ABSTRACT: This work was carried out during two successive seasons of 2017 and 2018 at the Nursery, Department of Floriculture, Ornamental Horticulture and Landscape Gardening, Faculty of Agriculture, Alexandria University, Egypt to investigate the effect of different growing media (calcareous + sand + peat moss at the rate 70 and 40%) and two types of organic compost (rice straw and sugar beet at 30 and 60%) and their interaction on the growth and flowering of Gazania splendens plants. The experimental design in split-plot arrangement, with four replications, in both seasons. The growing media were laid out in the main plots and sub-plots included the different organic composts. Three pots were used as a plot for each treatment. The means of the individual factors and their interactions were compared by L.S.D. test at 5% level of probability. The obtained results can be summarized as follows; most vegetative growth characteristics such as: number of tillers (54.74), number of leaves (239.76) and leaves fresh weight (100.29 g) were significantly affected by organic compost at 60% sugar beet with peat moss treatment, flowers characteristics (inflorescences diameter (9.34 cm) and number of inflorescences (14.87), and inflorescences dry weights (0.459 g), responded significantly to the interaction between the different media and organic compost, the highest significant values were obtained by organic compost at 30 and/ or 60% sugar beet and peat moss. Total chlorophyll (56.23 mg/g f.w.), nitrogen (3.42%), phosphorus (0.74%) in the leaves were the highest with 60% sugar beet and 40% peat moss in both seasons. However, potassium (2.85%) in the leaves gave the highest significant values by 60% sugar beet with calcareous soil (40%) for both seasons. It can be recommended that producing high quality of Gazania splendens plants for different decorative purposes in landscaping can be accomplished by growing plants in the mixture of peat moss (40%) with organic compost at rate 60% sugar beet led to improve its characteristics.

Key words: Gazania, growing media, organic compost, soil amendments, sugar beet, rice straw, perennial plants, Asteraceae.
INTRODUCTION

Gazania rigens (G. splendens) is an herbaceous perennial plant named for a flower shape resembling a medal (Zeng et al., 2016). It is a member of the family Asteraceae, native to South Africa. This plant has become very attractive to domestic producers in the last few years because of its ornamental and medicinal properties, the plants prefer a sunny locations and are tolerant of dryness and poor soils. Plants are salt tolerant and can be used in coastal regions very effectively (Ball, 1991). It is spreading low-growing, half-hardy perennial, growing to 50 cm (20 in) tall and wide, with blue-grey foliage and brilliant yellow, daisy-like composite flower heads throughout the summer (Sardoei et al., 2014).

Most of the newly reclaimed soils in Egypt are sandy and calcareous soils that are of poor available nutrients, to increase their productivity, organic matter application plays an important role to retain the inorganic elements in complex and chelate forms. In this accord, organic manures are well established to be involved in fertilization of plants in almost worldwide, due to their beneficial effects on soil physico-chemical and biological characteristics, which in turn influence the growth and increase plants production (Youssef et al., 2001).

The utilization of agricultural wastes in producing organic fertilizers minimizes the environmental pollution and overcomes the organic matter deficiency. Recycling the agricultural wastes through composting process under aerobic conditions converts them to stabilized and useful compost product (Osman et al., 2008). In Egypt, recycling rice straw and organic wastes is of great concern as well as improvement of soil properties. Rice straw compost could improve both organic waste recycling and soil quality. Rice straw has become a very serious problem in Egypt due to the huge production of straw of about 20 million tons yearly. Being a suitable material for insects and pests, rice straw is considered a problem for the farmers who store it near their houses or fields. The farmers then burn the straw causing black clouds and severe pollution in the Egyptian atmosphere (Afify et al., 2002).

Soil amendments are offered with the promise of improving soil fertility characteristics, such as reducing or eliminating the need for fertilizer elements, making native soil elements more available to plants, providing balanced soil fertility, or inoculating soil with proper or improved strains of bacteria, enzymes or hormones (Davis and Wilson, 2005). Sugar beet residual compost is processed as a local organic material. Sugar beet residual compost is an important issue in ornamental plants production. (Soliman, 2005), mainly due to its enrichment with S, N, P and K mineral elements. Composting is generally defined as the biological oxidative decomposition of organic constituents in wastes under controlled conditions which allow development of aerobic microorganisms that convert biodegradable organic matter into a final product sufficiently stable for storage and application without adverse environmental effects. The main products of aerobic composting are CO₂, H₂O, mineral ions and humus. During composting, organic matter is transformed into a humus-rich product by the action of microorganisms and their enzymes (Vargas-Garcia et al., 2010). Microbes and their secreted enzymes play a key role in biological and bio-chemical transformations of compost matrixes in the composting process (Guo et al., 2012).

So, the main objective of the present investigation was to evaluate the individual and combined effects of three selected growing media and two selected organic compost throughout the growing seasons on growth, flowering as well as the chemical constitutes of Gazania plants.

MATERIALS AND METHODS

The pot experimental was carried out during two successive growing seasons of
2017 and 2018 at the Nursery, Department of Floriculture, Ornamental Horticulture and Landscape Gardening, Faculty of Agriculture, Alexandria University, Egypt. The rooted cuttings of *Gazania splendens* were obtained from the Nursery, Department of Floriculture, Ornamental Horticulture and Landscape Gardening, Faculty of Agriculture, Alexandria University, Egypt. These rooted cuttings were similar in their shape and size with an average length of 10 cm and contained 5 leaves for each one. The rooted cuttings were transplanted on 10th April for the two seasons in 25 cm diameter clay pots (one plant/pot) using the different growing media. The planted Gazania were placed in a partial shade place for three weeks and watered as needed according to the climatic conditions. These plants were left for another 45 days after planting to grow vegetatively by early removing all formed flower buds, then they were arranged in the experiment. Calcareous soil was brought from the Northern Western Coast 37.5 km far off Alexandria City, while, sandy soil was brought from a sand storehouse in Alexandria city. Peat moss was brought from a commercial store in Alexandria city. Then it was mixed with different ratios (30 % and 60%) of the two organic compost, sugar beet compost and rice straw compost. Rice straw compost was obtained from Rice Research and Training Center (RRTC), Sakha, Kafr El-Sheikh, Egypt. Sugar beet compost was obtained from El Noor for Chemicals and Fertilizers, Industrial zone, Nubariya, Cairo-Alexandria desert road, Egypt. Chemical analysis of the two organic compost are presented in Table (1), Physical and chemical properties of the growing media used in the study are presented in Table (2). The components of the used organic compost treatments are shown in Table (3).

