80% when compared to the M0K0 level (control). This combination of treatments is thought to be able to meet the nutritional needs of cauliflower plants in the flower enlargement phase. Plants with met nitrogen needs will carry out the photosynthesis process and then the photosynthesis is translocated to all parts. According to Prawoto and Hartatik (2019), when cauliflower plants enter the phase of flower mass enlargement, of course the yield will increase

The photosynthate will be directed towards the development of flower mass so that the flower weight is heavier. The energy to carry out this translocation is obtained if the availability of phosphorus is sufficient.

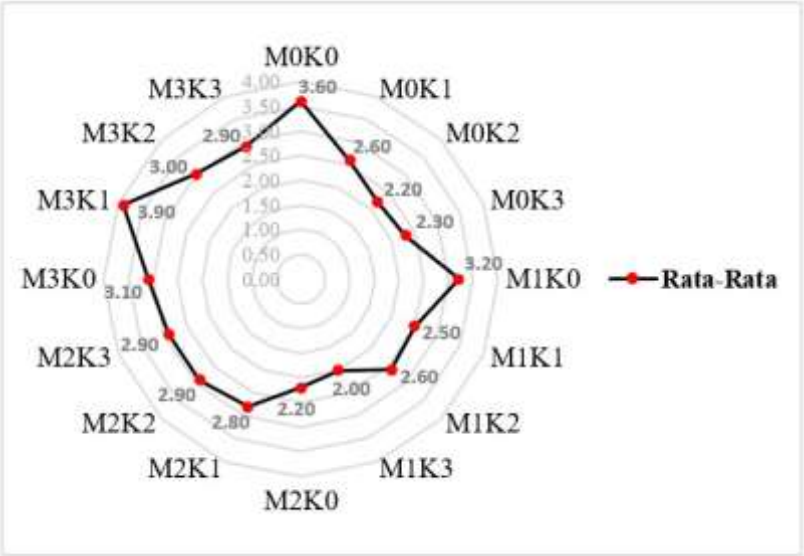
The results of the analysis of variance (ANOVA) showed that there was a combination of treatments with a lower NPK fertilizer dose level of 16.67% and a higher Kotciplus concentration of 15 ml/L which had no significantly different effect but produced a higher average flower mass weight. . The combination treatments included M3K0 (7.5 gr/plant NPK and 0 ml/L Kotciplus) amounting to 191.68 grams with M2K1 (6.25 gr/plant NPK and 30 ml/L Kotciplus) amounting to 196.52 grams and M3K2 (7.5 gr/plant NPK and 45 ml/L Kotciplus) amounting to 246.82 grams with M2K3 (6.25 gr/plant NPK and 60 ml/L) amounting to 249.96 grams. These combinations are followed by the same letter notation according to Table 4. This means that reducing the dose of NPK fertilizer from M3 to M2 level then combined with a higher concentration of Rabbit POC is able to produce the same mass weight of cauliflower so that economic efficiency of use is also achieved. In accordance with research by Afolabi, M. S., et al. (2021), namely the combination of using organic and inorganic fertilizers on lettuce plants together has been proven to be able to increase yields and produce higher harvest quality.

Crispness

The part of the cauliflower plant that is consumed by the public is the result of the generative phase in the form of flower masses. Consumers want the texture of the cauliflower mass after further processing, namely crunchy, not too hard, but do not want the texture of the cauliflower mass to be too soft in fresh products, which will speed up storage time. The crunchiness of the cauliflower mass was divided into very soft (1), soft (2), crunchy (3) and very crunchy (4). The scoring results were selected by 10 untrained test panelists. The average crispness scoring of the flower mass (curd) of cauliflower plants due to the influence of the combination treatment can be seen in Table 5.

INFOKUM
Volume 12 , Number 01, 2024, DOI 10.58471/infokum.v12i01
ESSN 2722-4635 (Online)
https://infor.seaninstitute.org/index.php/infokum

Table 5. Average Crunchiness Score Due to Combination of NPK Fertilizer Dosage and Rabbit POC Concentration.



The average crispness scoring which is included in the crispy category is shown in the combination treatments M0K0, M1K0, M3K0, M3K1, and M3K2. Highest scoring on

The crispy group obtained in the M3K1 combination treatment (7.5 gr/plant NPK and 30 ml/L Rabbit POC) was 3.90. The average crispness scoring which is included in the soft category is shown in the combination treatment M0K1, M0K2, M0K3, M1K1, M1K2, M1K3, M2K0, M2K1, M2K2, M2K3, and M3K3. The highest scoring of crispness in the soft category was obtained in the combination treatment of M2K2 (6.25 gr/plant NPK and 45 ml/L Rabbit POC), M2K3 (6.25 gr/plant NPK and 60 ml/L Rabbit POC), and M3K3 (7 .5 gr/plant NPK and 60 ml/LPOC Rabbit) of 2.90. The greater the dose of NPK fertilizer given to cauliflower plants will produce a mass of flowers (curd) in the crunchy category, while the greater the concentration of Rabbit POC will produce a mass of flowers (curd) in the soft category.

Organoleptic testing was carried out, namely assessing the crunchiness of the cauliflower mass. The crispness of the cauliflower mass is influenced by the water content and texture of the fruit due to the influence of different treatments. In accordance with all the results parameters, it was observed that the combination of M2K3 treatment (6.25 gr/plant NPK and 60 ml/L Rabbit POC) showed results in the form of high mass weight with soft category crunchy quality. Crispness is determined by the presence of the element calcium in the leaf tissue. According to Ariyadni, D. R., and N. E. Suminarti (2019), the higher the concentration of calcium that accumulates in the cell walls that make up an organ, this is followed by an increased level of crispness because calcium is a structural element that functions as a constituent of plant cell walls, especially in the middle lamella. Providing the nutrient Calcium in Rabbit POC is useful in meeting the need for Calcium which cannot be redistributed from old tissue to young tissue if only NPK fertilizer is applied.

