



## EFFECT OF SOME ORGANIC MATTER AND NUTRIENTES ON VEGETATIVE GROWTH OF *Dianthus caryophyllus* UNDER SUSTAINABLE FARMING SYSTEM

Bashaer F. Hussein<sup>1\*</sup>, Nawal M. Alwan<sup>2</sup>

<sup>1</sup>College of Agriculture Engineering Sciences, University of Baghdad, Baghdad Iraq [bashaer.fadel2205m@coagri.uobaghdad.edu.iq](mailto:bashaer.fadel2205m@coagri.uobaghdad.edu.iq)

<sup>2</sup>College of Agriculture Engineering Sciences, University of Baghdad, Baghdad Iraq [nawal.mahmood@coagri.uobaghdad.edu.iq](mailto:nawal.mahmood@coagri.uobaghdad.edu.iq)

Received 1/ 10/ 2024, Accepted 31/ 12/ 2024, Published 30/ 9/ 2026

This work is licensed under a CCBY 4.0 <https://creativecommons.org/licenses/by/4.0>



### ABSTRACT

Cut flowers are one of the most important commercial crops, and carnation (*Dianthus caryophyllus*) is one of these major flowers, as carnations rank first among the types of cut flowers produced all over the world. This study included two experiments: A field experiment conducted in one of the plastic houses located in the research station (B) of the Department of Horticulture and Landscape Engineering/ College of Agricultural Engineering Sciences/ University of Baghdad, for the fall season 2023-2024, to study the growth response of carnation plants to some organic materials under the sustainable agriculture system. Carnation seedlings of the (Grace) variety were imported with a length of (8-10) cm from one of the agricultural offices in Turkey. After that, they were planted in small anvils, then transferred to the permanent place (direct soil cultivation) after the appearance of the fourth leaf on the plant. The experiment was carried out after carrying out all service operations for the plastic house from sterilization (solar sterilization) before plowing, plowing, and leveling. The panels were made with an area of (1x1) and irrigation pipes were extended, as well as the agricultural soil was analyzed before planting and all service operations were carried out, then compost (wheat straw and palm waste) was added after removing the panel soil and at a depth of 30 cm, and then the extracted soil was mixed with the media and amended. The second experiment included a storage experiment conducted in the storage laboratory of the Department of Horticulture and Landscape Engineering / College of Agricultural Engineering Sciences/ University of Baghdad. The results indicated that the effect of organic materials (palm waste) at a concentration of 4 kg and also at a concentration of 20 g of aloe vera gel was significantly superior to the first concentration compared to the control in both treatments on all data. Growth characteristics: plant height (68.62-68.60 cm), number of leaves (75.97-76.38 leaves/plant-1), number of branches/plant (6.49-6.39 branches/plant-1), leaf chlorophyll content (76.57-73.64 (SPAD), leaf surface area index (583.33-605 cm<sup>2</sup>). As well as measuring the concentration of NPK elements in the leaves (3.00-2.97-0.37-0.36-2.69-2.73 mg kg<sup>-1</sup>) respectively for nitrogen, phosphorus and potassium.

**Key words:** organic matter; environmental pollution; growth parameters .

\*This article is taken from the doctoral dissertation of the first researcher.



## تأثير بعض المواد العضوية والمغذيات على النمو الخضري لنبات القرنفل *Dianthus caryophyllus* تحت نظام الزراعة المستدامة

بشائر فاضل حسين ، نوال محمود علوان

<sup>1</sup>كلية علوم الهندسة الزراعية، جامعة بغداد، بغداد، العراق، [bashaer.fadel2205m@coagri.uobaghdad.edu.iq](mailto:bashaer.fadel2205m@coagri.uobaghdad.edu.iq)  
الاستاذ المساعد الدكتور، كلية علوم الهندسة الزراعية، جامعة بغداد، بغداد، العراق، [nawal.mahmood@coagri.uobaghdad.edu.iq](mailto:nawal.mahmood@coagri.uobaghdad.edu.iq)