The degree of air temperature and relative humidity (%) at the Nursery, Department of Floriculture, Ornamental Horticulture and Landscape Gardening, Faculty of Agriculture, Alexandria University, Egypt. districts were recorded daily during the growing period of two seasons (6 months) for each and the monthly average of them are presented in Table (4).

### Table 1. Chemical analysis of the organic materials.

| Organic materials       | C %  | N %  | C:N Ratio | P %  | K %  |
|-------------------------|------|------|-----------|------|------|
| Rice straw compost      | 30   | 1.80 | 16.67     | 0.59 | 0.81 |
| Sugar beet compost      | 11.05| 0.56 | 20        | 0.57 | 0.75 |

### Table 2. Some physical and chemical characteristics of sand, calcareous soil and peat-moss.

| Soil characteristics                | Sandy soil | Calcareous soil | Peat moss |
|-------------------------------------|------------|-----------------|-----------|
| pH                                  | 8.1        | 8.3             | 6.86      |
| EC (dSm⁻¹) *                        | 1.1        | 3.2             | 0.6       |
| Total CaCO₃ (%)                     | 18.6       | 26.5            | N.D.      |
| TOC (%)                             | 0.26       | 1.28            | 0.10      |
| Particle size percent (%)           |            |                 |           |
| Sand                                | 83.8       | 39.6            | N.D.      |
| Silt                                | 5.2        | 5.2             | N.D.      |
| Clay                                | 11         | 55.2            | N.D.      |
| Soil texture                        |            |                 |           |
| Loamy sand                          |            |                 |           |
| Sandy clay loam                     |            |                 |           |
| Available macro and micro nutrients (mg kg⁻¹) | | | |
| N                                   | 83.2       | 157.4           | 4200      |
| P                                   | 13.3       | 13.8            | 300       |
| K                                   | 109.2      | 281.2           | 900       |

*Saturated soil paste extract.*
The experimental layout was designed to provide split plot design containing four replicates. Main plot was the different media, while organic compost treatments were the sub plot. Each replicate contained 15 treatments (5 organic compost treatments × 3 different media). Three pots were used as plot for each treatment. The means of the individual factors and their interactions were compared by L.S.D. test at 5% level of probability (Gomez and Gomez, 1984).

Data recorded for the vegetative growth parameters included; number of tillers, number of leaves, leaves fresh weight (g) and total plant fresh weight (g). The flowering data were; inflorescences diameter (cm), number of inflorescences and inflorescences dry weights (g). Data recorded for the chemical composition included; leaf total chlorophyll content (SPAD units) were measured according to method described by (Yadava, 1986) using Minolta SPAD chlorophyll Meter Model No. 502. The nitrogen (%) of the dried leaves was determined according to methods described by Evenhuis and Dewaard, (1980). While the potassium and phosphorus (%) were determined according to the method described by Chapman and Pratt (1961).

RESULTS AND DISCUSSION

Vegetative growth characteristics:

1. Number of tillers/plant:

Data presented in Table (5) showed that media had insignificant effects on that trait in the two seasons of study, while compost treatments and the interaction between media and compost treatments had significant effect on number of tillers/plant in the two seasons of study. With regard to different media, the results presented in Table (5) showed that calcareous and peat moss media
gave lower number of tillers/plant with different values with the media used. OCT1 gave lowest number of tillers/plant with all media. Moreover, OCT3 gave similar values in sandy and calcareous media, while it gave significantly higher value with peat moss. OCT4 had significantly low value in sandy medium as 15.93, 20.17 as compared to calcareous (22.91, 29.00), which was, also significantly higher than peat moss (18.37, 23.25). The highest values of 24.16 and 30.58 were obtained using OCT5 and peat moss, in the two seasons, respectively. This improvement in the number of tillers/plant may be attributed to some changes in soil physical and chemical properties of the media through increasing the organic matter and supplying the peat moss. These results were in agreement with those obtained by Singh (1999) on wheat and El-Nady (2015) on Cymbopogon flexuosus plants.

2. Number of leaves/plant:

Data presented in Table (6) showed that peat moss and calcareous gave high number of leaves/plant with values of 176.12, 222.94 in peat moss and 170.82, 216.23 in calcareous medium than sandy soil, in the two seasons, respectively. Means of compost treatments either 30% or 60% sugar beet compost produced the highest number of leaves as 202.97, 256.93 and 192.57, 243.76 in the two seasons, respectively, as compared to the other compost treatments. Concerning the interaction between the two studied factors, i.e. organic compost and media, data showed that OCT1 produced the lowest number of leaves/plant with all media in the two seasons. Moreover, OCT3 showed insignificant response to type of media.