CONCLUSION

From the results of the research carried out, several conclusions can be drawn, namely: There is a real interaction in the combined treatment of doses of NPK Fertilizer and Rabbit Liquid Organic Fertilizer on the mass weight of flowers. The combination treatment dose of 6.25 gr/plant NPK and a concentration of 60 ml/L POC Kelinci (M2K3) gave flower mass weight results that were not significantly different from M3K3 but with a soft category crispness level. Treatment with a dose of NPK fertilizer of 7.5 grams/plant (M3) had a significant effect on the parameters of crown diameter per plant (77.06 cm) and had a very significant effect on the flower mass circumference (33.67 cm). The treatment dose of Rabbit Liquid Organic Fertilizer 60 ml/L (K3) had a significant effect on the parameter of crown diameter per plant (78.19 cm) and had a very significant effect on the flower mass circumference (33.54 cm).

REFERENCES

Afolabi, M.S. et al. 2021. Comparative Effects of Organic and Inorganic Fertilizer Treatment on Growth, Yield, and Quality of Lettuce (Lactuca sativa L.). Journal of Pure and Applied Agriculture, 6(2), pp. 1–8. Available at: http://jpaa.aiou.edu.pk/.

Ariyadni, D. R., dan N. E. Suminarti. 2019. Pengaruh Pupuk Kalsium dan Giberelin pada Pertumbuhan, Hasil dan Kualitas Cabai Besar (Capsicum annuum)', Jurnal Produksi Tanaman, 7(12), pp. 2262 – 2271. Available at: http://repository.ub.ac.id/id/eprint/173066.

BPS. 2022. Produksi Tanaman Sayuran 2021, Badan Pusat Statistik. Jakarta. Available at: https://www.bps.go.id/indicator/55/61/1/produksi-tanaman-sayuran.html (Accessed: 5 January 2023).

Indriani, S. 2021. Efektivitas Pupuk Organik Cair (POC) Kombinasi Kotoran Kelinci Dan Air Cucian Beras terhadap Pertumbuhan Sawi (Brassica Juncea L). Doctoral Dissertation. Poltekkes Kemenkes Bengkulu. 69 hal.

Manik, F., B. B. Karo, R. C. Hutabarat dan D. Musaddad. 2021. Respon Tanaman Brokoli (Brassica oleracea) terhadap Pupuk Organik Cair. Agriprima : Journal of Applied Agricultural Sciences, 5(2), pp. 122–130. Available at: https://doi.org/10.25047/agriprima.v5i2.434.

Nurjasmi, R., Sholihah, S. M., Suryani, S., Banu, L. S., dan Wahyuningrum, M. A. 2019.

Pelatihan Teknologi Budidaya Tanaman Sayuran Di Lahan Sempit Kepada Anggota Poktan Kelurahan Bampu Apus Kecamatan Cipayung Jakarta Timur. Jurnal Pelayanan dan Pengabdian Masyarakat (PAMAS), 3(Vol 3, No 2 (2019): Jurnal Pelayanan dan Pengabdian Masyarakat (PAMAS)), pp. 72–81. Available at: http://ejournal.urindo.ac.id/index.php/PAMAS/article/view/523.

Prawoto, T.Y. dan Hartatik, S. 2019. Respon Pertumbuhan dan Hasil Beberapa Varietas Bunga Kol (Brassica oleracea Var. Botrytis L.) terhadap Penggunaan Pupuk Majemuk NPK di Dataran Rendah', UNEJ e-Proceeding, Pembanguna Peluang dan Tantangan di Era Industri 4.0, pp. 718–731. Available at:

https://jurnal.unej.ac.id/index.php/prosiding/article/view/8976.

Puspitaeni, I., dan Yakop, U. M. 2023. Respon Pertumbuhan dan Hasil Brokoli (Brassica Oleracea L.) pada Berbagai Dosis Pupuk Kandang Kambing dan Pupuk NPK di Dataran Medium. Jurnal Ilmiah Mahasiswa Agrokomplek, 2(3), pp. 335–341. Available at: https://doi.org/10.29303/jima.v2i3.3569.

Sitompul, H.F., Simanungkalit, T. dan Mawarni, L. 2016. Respons Pertumbuhan Bibit Kakao (Theobroma cacao L.) terhadap Pemberian Pupuk Kandang Kelinci dan Pupuk NPK (16: 16: 16).', Jurnal Online Agroteknologi, 2(3), pp. 1064–1071. Available at: http://download.garuda.kemdikbud.go.id/article.php?article=1429308&val=4122&title=Respons Pertumbuhan Bibit Kakao Theobroma Cacao L Terhadappemberianpupuk Kandang Kelinci Dan Pupuk Npk 161616.

Suryani, R. 2019. Pengaruh Hasil Tiga Varietas Tomat Melalui Aplikasi Pemberian Pupuk Organik Cair di Dataran Tinggi. In Seminar Nasional Pembangunan Pertanian Berkelanjutan Berbasis Sumber Daya Lokal (pp. 25-38).

Wu, X., Huang, H., Childs, H., Wu, Y., Yu, L., and Pehrsson, P. R. 2021. Glucosinolates in Brassica Vegetables: Characterization and Factors That Influence Distribution, Content, and Intake', Annual Review of Food Science and Technology, 12, pp. 485–511. Available at: https://doi.org/10.1146/annurev-food-070620-025744.