### الخلاصة

تعد الزهور المقطوفة واحدة من اهم المحاصيل التجارية، ونبات القرنفل (*Dianthus caryophyllus*) هو واحد من هذه الزهور الرئيسية ، اذ يحتل القرنفل المركز الاول بين انواع الزهور المقطوفة والمنتجة في جميع انحاء العالم . تضمنت هذه الدراسة تجربتين: تجربة حقلية اجريت في احد البيوت البلاستيكية الواقعة في المحطة البحثية (B) التابعة لقسم البستنة وهندسة الحدائق/ كلية علوم الهندسة الزراعية/ جامعة بغداد ، للموسم الخريفي 2023-2024 ، لدراسة استجابة نمو نبات القرنفل لبعض المواد العضوية في ظل نظام الزراعة المستدامة. وتم استيراد شتلات القرنفل صنف (Grace) بطول (8-10) سم من احد المكاتب الزراعية في تركيا. وبعد ذلك تم زراعتها في سنادين صغيرة، ثم حولت الى المكان المستديم (الزراعة بالتربة مباشرة) بعد ظهور الورقة الرابعة على النبات . نفذت التجربة بعد اجراء كافة عمليات الخدمة للبيت البلاستيكي من تعقيم (التعقيم الشمسي) قبل الحراثة، وحراثة، وتسوية. وتم عمل الواح بمساحة (1x1) م ومد انابيب الري، وكذلك تحليل تربة الزراعة قبل الزراعة واجراء عمليات الخدمة كافة، ثم تم اضافة كل من كومبوست (تبين الحنطة ومخلفات النخيل) بعد اخراج تربة اللوح وعلى عمق 30سم، وبعد ذلك خلط التربة المستخرجة مع الاوساط وتعديلها. وتضمنت التجربة الثانية تجربة خزنية اجريت في مختبر الخزن التابع لقسم البستنة وهندسة الحدائق/ كلية علوم الهندسة الزراعية/ جامعة بغداد. وأشارت النتائج الى ان تأثير المواد العضوية (مخلفات النخيل) بتركيز 4 كغم وكذلك بتركيز 20 غم من جل الصبار تفوق معنويا على التركيز الاول مقارنة بالسيطرة في كل المعاملتين على جميع البيانات. خصائص النمو: ارتفاع النبات (68.62- 68.60سم)، عدد الاوراق (76.38-75.97 ورقة نبات<sup>1</sup>)، وعدد الافرع على النبات (6.39-6.49 فرع نبات<sup>1</sup>)، محتوى الاوراق من الكلوروفيل (SPAD 73.64-76.57) ، دليل مساحة سطح الورقة (583.33-605سم<sup>2</sup>). وكذلك قياس تركيز عناصر NPK في الاوراق (2.73-2.69-0.36-0.37-2.97-3.00 ملغ كغم<sup>-1</sup>) على التوالي للنتروجين والفسفور والبوتاسيوم.  
<sup>1</sup>الكلمات المفتاحية: مادة عضوية ، تلوث البيئة، منظمات النمو.

## INTRODUCTION

Fresh cut flowers are considered one of the greatest delicate and challenging commercial crops (Rashed *et al*, 2024). It is vital to consider into importance how to reduce cut flowers loss through storage and transportation.

Carnation (*Dianthus caryophyllus*) is one of the principal floricultural crops and has first place among the cut flower species produced worldwide (Dewanti *et al*, 2024). The major breeding objectives for ornamentals utilized to be visual qualities like appearance, flower color, type, size, and plant form. The authors aimed to obtain the carnation genotypes that have a superior appearance as cut ornamental plants and to find out the magnitude of genetic and phenotypic variability values of morphological characters in 10 carnation genotypes.

In fact, chemical fertilizers are a critical source for plant nutrition. Additionally, chemical fertilizers at extreme levels for long time can enhance the dangerous impact of chemical residual in plant tissues and animal consumers. Therefore, it has piloted farmers to application various plant extracts to enhance the plant growth (Abbas *et al*, 2016).

Organic fertilizers have a positive result to improve the vegetative characteristic due to increasing the efficiency of the photosynthesis process, which is represented by the vegetative



and floral characteristics as reported by those (Abdullatif *et al* , 2019; Al-Silmawy & Abdul-Ratha, 2023; Hameed & Khalil, 2023) as well as, they reported that the dry matter percentage in the leaves and the concentration of chlorophyll was affected by the organic fertilizers. Adding organic fertilizers showed an increase in the absorption of elements from the soil (Alkhafaji & Khalil, 2019). Alwan *et al* (2023) sprayed Licorice and “Disper Bloom” on *Gerbera Jamesonii* L., plants to study their effect on the vegetative and flowering parameters. The results indicated a high significant effect of these materials on plants compared with control.

Many studies showed the effect of adding fertilizer, which modifies the soil properties and improving the soil ability to aerate and retain water, thus facilitating the increased and growth of plants roots. Organic fertilizers also play a role in increasing the availability of nutrients and are reflected in the concentration of those elements in the leaves (Jubeir & Ahmed, 2019). These results are consistent with Khalil (2023) who showed a significant increase in the content of phosphorus and nitrogen after adding organic fertilizers. Moreover, Al-Hadethi (2019) reported that organic materials provide nutrients to plants without endangering the environment and the fertilization plays a crucial function in controlling plant growth and development, which positively affects yield and farmer revenues (Al-Hadethi *et al* , 2020; Al-Halfi & Al-Azzawi, 2022). Taha & Abood (2018) Indicated the positive effect of organic fertilization on the mineral content of fruit tree leaves and fruit characteristics.

Alwan *et al* (2018) studied the impact of the soaking period and salicylic acid concentrations in the iris growth and production during the growth and flowering stage. The results indicated that usage of both materials showed a significant role in improving all vegetative and flowering parameters. In addition, Alwan & Sadiq (2019) showed the influence of tuberous root soaking in SA and foliar apply of plants on growth parameters, and flowering parameters of *Ranunculus asiaticus*.