Table 5. Effect of different media, organic compost and their interaction on number of tillers/plant of Gazania splendens during 2017 and 2018 seasons.

| Organic compost treatments (B) | Media (A)       | Mean (B)          |
|-------------------------------|-----------------|------------------|
|                               | Sandy           | Calcareous       | Peat moss |                   |
| First season                  |                 |                  |           |                   |
| OCT1                          | 13.13           | 13.52            | 11.67     | 12.77             |
| OCT2                          | 15.44           | 17.20            | 16.15     | 16.27             |
| OCT3                          | 16.42           | 17.01            | 21.59     | 18.34             |
| OCT4                          | 15.93           | 22.91            | 18.37     | 19.07             |
| OCT5                          | 22.37           | 20.83            | 24.16     | 22.46             |
| Mean (A)                      | 16.66           | 18.30            | 18.39     |                   |
| LSD0.05                       | A= N.S          | B= 1.57          | A×B= 2.72 |                   |
| Second season                 |                 |                  |           |                   |
| OCT1                          | 16.62           | 17.12            | 14.77     | 16.17             |
| OCT2                          | 19.55           | 21.77            | 20.44     | 20.59             |
| OCT3                          | 20.79           | 21.53            | 27.33     | 23.22             |
| OCT4                          | 20.17           | 29.00            | 23.25     | 24.14             |
| OCT5                          | 28.32           | 26.37            | 30.58     | 28.43             |
| Mean (A)                      | 21.09           | 23.16            | 23.28     |                   |
| LSD0.05                       | A= N.S          | B= 1.99          | A×B= 3.45 |                   |

* N.S: not significant.

Table 6. Effect of different media, organic compost and their interaction on number of leaves/plant of Gazania splendens during 2017 and 2018 seasons.

| Organic compost treatments (B) | Media (A)       | Mean (B)          |
|-------------------------------|-----------------|------------------|
|                               | Sandy           | Calcareous       | Peat moss |
| First season                  |                 |                  |           |
| OCT1                          | 95.33           | 123.10           | 119.22    | 112.54            |
| OCT2                          | 108.23          | 145.10           | 174.42    | 142.58            |
| OCT3                          | 186.58          | 191.97           | 178.87    | 185.81            |
| OCT4                          | 187.85          | 224.61           | 196.45    | 202.97            |
| OCT5                          | 196.71          | 169.35           | 211.63    | 192.57            |
| Mean (A)                      | 154.94          | 170.82           | 176.12    |                   |
| LSD0.05                       | A= 14.75        | B= 14.07         | A×B= 24.39|                   |
| Second season                 |                 |                  |           |
| OCT1                          | 120.67          | 155.78           | 150.91    | 142.46            |
| OCT2                          | 137.00          | 183.66           | 220.78    | 180.48            |
| OCT3                          | 236.18          | 243.00           | 226.42    | 235.20            |
| OCT4                          | 237.78          | 284.32           | 248.67    | 256.93            |
| OCT5                          | 249.00          | 214.37           | 267.89    | 243.76            |
| Mean (A)                      | 196.13          | 216.23           | 222.94    |                   |
| LSD0.05                       | A= 18.67        | B= 17.81         | A×B= 30.88|                   |
However, OC\textsubscript{T4} gave low values in sandy and peat moss media compared to calcareous. OC\textsubscript{T5} gave significantly higher number of leaves/plant in peat moss medium (211.63 and 267.89, respectively) as compared to the calcareous soil. This increase in the leaves number of gazania plants may be due to cell multiplication, cell enlargement and cell differentiation, which have resulted in increasing number and area of the leaves, and it may have been related to the favorable effects of such amendments on soil physical and chemical properties besides their nutrients content. Many researches obtained similar results as Sherif and El-Naggar (2005) on \textit{Zantedeschia aethiopica}, and Soliman et al. (2013) on \textit{Gardenia jasminoides}.

3. Leaves fresh weight/plant (g):

Data presented in Table (7) showed that calcareous and peat moss gave highest values of 54.99,70.51 g and 54.25,69.55 g, respectively, in the both seasons, whereas the lowest values were recorded in sandy soil. Means of compost treatments indicated that organic compost at 60% sugar beet produced the highest leaves fresh weight/plant as 74.89 and 96.02 g in both seasons, respectively, while the lowest values resulted from the treatment without any organic compost OC\textsubscript{T1} giving values of 30.13 and 38.63 g, respectively, in the two seasons. For the interactions effect on the leaves fresh weight/plant (g), means presented in Table (7) showed that organic compost treatments gave different values with the media used. OC\textsubscript{T1} without any organic compost produced less leaves fresh weight/plant with all media, while it gave heaviest values of leaves fresh weight/plant as 87.89 and 112.68 from using OC\textsubscript{T5} and peat moss, in the two seasons, respectively, as compared to the other media. Concerning pot media, peat moss showed better leaves fresh weight. The favorable effect of peat moss was mainly due to its higher organic matter content and lower pH value and electrical conductivity EC, and enhancing the accumulation of biosynthesis and for increasing the fresh weight of leaves.

Table 7. Effect of different media, organic compost and their interaction on the leaves fresh weight/plant (g) of \textit{Gazania splendens} during 2017 and 2018 seasons.

| Organic compost treatments (B) | Media (A) | Sandy | Calcareous | Peat moss | Mean (B) |
|--------------------------------|-----------|-------|------------|-----------|----------|
| OC\textsubscript{T1}          |           | 35.88 | 35.40      | 19.10     | 30.13    |
| OC\textsubscript{T2}          |           | 36.36 | 40.58      | 48.20     | 41.71    |
| OC\textsubscript{T3}          |           | 65.05 | 62.58      | 54.12     | 60.58    |
| OC\textsubscript{T4}          |           | 53.31 | 66.22      | 61.93     | 60.49    |
| OC\textsubscript{T5}          |           | 66.60 | 70.21      | 87.89     | 74.89    |
| Mean (A)                      |           | 51.44 | 54.99      | 54.25     | 54.25    |
| LSD\textsubscript{0.05}       | A=1.86    | B=3.23| A×B=5.60  |           |          |

These results were in harmony with, Soliman (2005) on \textit{Lawsonia alba}, Lam. and Hendawy et al. (2015) on \textit{Plantago arenaria}.