Ameen (2010) studied the influence of irrigation with magnetized water (MW) and P fertilization on vegetative and flowering characters of *Rosa damascene*. The results showed that adding water to plants with MW with both magnetic fields substantially improved the morphological constraints. Alwan *et al* (2019) showed the response of plant growth and production of *Gerbera jamesonii* plants to some fertilizers, the results indicated that the foliar application with ammonium nitrate (150 g m<sup>-2</sup>) and calcium superphosphate (150 g m<sup>-2</sup>) recorded a growth in all vegetative growth characters.

*Aloe vera* extracts (AVE) obtained from the Aloe plants leaves which belong to family *Alliaceae* is succulent herb with significant antioxidant activity (Hu *et al*, 2003). *Aloe vera* has all the essential amino acids and a few non-essential amino acids. Moreover, it contains mono polysaccharide, macro nutrients, secondary nutrients, micronutrients trace<sup>-1</sup> elements, vitamins, enzyme and salicylic acid (Raman Rao *et al*; 2013). ALE is used to improve vegetative growth and might be effective as natural plant growth regulator.

An experiment was carried out by Al-Zurfi *et al* (2023) at the University of Kufa to examine the reaction of Chinese carnation plants for applying with putrescine and roselle extract in growth and flowering markers. The results were instituted that spraying putrescine (100 mg) with roselle extract (2.5 ml) managed to a significant raise in plant growth attributes.



A recent experiment was carried out by **Fatmi (2023)** to investigate the influence of organic manures on carnation growth, flowering, quality and yield. The results indicated significant improved in all the carnation parameters. **El-Attar & Sakr (2022)** used humic acid and *Aloe vera* gel on carnation plants. Their results proved the potential effect of these materials to be used as preservative solutions for improving postharvest vase life and quality. So, the main objectives of the current study are evaluating some organic matter on *Dianthus caryophyllus* vegetative growth parameters under sustainable farming system.

## MATERIALS AND METHODS

A field experiment was conducted conducted in the greenhouses located in Research Station B, affiliated with the Department of Horticulture and Landscape Engineering - College of Agricultural Engineering Sciences - University of Baghdad / Al-Jadriyah, Iraq for the fall season 2023-2024 to study the effect of some organic matter on *Dianthus caryophyllus* vegetative growth under sustainable farming system.

Seedlings of the Grace variety, sized 10-12 cm, were imported from Turkey, and were planted in small anvils and then transferred to a permanent place (planting directly in the soil) after the appearance of the fourth leaf on the plant. The experiment was carried out after carrying out all service operations for the greenhouse, including sterilization (solar sterilization). Before plowing, plowing, leveling, making panels with an area of 1x1, laying irrigation pipes, as well as analyzing the agricultural soil before planting and performing all service operations **Table (1)**.

**Table (1):** chemical analysis of the soil used in current study.

| Parameters                              | Value          |
|-----------------------------------------|----------------|
| PH                                      | 7.0            |
| EC (dS m <sup>-1</sup> )                | 2.44           |
| Cation exchange                         | 24             |
| N content (mg kg <sup>-1</sup> )        | 23.1           |
| Cl content (mg kg <sup>-1</sup> )       | 18.12          |
| Mg content (mg kg <sup>-1</sup> )       | 8.21           |
| Na content (mg l <sup>-1</sup> )        | 3.1            |
| P content (mg kg <sup>-1</sup> )        | 6.11           |
| K content (mg kg <sup>-1</sup> )        | 21.4           |
| Cacl <sub>2</sub> (g kg <sup>-1</sup> ) | 230            |
| Organic matter (g kg <sup>-1</sup> )    | 4.85           |
| Sand (%)                                | 7              |
| Loom (%)                                | 58             |
| Clay (%)                                | 35             |
| Soil type                               | clay loam soil |