4. Leaves dry weight/plant (g):

Data presented in Table (8) showed that media had insignificant effects on that trait, while compost treatments and the interaction between different media and compost treatments had significant effect on leaves dry weight/plant (g) in the two seasons of study. With regard to different media, peat moss and sandy gave the heavier leaves dry weight, though insignificant, than calcareous in both seasons. Organic compost at 60% sugar beet compost, 60% rice straw and 30%sugar beet compost gave statistically the highest values for leaves dry weight/plant in both seasons. For the interaction, organic compost responded significantly and differently to media. OC\textsubscript{T3} showed significant response to media type which gave higher value in peat moss and calcareous media as compared to sandy soil. Meanwhile, OC\textsubscript{T4} had significantly lower value in calcareous and sandy media, while it
Table 8. Effect of different media, organic compost and their interaction on the leaves dry weight/plant (g) of Gazania splendens during 2017 and 2018 seasons.

| Organic compost treatments (B) | Media (A) | Sandy | Peat moss | Mean (B) |
|-------------------------------|-----------|-------|-----------|---------|
|                               | First season |       |           |         |
| OCT1                         | 11.47     | 10.60 | 7.02      | 9.69    |
| OCT2                         | 11.32     | 11.91 | 12.07     | 11.76   |
| OCT3                         | 13.91     | 15.07 | 16.71     | 15.23   |
| OCT4                         | 14.91     | 14.41 | 15.89     | 15.07   |
| OCT5                         | 15.78     | 14.03 | 17.88     | 15.90   |
| Mean (A)                     | 13.48     | 13.20 | 13.91     |         |
| LSD0.05                      | A= N.S    | B=1.69| A×B=2.94  |         |
|                               | Second season |       |           |         |
| OCT1                         | 14.70     | 13.59 | 9.00      | 12.43   |
| OCT2                         | 14.51     | 15.27 | 15.47     | 15.08   |
| OCT3                         | 17.83     | 19.32 | 21.42     | 19.53   |
| OCT4                         | 19.12     | 18.48 | 20.37     | 19.32   |
| OCT5                         | 20.23     | 17.99 | 22.93     | 20.39   |
| Mean (A)                     | 17.28     | 16.93 | 17.84     |         |
| LSD0.05                      | A= N.S    | B=2.17| A×B=3.77  |         |

* N.S: not significant.

These results were in harmony with Algur and Youssef (2008) on Pelargonium zonale.

Flowering characteristics:

1. Inflorescence diameter (cm):

Results presented in Table (9) indicated that inflorescences diameter gave the significantly highest value of 8.65 and 8.29 cm for peat moss in September in both seasons, respectively. On the other hand, the lowest values were recorded in calcareous soil (4.76 cm in August 2017 and 6.01 cm in November 2018). The treatment of OCT5 (60% sugar beet) gave the significantly highest values of 8.84 and 8.82 cm in September 2017 and 2018 respectively, while the lowest values were recorded for control (4.68 cm in August 2017 and 5.91 cm in November 2018), Table (10). Means of inflorescence diameter as affected by growing media and organic compost treatments, in the two seasons, are presented in Table (11) The results indicated that OCT4 showed fairly constant response to the three growing media in all months, whereas all other compost treatments showed significantly higher values of inflorescence diameter in peat moss medium than sandy or calcareous media. The highest value, in all months, was obtained with OCT5 at peat moss medium, whereas the lowest values were recorded for OCT1 in calcareous media. These results may be related to the presence of compost at a suitable ratio which led to improve the soil characters and provide the plants with minerals, consequently the vegetative growth parameters of the used plants would be increased and thus their flower quality was improved. Many researches obtained similar results such as EL-Sayed (1991) on Chrysanthemum and Dianthus, Abdul-Hafeez et al. (2015) on Gardenia jasminoides, and Idrovo et al. (2019) on Rosa hybrida.

2. Number of inflorescences/plant:

Number of inflorescences/plant was higher in peat moss, significantly or insignificantly, in all months except October where calcareous medium gave significantly higher values Table (12). Concerning organic compost treatments Table (13), OCT5 and OCT4 gave higher number of inflorescences/plant in all months, except in October where OCT3 produced the highest value for that trait in the two seasons. With regard to compost treatment and media interaction, data in Table (14) indicated that the interaction between the two studied factors varied with the month. In June, OCT1 gave stable response to all three media, and the highest value for number of inflorescences/plant was obtained with OCT5 and peat moss media.
Table 9. Effect of different media on inflorescences diameter (cm) of *Gazania splendens* during 2017 and 2018 seasons.

| Media      | June 2017 | July 2017 | August 2017 | September 2017 | October 2017 | November 2017 | June 2018 | July 2018 | August 2018 | September 2018 | October 2018 | November 2018 |
|------------|-----------|-----------|-------------|-----------------|---------------|---------------|-----------|-----------|-------------|----------------|---------------|---------------|
| Sand       | 6.53      | 7.25      | 5.80        | 6.90            | 5.07          | 6.66          | 7.97      | 7.74      | 6.89        | 6.87           | 6.16          | 6.46          |
| Calcareous | 6.12      | 6.80      | 5.44        | 6.45            | 4.76          | 6.36          | 7.48      | 7.36      | 6.46        | 6.51           | 5.78          | 6.01          |
| Peat moss  | 7.08      | 7.86      | 6.29        | 7.51            | 5.50          | 6.96          | 8.65      | 8.29      | 7.47        | 7.72           | 6.68          | 7.07          |
| L.S.D0.05  | 0.394     | 0.439     | 0.351       | 0.439           | 0.307         | 0.359         | 0.483     | 0.440     | 0.417       | 0.317          | 0.373         | 0.349         |

Table 10. Effect of organic compost on inflorescences diameter (cm) of *Gazania splendens* during 2017 and 2018 seasons.