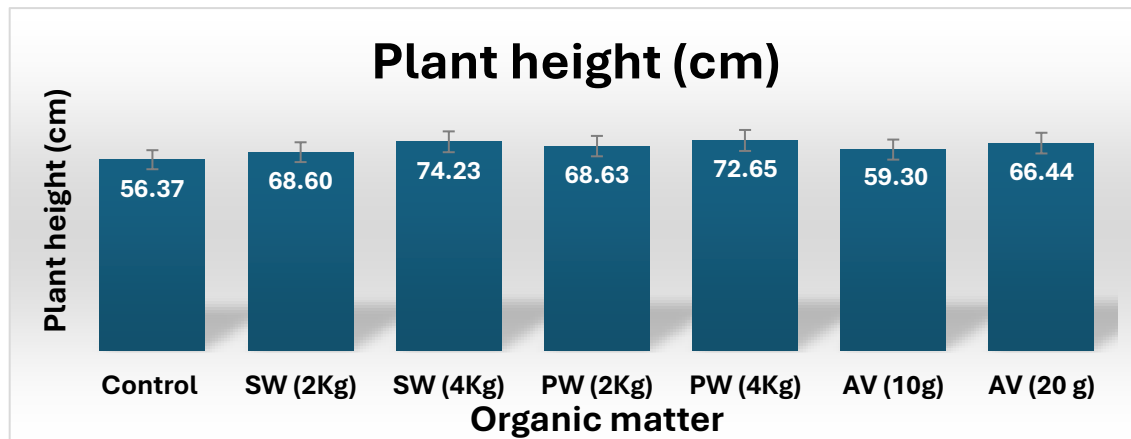
Then a field experiment was conducted by creating square panels with an area of (1x1 m) in the field after adding both compost (wheat straw and palm waste media) after removing the soil from the panel at a depth of 30 cm, and then mixing the extracted soil with the media and amending. Clove seedlings were planted at the stage of the emergence of the fourth leaf of the plant next to the drip tube and on both sides of the panels, with 40 cm between each seedling, at a rate of 10 plants per panel. The concentrations of straw wheat and palm waste were 2 and 4 kg, in respect, and the *aloe vera* get extract was 10 and 20 g l<sup>-1</sup>, while the vegetative growth parameters were assessed: plant height (cm); number of leaves plants<sup>-1</sup>; chlorophyll content (SPAD); leaf area index (cm<sup>2</sup>) and NPK content. The data were analyzed using ANOVA (spilt-spilt design). The least significant difference was used at 0.05 to detect the different between means.

## RESULTS AND DISCUSSION

### Plant height (cm):

The results illustrated in Figure (1) showed that, there are high significant variations between control and different organic matter materials. The results indicated no significant variations were observed when using 4 kg of palm waste and 20 g *Alo vera* gel with the average was 68.63 cm and 68.60 cm, respectively. In addition, usage of 4 kg straw wheat showed the high plant height (66.44 cm) compared with control treatment (59.30 cm).

These results indicated that using of the organic matter showed an increase in *Dianthus caryophyllus* height compared with un-treated plants as found in Figure (1). The results of interaction between the two study factors showed that there were significant differences between the treatments, indicating that the 4 kg palm waste, 4 kg straw wheat and 20 g l<sup>-1</sup> *aloe vera* gel extract in the plant height (74.23 cm and 72.65 cm, in respect). The control treatment recorded the lowest plant height (56.37 cm). The results demonstrate a significant effect of using organic materials (palm waste) at a concentration of 4 kg, as well as *aloe vera* gel at a concentration of 20 g l<sup>-1</sup>, on the height *Dianthus caryophyllus* plants under experimental conditions Figure (1). The current results are agreeing with **Bañón et al (2002)** and **Al-Bayati & Salih (2021)** who studied the production of *D. Caryophyllus* L. during different plant stages under the previous treatments.



**Figure (1):** showing the difference in plant height in *Dianthus caryophyllus* under the using of organic matter.

#### Number of leaves/plants (leaf plant<sup>-1</sup>):

The results recorded in Figure (2) showed that AV with the concentration 20 g l<sup>-1</sup> recorded the highest leaves number plant<sup>-1</sup> (76.38dm) compared with control which showed (63.29dm). The number of leaves is considered one of the important vegetative characteristics of the plant because it is linked to the rates of photosynthesis and its relationship to the vegetative growth in plants. The results of Figure (2) showed clear significant differences between the usage of organic matter treatments, and the use of 4 kg of palm waste.

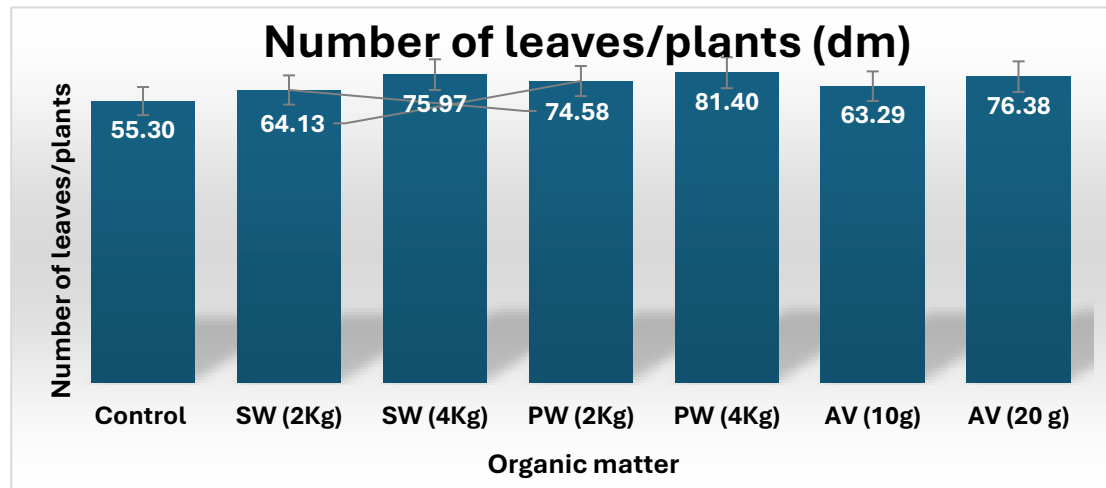
Treatment of 4 kg of palm waste achieved the largest number of leaves, reaching (75.97dm) leaves plant<sup>-1</sup>, and treatment of 4 kg of wheat straw did not differ significantly from 4 kg of palm waste, recording (74.58dm) leaves plant<sup>-1</sup>. Control recorded the lowest number of leaves, reaching (64.13dm) leaves plant<sup>-1</sup>. As for the spraying treatment with *aloe vera* gel extract, the results showed that treatment 20 g l<sup>-1</sup> was significantly, with an average number of leaves reaching (76.38dm) leaves plant<sup>-1</sup>, while treatment 20 g l<sup>-1</sup> recorded the lowest number of leaves (63.29dm) leaves plant<sup>-1</sup>.

The results of the interaction between the two factors of the study showed that there were significant differences between the treatments, indicating that treatment 4 kg of palm waste x 20 g l<sup>-1</sup> *aloe vera* gel extract was superior with the highest number of leaves, amounting to 81.40 leaves plant<sup>-1</sup>. The control recorded the lowest number of leaves, amounting to (55.30dm) leaves plant<sup>-1</sup>.

These results in the same trend with Abdulridha, & Essa, (2023) found that the addition of animal and plant wastes has significant effect in soil improving properties and thus reflects positively on increasing crop productivity. The results of Ali, & Abdul-Latif, (2024) showed that biosynthesis and organic fertilization had a positive effect on the vegetative and flowering growth characteristics of the tuberose plant. Al-Zaidy, & Al-Ubaidy (2017)



concluded that treating red cabbage with organic fertilization at all levels resulted in significant differences in the vegetative growth and yield characteristics of the plant.

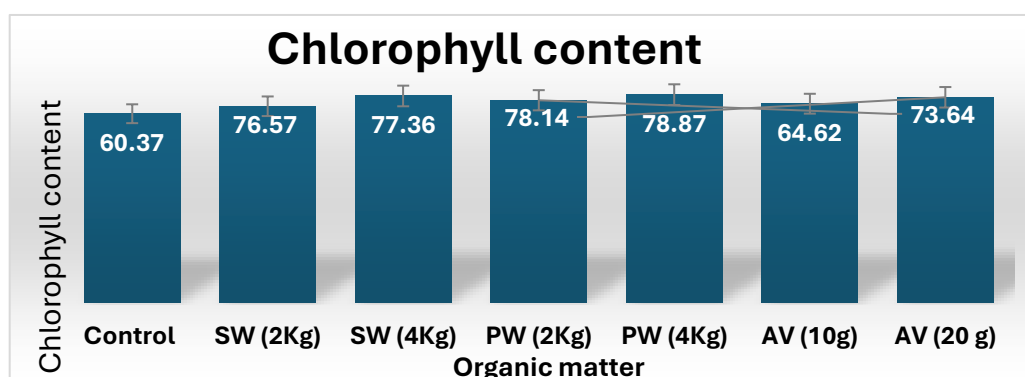


**Figure (2):** showing the difference in number of leaves/plants in *Dianthus caryophyllus* under the using of organic matter.

#### Chlorophyll content (SPAD):

Chlorophyll content is one of the most important characteristics that demonstrate the response plants to different treatments. The results of the statistical analysis shown in Figure 3 showed that there were significant differences between the treatments, as treatment 4 kg straw wheat (A2) and 4 kg of palm waste (A4) had the highest value of the chlorophyll content in plants, reaching 76.57 and 77.36 (SPAD) respectively, while the results showed that control recorded the lowest Chlorophyll content, amounting to 64.62 (SPAD), with regard to foliar application with *aloe vera* gel extract.

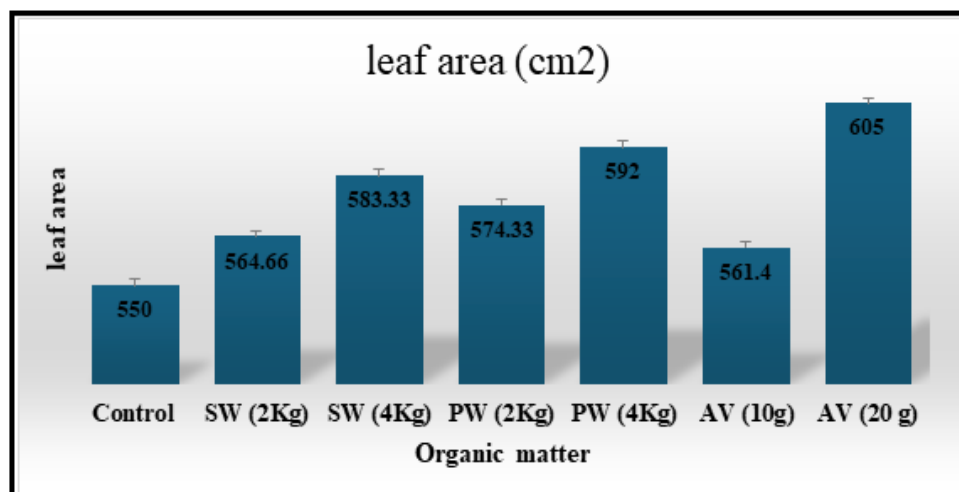
The results in Figure 3 indicated a highly significant superiority for treatment 20 g l<sup>-1</sup> (B2) with a value of 73.64 (SPAD), while treatment control recorded the lowest value of 69.01 (SPAD). The results of the interaction between the two study factors, showed that there were significant differences between the treatments, as treatment A4B2 giving the highest value of 78.87 (SPAD), and the interaction between treatment A2B2 did not differ significantly with Chlorophyll content of 78.14 (SPAD), while the comparison treatment A0B0 recorded the lowest value of 60.37 (SPAD).