| Organic compost Treatments | June 2017 | July 2017 | August 2017 | September 2017 | October 2017 | November 2017 | June 2018 | July 2018 | August 2018 | September 2018 | October 2018 | November 2018 |
|----------------------------|-----------|-----------|-------------|-----------------|---------------|---------------|-----------|-----------|-------------|----------------|---------------|---------------|
| OCT1                       | 6.02      | 6.69      | 5.35        | 6.35            | 4.68          | 6.35          | 7.36      | 7.37      | 6.36        | 6.71           | 5.69          | 5.91          |
| OCT2                       | 6.35      | 7.06      | 5.64        | 6.71            | 4.94          | 6.37          | 7.76      | 7.37      | 6.70        | 6.63           | 6.00          | 6.27          |
| OCT3                       | 6.33      | 7.03      | 5.63        | 6.68            | 4.92          | 6.38          | 7.74      | 7.30      | 6.68        | 6.83           | 5.98          | 6.25          |
| OCT4                       | 6.91      | 7.68      | 6.14        | 7.33            | 5.38          | 6.85          | 8.45      | 8.11      | 7.30        | 7.09           | 6.53          | 6.89          |
| OCT5                       | 7.24      | 8.04      | 6.44        | 7.69            | 5.63          | 7.37          | 8.84      | 8.82      | 7.64        | 7.91           | 6.84          | 7.26          |
| L.S.D0.05                  | 0.228     | 0.254     | 0.203       | 0.254           | 0.177         | 0.255         | 0.279     | 0.260     | 0.241       | 0.399          | 0.215         | 0.254         |

Table 11. Effect of different media, organic compost and their interaction on inflorescences diameter (cm) of *Gazania splendens* during 2017 and 2018 seasons.

| Interaction     | June 2017 | July 2017 | August 2017 | September 2017 | October 2017 | November 2017 | June 2018 | July 2018 | August 2018 | September 2018 | October 2018 | November 2018 |
|-----------------|-----------|-----------|-------------|-----------------|---------------|---------------|-----------|-----------|-------------|----------------|---------------|---------------|
| M1 * OCT1       | 6.03      | 6.70      | 5.36        | 6.35            | 4.69          | 6.08          | 7.30      | 7.21      | 6.36        | 6.47           | 5.69          | 5.91          |
| M1 * OCT2       | 6.54      | 7.27      | 5.82        | 6.92            | 5.09          | 6.59          | 8.00      | 7.66      | 6.91        | 6.67           | 6.18          | 6.48          |
| M1 * OCT3       | 6.34      | 7.04      | 5.63        | 6.69            | 4.92          | 6.36          | 7.74      | 7.30      | 6.69        | 6.65           | 5.98          | 6.25          |
| M1 * OCT4       | 6.96      | 7.73      | 6.18        | 7.38            | 5.41          | 7.10          | 8.50      | 7.93      | 7.34        | 7.08           | 6.57          | 6.94          |
| M1 * OCT5       | 6.75      | 7.50      | 6.00        | 7.15            | 5.25          | 7.17          | 8.25      | 8.58      | 7.12        | 7.49           | 6.37          | 6.71          |
| M2 * OCT1       | 4.80      | 5.33      | 4.26        | 4.98            | 3.73          | 5.83          | 5.86      | 6.39      | 5.06        | 5.95           | 4.53          | 4.54          |
| M2 * OCT2       | 5.78      | 6.43      | 5.14        | 6.08            | 4.50          | 6.07          | 7.07      | 6.78      | 6.10        | 5.76           | 5.46          | 5.64          |
| M2 * OCT3       | 5.98      | 6.64      | 5.31        | 6.29            | 4.65          | 6.08          | 7.30      | 6.94      | 6.31        | 6.53           | 5.64          | 5.85          |
| M2 * OCT4       | 6.85      | 7.61      | 6.09        | 7.26            | 5.32          | 6.65          | 8.37      | 7.99      | 7.23        | 6.58           | 6.47          | 6.82          |
| M2 * OCT5       | 7.19      | 7.99      | 6.39        | 7.64            | 5.59          | 7.19          | 8.79      | 8.69      | 7.59        | 7.72           | 6.79          | 7.20          |
| M3 * OCT1       | 7.25      | 8.05      | 6.44        | 7.70            | 5.63          | 7.13          | 8.85      | 8.51      | 7.64        | 7.70           | 6.84          | 7.26          |
| M3 * OCT2       | 6.70      | 7.47      | 5.98        | 7.12            | 5.23          | 6.45          | 8.22      | 7.66      | 7.10        | 7.45           | 6.35          | 6.68          |
| M3 * OCT3       | 6.68      | 7.42      | 5.94        | 7.07            | 5.19          | 6.68          | 8.17      | 7.66      | 7.05        | 7.30           | 6.31          | 6.63          |
| M3 * OCT4       | 6.94      | 7.71      | 6.17        | 7.36            | 5.39          | 6.79          | 8.48      | 8.42      | 7.32        | 7.60           | 6.55          | 6.92          |
| M3 * OCT5       | 7.77      | 8.64      | 6.91        | 8.29            | 6.04          | 7.76          | 9.50      | 9.18      | 8.20        | 8.53           | 7.34          | 7.85          |
| LSD0.05         | 0.39      | 0.44      | 0.35        | 0.44            | 0.31          | 0.44          | 0.48      | 0.44      | 0.41        | 0.69           | 0.37          | 0.44          |
Table 12. Effect of different media on number of inflorescences/plant of *Gazania splendens* during 2017 and 2018 seasons.

| Media          | June 2017 | July 2017 | August 2017 | September 2017 | October 2017 | November 2017 |
|----------------|-----------|-----------|-------------|----------------|--------------|---------------|
| Sand           | 1.58      | 1.21      | 2.17        | 1.86           | 1.99         | 1.58          |
| Calcareous     | 1.96      | 1.56      | 2.27        | 1.92           | 2.43         | 2.09          |
| Peat moss      | 2.43      | 1.98      | 2.41        | 1.95           | 2.24         | 1.91          |
| LSD0.05        | 0.25      | 0.21      | N.S         | N.S            | 0.33         | 0.38          |

* N.S: not significant.