**Figure (3):** showing the difference in Chlorophyll content (SPAD) in *Dianthus caryophyllus* under the using of organic matter.

#### Leaf area (cm<sup>2</sup>) :

The leaf area was measured using the Digmizer program, and the results of the statistical analysis shown in Figure 4 showed that there were significant differences between the different treatments, as A2 and A4 showed the highest leaf area value in plants, reaching 583.33 and 592.0 cm<sup>2</sup>, respectively. Treatment A2 did not show a significant difference with the A4 treatment in the same trait. While the results showed that treatment A0 (control) recorded the lowest leaf area of 550 cm<sup>2</sup>, regarding spraying with *aloe vera* gel extract, the results in Figure 4 indicated a highly significant superiority for treatment B2 (20 g/l) with a value of 605 (cm<sup>2</sup>), while control recorded the lowest value of 561 cm<sup>2</sup>. The results of the interaction between the two study factors showed that there were significant differences between the treatments, as A4B2 giving the highest value of 644 cm<sup>2</sup>.



**Figure (4):** showing the difference in leaf area (cm<sup>2</sup>) in *Dianthus caryophyllus* under the using of organic matter.

#### NPK content:

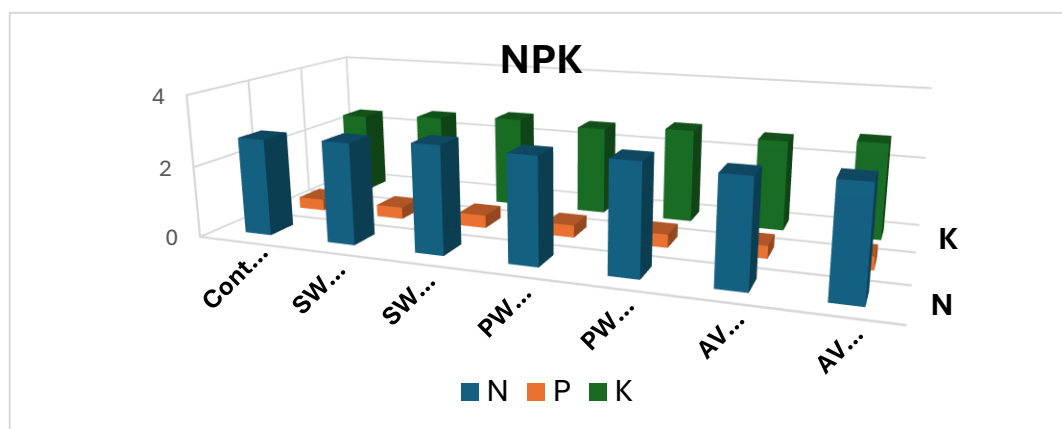


The results in Figure (5) showed that the different values of nitrogen, phosphorus, and potassium content under the influence of adding organic matter and spraying with *aloe vera* gel extract on *Dianthus caryophyllus* plants. Regarding the values of nitrogen content in the leaves showed that treatments A2 and A4 of (organic matter from wheat straw and palm waste) had the highest N values, recording 2.989 and 3.008, respectively.

The results also showed that there was a significant effect of using *aloe vera* gel (B2), with an overall average capacity. 2.970 compared to the control, which recorded an overall average of 2.851 Figure (5). The interaction between the use of organic matter and *aloe vera* gel extract had a significant effect, as treatment A4B2 recorded the highest interaction with an average power of 3.080 compared to the control, which recorded for the same interaction 2.967.

The results in Figure (5) regarding the values of phosphorus content in the leaves showed that treatments A2 and A4 of using organic matter from wheat straw and palm fronds had the highest value recorded at 0.373 and 0.368, respectively. The results also showed that there was a significant effect of using *aloe vera* gel (B2) with an overall average capacity. 0.369 compared to the control, which recorded an overall average of 0.323 Figure (5).

The interaction between the use of organic matter and *aloe vera* gel extract did not show a significant effect on *Dianthus caryophyllus* plants. The results in Figure 5 regarding the potassium content values in the leaves showed that treatment A2 and A4 of using organic matter from wheat straw and palm waste had the highest value and had a significant effect between the two treatments, recording 2.694 and 2.656, respectively. The results also showed that there was the most significant effect of using *aloe vera* gel. Treatment B2 had an overall average of 2.731 compared to the control, which recorded an overall average of 2.378 Figure (5). The interaction between the use of organic matter and *aloe vera* gel extract had a significant effect on *Dianthus caryophyllus* plants, as treatment A4B2 recorded the highest interaction with an average power of 2.900 compared to the control, which recorded for the same interaction 2.378. The different growth stages for *Dianthus caryophyllus* plants are found in Figures (6 and 7).



**Figure (5):** NPK values in *Dianthus caryophyllus* plants during vegetative growth stages.

## CONCLUSIONS



- Plant waste or agricultural waste are: the remains or output resulting from an activity or they are: secondary products within the agricultural production system that must be maximized to form organic media or clean energy and manufactured in order to achieve clean horizontal agriculture and protect the environment from pollution.
- Reusing organic media in agriculture is an appropriate way to manage the environment and provide nutrients to plants.
- There was a clear effect of organic media and spraying with aloe vera gel extract on the vegetative and flowering growth characteristics and storage qualities of clove plants.
- From the results presented above, we can conclude that the use of agricultural waste, especially palm waste at a concentration of 4 kg, has achieved the highest averages for the vegetative and flowering growth characteristics and storage qualities of the clove plant.
- In second place came the use of a concentration of 4 kg of wheat straw in influencing the characteristics of vegetative growth, flowering, and storage on clove plants.
- Aloe vera gel or aloe vera juice had a noticeable significant effect on the vegetative and flower growth characteristics and storage characteristics of clove flowers when 20 mg was used in the treatment.

## REFERENCES

1. Abbas, S., Zagloul, M., El-Ghadban, E., El-Kareem, A. & Waly, A. (2016). Effect of foliar application with aloe leaf extract (ALE) on vegetative growth, oil percentage and anatomical leaf structure of sage (*Salvia officinalis* L.) plant under sand soil conditions. *Hortscience Journal of Suez Canal University*, 5(1), 9-14
2. Abdullatif, A. M. S. A., Talib, A. K. & Hamad, R. M. (2019). Effect of Azospirillum brasilense, water type and potassium in the growth and flowering of the Gladiolus plant. *Plant Archives* 19(2), 43-52
3. Abdulridha, A. N. & Essa, S. K. (2023). Use of organic matter and sand in improving properties of some soils of holy karbala governorate affected by phenomenon of cracking. *Iraqi Journal of Agricultural Sciences*, 54(1), 268-281.
4. Al-Bayati, M. Y. I. & Salih, Z. K. (2021) November. Production of *Dianthus Caryophyllus* L. Cultivar (Nanus) as A potted Flowering Plant Using Two Growth Retardants (Alar and Paclobutrazol). In *IOP Conference Series: Earth and Environmental Science*, 92(3), 208-215
5. Al-Hadethi, M. E. A. (2019). Response of hawthorn transplants to biofertilizers and poultry manure. *Iraqi Journal of Agricultural Sciences*, 2(50), 68-82
6. Al-Hadethi, M. E., Taha, F. H. & Abbood, S. M. (2020). Effect of compost prepared from plant residues on olive transplants growth. *International Journal of Agricultural and statistical sciences*, 16(Supplement 1), 1385-1389.