Table 13. Effect of organic compost on number of inflorescences/plant of *Gazania splendens* during 2017 and 2018 seasons.

| Organic compost Treatments | June 2017 | July 2017 | August 2017 | September 2017 | October 2017 | November 2017 |
|----------------------------|-----------|-----------|-------------|----------------|--------------|---------------|
| OCT1                       | 1.68      | 1.33      | 1.98        | 1.71           | 1.75         | 1.55          |
| OCT2                       | 1.78      | 1.42      | 2.04        | 1.74           | 2.03         | 1.57          |
| OCT3                       | 1.84      | 1.45      | 2.31        | 1.94           | 2.46         | 2.07          |
| OCT4                       | 2.27      | 1.78      | 2.40        | 1.97           | 2.34         | 1.94          |
| OCT5                       | 2.36      | 1.94      | 2.68        | 2.20           | 2.52         | 2.17          |
| LSD0.05                    | 0.40      | 0.40      | 0.37        | N.S            | 0.34         | 0.35          |

* N.S: not significant.

Table 14. Effect of different media, organic compost and their interaction on number of inflorescences/ plant of *Gazania splendens* during 2017 and 2018 seasons.

| Interaction       | June 2017 | July 2017 | August 2017 | September 2017 | October 2017 | November 2017 |
|-------------------|-----------|-----------|-------------|----------------|--------------|---------------|
| M1 * OCT1         | 1.77      | 1.44      | 2.14        | 1.83           | 2.03         | 1.69          |
| M1 * OCT2         | 1.26      | 0.92      | 1.92        | 1.79           | 1.61         | 1.21          |
| M1 * OCT3         | 1.18      | 0.83      | 2.03        | 1.69           | 1.94         | 1.50          |
| M1 * OCT4         | 1.49      | 1.09      | 1.92        | 1.57           | 1.96         | 1.51          |
| M1 * OCT5         | 2.18      | 1.76      | 2.81        | 2.42           | 2.44         | 1.98          |
| M2 * OCT1         | 1.79      | 1.49      | 2.10        | 1.92           | 1.94         | 1.98          |
| M2 * OCT2         | 1.82      | 1.48      | 2.10        | 1.69           | 2.39         | 1.70          |
| M2 * OCT3         | 1.73      | 1.40      | 2.30        | 1.90           | 2.65         | 2.25          |
| M2 * OCT4         | 2.48      | 1.89      | 2.75        | 2.37           | 2.80         | 2.37          |
| M2 * OCT5         | 1.97      | 1.55      | 2.09        | 1.68           | 2.36         | 2.10          |
| M3 * OCT1         | 1.47      | 1.05      | 1.67        | 1.38           | 1.27         | 0.96          |
| M3 * OCT2         | 2.27      | 1.86      | 2.10        | 1.71           | 2.10         | 1.78          |
| M3 * OCT3         | 2.62      | 2.11      | 2.60        | 2.20           | 2.77         | 2.43          |
| M3 * OCT4         | 2.84      | 2.34      | 2.53        | 1.97           | 2.26         | 1.91          |
| M3 * OCT5         | 2.93      | 2.50      | 3.14        | 2.48           | 2.76         | 2.42          |
| LSD0.05           | 0.70      | 0.69      | 0.64        | N.S            | N.S          | N.S           |

* N.S: not significant.
However, in September, the highest value for that trait was obtained from OC_{T4} with calcareous medium. Perner et al. (2007) proposed that this effect was due to the higher water holding capacity of peat moss-based substrates with higher compost addition rate. Previous researches reported similar variability in number of inflorescences between different treatments El-Nagger and El-Nasharty (2009) on Hippeastrum vittatum, Soliman et al. (2013) on Gardenia Jasminoides and Abdul-Hafeez et al. (2015) on Gardenia jasminoides.

3. Inflorescence dry weights (g):

Dry weight of inflorescence Table (15), showed variable response to media in the two seasons. In the first season, sandy and peat moss media showed statistically comparable values for that character, whereas, in July, August and September 2018, peat moss was significantly superior to sandy and calcareous media for that character. With regard to the effect of compost treatment, the means presented in Table (16) showed that OC_{T1} gave the significantly lowest dry weight of inflorescence in all months of the two seasons of study. Treatments of OC_{T2} and OC_{T3} were similar in their effect on inflorescence dry weight and significantly higher than OC_{T1}. OC_{T5} which was 60% sugar beet compost gave significantly heavier inflorescences than OC_{T4} in all months of the two seasons. The interaction between organic compost and media Table (17) varied with the season and month of inflorescence dry weight determination. In June OC_{T2} and OC_{T3} gave statistically similar response using the three media. OC_{T4} was superior in sandy medium, whereas both gave comparable means in calcareous and peat moss media. OC_{T1} gave heaviest inflorescences with peat moss compared to calcareous; OC_{T2} in sandy and peat moss media were superior to calcareous medium and OC_{T3} in peat moss was superior to both calcareous and sandy media. This result could be attributed to the high organic matter content of peat, which increases the microorganism’s activity in the medium. These results of the study are in agreement with those of Atta-Alla et al. (2003) on Gladiolus antakiensis, Sherif and EL-Naggar (2005) on Zantedeschia aethiopica, and Mousa et al. (2015) on Gardenia jasminoides.

Chemical analysis:

1. Chlorophyll content in the leaves (SPAD unit):

Data presented in Table (18) showed that different media, compost treatments and their interactions had significant effects on that trait in the two seasons of study for chlorophyll content in leaves. With regard to different media, results presented in Table (18) showed that peat moss and calcareous media gave higher values of 45.22, 56.52 and 45.10, 56.37, respectively in the two summer seasons. Means of compost treatments effect Table (18) showed that organic compost at 60% sugar beet produced the highest chlorophyll content of 46.92 and 58.65 SPAD respectively, while the lowest values resulted from the treatment without any organic compost 41.57 and 51.96 SPAD in both seasons, respectively. For the interaction effect on that character, means presented in Table (18) showed that organic compost treatments gave different values with the media used. OC_{T3} gave statistically similar values in peat moss and calcareous media, while it gave lowest value with sandy medium. OC_{T4} had significantly high value in calcareous medium of 48.68 and 60.85 SPAD compared to sandy and peat moss medium. Meanwhile, OC_{T5} gave significantly higher value of chlorophyll content with peat moss 49.98 and 62.48 SPAD, respectively. In the both seasons, such increase in photosynthetic pigments formation could be attributed to the difference in their composition. Similar results were noticed by other residues, Youssef (2008) with Pentas lanceolata, El-Naggar and El-Nasharty (2009) on Hippeastrum vittatum,

2. Nitrogen in the leaves (%):

Data presented in Table (19) showed that different media and compost treatment had
Table 15. Effect of different media on number of inflorescences/plant of *Gazania splendens* during 2017 and 2018 seasons.

| Media          | June 2017 | July 2017 | August 2017 | September 2017 | October 2017 | November 2017 | October 2018 | November 2018 |
|----------------|-----------|-----------|-------------|----------------|---------------|---------------|---------------|---------------|
| Sand           | 0.293     | 0.345     | 0.258       | 0.290          | 0.224         | 0.261         | 0.189         | 0.258         |
| Calcareous     | 0.249     | 0.294     | 0.220       | 0.275          | 0.191         | 0.259         | 0.161         | 0.256         |
| Peat moss      | 0.295     | 0.348     | 0.261       | 0.386          | 0.226         | 0.376         | 0.191         | 0.380         |
| L.S.D.0.05     | 0.0137    | 0.0161    | 0.012       | 0.023          | 0.0104        | 0.022         | 0.0088        | 0.0193        |

Table 16. Effect of organic compost on inflorescences dry weight (g) of *Gazania splendens* during 2017 and 2018 seasons.

| Organic compost | June 2017 | July 2017 | August 2017 | September 2017 | October 2017 | November 2017 | October 2018 | November 2018 |
|-----------------|-----------|-----------|-------------|----------------|---------------|---------------|---------------|---------------|
| OC T1           | 0.252     | 0.296     | 0.222       | 0.300          | 0.192         | 0.280         | 0.163         | 0.276         |
| OC T2           | 0.264     | 0.311     | 0.233       | 0.314          | 0.202         | 0.294         | 0.171         | 0.287         |
| OC T3           | 0.269     | 0.316     | 0.237       | 0.305          | 0.205         | 0.288         | 0.174         | 0.286         |
| OC T4           | 0.288     | 0.339     | 0.254       | 0.312          | 0.220         | 0.296         | 0.186         | 0.302         |
| OC T5           | 0.323     | 0.380     | 0.285       | 0.354          | 0.247         | 0.337         | 0.209         | 0.343         |
| L.S.D.0.05      | 0.0155    | 0.0183    | 0.0137      | 0.022          | 0.0119        | 0.0212        | 0.0101        | 0.0169        |

Table 17. Effect of different media, organic compost and their interaction on inflorescences dry weight (g) of *Gazania splendens* during 2017 and 2018 seasons.

| Interaction     | June 2017 | July 2017 | August 2017 | September 2017 | October 2017 | November 2017 | October 2018 | November 2018 |
|-----------------|-----------|-----------|-------------|----------------|---------------|---------------|---------------|---------------|
| M1 * OC T1      | 0.238     | 0.280     | 0.210       | 0.271          | 0.182         | 0.242         | 0.154         | 0.240         |
| M1 * OC T2      | 0.284     | 0.335     | 0.251       | 0.322          | 0.217         | 0.293         | 0.184         | 0.291         |
| M1 * OC T3      | 0.301     | 0.355     | 0.266       | 0.300          | 0.230         | 0.271         | 0.195         | 0.268         |
| M1 * OC T4      | 0.318     | 0.375     | 0.281       | 0.276          | 0.243         | 0.247         | 0.206         | 0.244         |
| M1 * OC T5      | 0.323     | 0.380     | 0.285       | 0.281          | 0.247         | 0.252         | 0.209         | 0.249         |
| M2 * OC T1      | 0.225     | 0.265     | 0.196       | 0.243          | 0.170         | 0.222         | 0.144         | 0.219         |
| M2 * OC T2      | 0.225     | 0.265     | 0.196       | 0.243          | 0.170         | 0.222         | 0.144         | 0.219         |
| M2 * OC T3      | 0.218     | 0.257     | 0.193       | 0.238          | 0.167         | 0.225         | 0.141         | 0.222         |
| M2 * OC T4      | 0.269     | 0.317     | 0.238       | 0.298          | 0.206         | 0.287         | 0.174         | 0.284         |
| M2 * OC T5      | 0.312     | 0.367     | 0.275       | 0.348          | 0.238         | 0.335         | 0.202         | 0.332         |
| M3 * OC T1      | 0.295     | 0.347     | 0.260       | 0.386          | 0.225         | 0.376         | 0.191         | 0.366         |
| M3 * OC T2      | 0.284     | 0.335     | 0.251       | 0.373          | 0.217         | 0.363         | 0.184         | 0.345         |
| M3 * OC T3      | 0.286     | 0.337     | 0.253       | 0.376          | 0.219         | 0.366         | 0.185         | 0.369         |
| M3 * OC T4      | 0.276     | 0.325     | 0.243       | 0.373          | 0.211         | 0.353         | 0.178         | 0.377         |
| M3 * OC T5      | 0.335     | 0.395     | 0.296       | 0.433          | 0.256         | 0.423         | 0.217         | 0.446         |
| L.S.D.0.05      | 0.0268    | 0.031     | 0.0205      | 0.0379         | 0.0202        | 0.0365        | 0.0169        | 0.0209        |
significant effects on that trait in the two seasons of study, while the interactions between media and compost treatments were insignificant in the first season. With regard to the different media, the results presented in Table (19) showed that peat moss and sandy media gave highest nitrogen % in the leaves values of 2.34, 2.98% and 2.19, 1.76%, in the two seasons, respectively. Means of compost treatments Table (19) indicated that organic compost at 60 % sugar beet produced the highest values of nitrogen in leaves as 2.56, 2.37% in the two seasons, respectively. For the interaction effect on that character, the values shown in Table (19), revealed that organic compost treatments gave significant effect only in the second season. OC1: gave low values of nitrogen in the leaves, while the highest value 3.42% was obtained from using OC5 and peat moss compared to calcareous and sandy soil, in the second season. Organic matters such as compost could improve soil structure, improving root development, providing plant nutrients and enhancing nutrient uptake by plants. The present results were in agreement with those obtained by Youssef et al. (1998) on Ocimum basilicum, Gad (2003) on Schefflera actinophylla, and El-Sayed et al. (2012) on Freesia refracta.