7. Al-Halfi, D. A. & Al-Azzawi, S. S. (2022). Effect of organic fertilizer sources and chemical fertilization on some soil physical traits and yield of summer squash (*cucurbita pepo* L.) ,*Iraqi Journal of Market Research and Consumer Protection*, 14(2), 74-81.
8. ALI, Z. & Abdul-Latif, S. A. (2024). effect of soaking with atonic, water hyacinths compost and biofertilizers on vegetative and flowering growth of tuberose. *Iraqi Journal of Agricultural Sciences*, 55(Special), 136-150.
9. Alkaç, O. S., Güneş, M. & Belgüzar, S. (2023). Effects of organic acids, chemical treatments and herbal essential oils on the vase life of cut carnation (*Dianthus caryophyllus* L.) flowers. *Emirates Journal of Food and Agriculture*.33 (2), 56-68
10. Alkhafaji, A. R. & Khalil, N. H. (2019). Effect of fertilization, rootstocks and growth stimulant on growth of *citrus limon* L. Sapling. *The Iraqi Journal of Agricultural Science*, 50(3), 990-1000.
11. Al-Silmawy, N. A. & Abdul-Ratha, H. A. (2023). Effect of biofertilizer, vermicompost and phosphate fertilizer on growth and yield of cauliflower (*Brassica oleraceae* var. botrytis). *Iraqi Journal of Agricultural Sciences*, 54(2), 505-515.
12. Altaf, K., Younis, A., Ramzan, Y. & Ramzan, F. (2021). Effect of composition of agricultural wastes and biochar as a growing media on the growth of potted Stock (*Matthiola incana*) and Geranium (*Pelargonium* spp). *Journal of Plant Nutrition*, 44(7), 919-930.
13. Alwan, N. M. (2019). Response of growth and production of Gerbera plant (*Gerbera jamesonii*) to chemical fertilizers. *Biochemical & cellular archives*, 19(1) , 55-68.
14. Alwan, N. M. & Sadiq, S. M. (2019). Influence of tuberous root soaking in Salicylic acid and foliar spray of plants with Benzyladenine on growth, flowering and tuberous root. production of *Ranunculus asiaticus*. *Plant Archives*, 19(2),32-47.
15. Alwan, N. M., Aziz, N. K. & Sadiq, S. M. (2018). Effect of the period of soaking and concentrations of salicylic acid in the growth and production of iris. *IOSR Journal of Agricultural Science*,11 (5), 34-41.
16. Alwan, N. M., Kadhim, F. J. & Mahdi, S. A. (2023). Effect of Licorice Organic Media and Disper Bloom Spraying on vegetative growth and Flowering *Gerbera Jamesonii* L. In *IOP Conference Series: Earth and Environmental Science*. 62 (4),42-65
17. Al-Zaidy, A. K. N. & Al-Ubaidy, R. M. (2017). Effect of adding wheat peat and spraying with its extract and organic nutrient vegeamino on growth and yield of red cabbage. *Iraqi Journal of Agricultural Sciences*, 48(2), 165-171
18. Al-Zurfi, M., Bhiah, K. & Ahmed, J. (2023). Response of Chinese Carnation Plant, *Dianthus chinensis*, to Spraying with Putrescine and Roselle Extract in Growth and Flowering Indicators. In *IOP Conference Series: Earth and Environmental Science*, 26(4),203-211.
19. Ameen, S. K., Aziz, N. K. & Alwan, N. M. (2010). Influence of magnetized water with different magnetic fields and phosphorus fertilization on growth and flowering parameters of *Rosa damascena* Mill.*Diyala agricultural sciences journal*, 2(1) 194–207.



20. Bañón, S., González, A., Cano, E. A., Franco, J. A. & Fernández, J. A. (2002). Growth, development and colour response of potted *Dianthus caryophyllus* cv. Mondriaan to paclobutrazol treatment. *Scientia Horticulturae*, 94(3-4): 371-377.
21. Dewanti, M., Kartikaningrum, S. & Mawaddah, M. (2024). The performance and variability of 10 carnation (*Dianthus caryophyllus* L.) genotypes. In *AIP Conference Proceedings*, 29(5), 108-113.
22. El-Attar, A. B. E. D. S. & Sakr, W. R. A. (2022). Extending vase life of carnation flowers by postharvest nano silver, humic acid and *Aloe Vera* gel treatments. *Ornamental Horticulture*, 28, 67-77.
23. Fatmi, U. (2023). Influence of Organic Manures on Growth, Flowering, Quality and Yield of Carnation (*Dianthus caryophyllus*) Cv. Master under Naturally Ventilated Polyhouse Conditions of Prayagraj, India. *International Journal of Plant & Soil Science*, 35(19), 24-30.
24. Hameed, D. M. & Khalil, N. H. (2023). High NPK solution and PGP improved EOS properties of rose grown in cocopeat. *Iraqi journal of agricultural sciences*, 54(3), 850-859.
25. Heidari, S., Mortazavi, S. N., Reezi, S. & Nikbakht, A. (2021). Composted palm waste as an alternative of coco peat in growing media: effects on growth and nutritional status of Lily cut flower (*Lilium spp.*). *Journal of Horticulture and Postharvest Research*, 4(Special Issue-Plant Nutrition in Horticulture), 49-66.
26. Hu, Y., Xu, J. & Hu, Q. (2003). Evaluation of antioxidant potential of *Aloe vera* (*Aloe barbadensis* Miller) extracts. *Journal of agricultural and food chemistry*, 51(26), 7788-7791.
27. Jubeir, S. M. & Ahmed, W. A. (2019). Effect of nanofertilizers and application methods on vegetative growth and yield of date palm. *The Iraqi Journal of Agricultural Science*, 50(1), 267-274.
28. Khalil, N. H. (2023). The effect of organic fertilization on leaf mineral content of three citrus species. In *IOP Conference Series: Earth and Environmental Science*, 58(4), 42-49.
29. Raman Rao, P. V., Rita Raghuvanshi S., Mondal B. C. & Singh S. K. (2013): Effect of *Aloe vera* and clove powder supplementation on carcass characteristics, composition and serum enzymes of Japanese quails. *World*, 8(5), 664-668.
30. Rashed, N. M., Memon, S. A., Turki, S. M. A., Shalaby, T. A. & El-Mogy, M. M. (2024). An analysis of conventional and modern packaging approaches for cut flowers: a review article. *Frontiers in Plant Science*, 15(1), 137-148.
31. Taha, F. H. & Abood, M. R. (2018). Influence of organic fertilizer on date palm cv. Barhi 2. Leaves mineral content. *Iraqi Journal of Agricultural Sciences*, 49(3), 372-376.