### 3. Phosphorus in the leaves (%):

Data presented in Table (20) showed that different media, compost treatment and their interactions had significant effects on phosphorus for that trait in the two seasons of study. With regard to different media effect on phosphorus in the leaves during 2017 and 2018 seasons of study data indicated that peat moss gave higher phosphorus % in the leaves as 0.51 and 0.69%, respectively, in both seasons than sandy and calcareous media. Means of compost treatments indicated that organic compost at 60% sugar beet produced the highest phosphorus in the leaves (0.57 and 0.77%), respectively in the two seasons. With regard to the mean values of phosphorus in the leaves (%) under the effect of different media and the compost treatment

### Table 18. Effect of different media, organic compost and their interaction on the total chlorophyll content (SPAD) in leaves of Gazania splendens during 2017 and 2018 seasons.

| Organic compost treatments (B) | Media (A) | Sandy | Calcareous | Peat moss | Mean (B) |
|-------------------------------|-----------|-------|------------|-----------|----------|
| OC1                           | First season | 43.98 | 39.16     | 41.55     | 41.57    |
| OC2                           |            | 41.78 | 45.66     | 44.33     | 43.93    |
| OC3                           |            | 42.96 | 45.30     | 47.46     | 45.24    |
| OC4                           |            | 44.18 | 48.68     | 42.78     | 45.21    |
| OC5                           |            | 44.10 | 46.69     | 49.98     | 46.92    |
| Mean (A)                      |            | 43.40 | 45.10     | 45.22     |          |
| LSD0.05                       |            | A=1.64 | B=1.32    | A*B=2.30  |          |

### Table 19. Effect of different media, organic compost and their interaction on nitrogen in the leaves (%) of Gazania splendens during 2017 and 2018 seasons.

| Organic compost treatments (B) | Media (A) | Sandy | Calcareous | Peat moss | Mean (B) |
|-------------------------------|-----------|-------|------------|-----------|----------|
| OC1                           | First season | 1.89  | 1.69       | 2.05      | 1.88     |
| OC2                           |            | 2.16  | 1.99       | 2.23      | 2.13     |
| OC3                           |            | 2.11  | 2.07       | 2.28      | 2.19     |
| OC4                           |            | 2.28  | 2.31       | 2.44      | 2.34     |
| OC5                           |            | 2.49  | 2.48       | 2.71      | 2.56     |
| Mean (A)                      |            | 2.19  | 2.13       | 2.34      |          |
| LSD0.05                       |            | A=0.167 | B=0.136   | A*B=N.S   |          |

### Second season

| OC1 | 1.50 | 1.27 | 2.60 | 1.79 |
| OC2 | 1.60 | 1.37 | 2.80 | 1.92 |
| OC3 | 1.75 | 1.32 | 2.97 | 2.01 |
| OC4 | 1.92 | 1.47 | 3.12 | 2.17 |
| OC5 | 2.05 | 1.65 | 3.42 | 2.37 |
| Mean (A) | 1.76 | 1.42 | 2.98 |      |
| LSD0.05 | A=0.231 | B=0.077 | A*B=0.134 |      |

* N.S: not significant.
interactions in the two seasons, data showed that OC₇ gave low values of phosphorus in the leaves with all media. Meanwhile, OC₅ gave high values in sandy and peat moss media compared to calcareous medium. These results were in agreement with Saadawy et al. (2005) on Peperomia, Schefflera and Syngonium, El-Sayed et al. (2012) on Freesia refracta, and Abdul-Hafeez et al. (2015) on Gardenia jasminoides.

4. Potassium in the leaves (%):

Data in Table 21 showed that different media, organic compost treatments and their interactions had significant effects on that trait in the two seasons of study. With regard to different media, results presented in Table 21 showed that peat moss and sandy media gave statistically similar values, while gave higher value with calcareous as 2.09 and 2.38%, respectively in the two seasons. Means of compost treatments Table (21) indicated that organic compost at 60%sugar beet and 60% rice straw gave highest percentage of potassium in leaves as 2.21, 2.52% and 2.06, 2.34%, respectively in the two seasons. With regard to the mean of potassium in leaves (%) under the effect of different media and the compost treatment interactions in the both seasons. Data showed that OC₇ gave stable response to all three media, whereas OC₅ had significantly highest percentage of potassium % in leaves in sandy medium compared to calcareous and sandy media. OC₅ gave low values with peat moss compared to calcareous and sandy soil. These results were in agreement with those of Abou-Hussien (2012) on Origanum majorana, Mazher et al. (2012) on Amaranthus tricolor, Abou Seedo et al. (2014) on Salvia officinalis, and Abdul-Hafeez et al. (2015) on Gardenia jasminoides.

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