ISSN 1110-0419

*Annals Of Agric. Sc., Moshtohor,*
*Vol. 46(1): Ho 21-30, (2008).*

# RESPONSE OF GERBERA TO MINERAL FERTILIZERS IRRIGATION INTERVALS AND GROWTH RETARDANTS

BY

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## ABSTRACT

***This*** study was conducted during two successive seasons of 2005 and 2006 at the Experimental Farm of Faculty of Agriculture at Moshtohor to investigate the effect of commercial NPK fertilizer, regime of irrigation and growth retardants on gerbera growth, flowering and offsets yield. The treatments of ammonium nitrate fertilizer were 12.5 and 18.8 and 25.0 g/plant, while for calcium super phosphate treatments were 15.5, 23.3 and 31.0 g/plant. However, potassium sulphate were 48.0, 72.0 and 96.0 g/plant. The complete NPK fertilizer was at two levels as the first was 12.5 + 15.5 + 48.0 g/plant, and the second was 18.8 + 23.3 + 48.0 g/plant. Each amount of fertilizer treatment was divided into 3 equal parts and dressed at 1, 2 and 3 months after planting.

The obtained results showed that, adding ammonium nitrate at 18.8 g/plant significantly increased flower number/plant and both flower fresh and dry weights in both seasons. However adding complete fertilizer at the first level, produced the highest flower number/plant and the highest offsets yield/plant in both seasons.

As for the irrigation treatments, three regimes irrigation were suggested 1) irrigate every 7 days in summer then 10 days in winter, 2) irrigation every 10 days in summer then every 15 days in winter, 3) irrigate every 13 days in summer then every 20 days in winter, the control was irrigated every week. The obtained results showed that, the second regime was useful for producing flowers suitable to cut production, while the third regime was suitable to produce the largest offsets yield meanwhile, the first regime may be useful to produce the highest fresh leaves/plant. The obtain an antimicrobial substance from gerbera fresh leaves.

As for growth retardants, the treatments were cycocel at 500 and 1000 ppm and dikegulac at 0.2 and 0.4%. The obtained results showed that spraying gerbera foliage with 500 ppm cycocel significantly increased production of offsets yield with increasing most of the flowering parameters. Regard ornamental appearance treating gerbera with any concentration produced better appearance because, due to shortening plants, more than their flower especially at the second season (plants of two years old).

## INTRODUCTION

*Gerbera jamesonii* plant Fam. Asteraceae in mainly propagate by seeds, cuttings and offsets (Bailey, 1978). It has a considerable economical value owing to their beautyful shape and yearly exports more than five millions gerbera pot plant (I.T.C., 1997). However, some flower growers in Egypt use local seeds of gerbera, which produce seedlings with high genetic variability, thus their production is the second grade and always in tumble down. Therefore, the main target of this investigation is to produce large number of new offsets (which could used in vegetative propagation) as well as time producing high quality gerbera flowers by adding some fertilizers or by finding the most suitable water regime meantime, some growth retardants were sprayed to obtain the proper case of producing gerbera offsets with the best quality flowers yield. On this concern, Vass and Hargital (1986) on gerbera cv. Marleen, reported that plants demanded a continuous N

supply during vegetative growth, the soluble N content of soil gradually decreased even when nutrient solutions were applied. However, Holcomb *et al.* (1992) on Asiatic lily, stated that good market quality was produced with 75 mg N/litre. While, Nasr (1997) on gerbera found that, formula of NPK at 1:2:1 or 2:1:1 were the most effective treatments for increasing number of offsets formed by the plants, but did not affect plant height in the first season, whereas some treatments produced a significant increase in the second one.

On the other hand, the irrigation period of plants could affect growth and flowering of plants, in this concern, Poole and Conover (1986) obtained the better Syngonium growth with higher frequency of irrigation. While, Conover *et al.* (1995) obtained the greatest Dieffenbachia growth at 3 irrigations per week. However, Maggio *et al.* (1995) found that the irrigation of gladioli had no effect on both number or weight of corms.

On the second hand, spraying the foliage of plants with some growth retardants could stimulate growth of lateral shoots or produce more compact or attractive growth. In this purpose, Mao *et al.* (1991) controlled the height of potting *Salvia splendens* plants with largest flowers number by spraying the foliage with PP-333 at 40-80 ppm. While, Lozoyasaldana (1994) produced most attractive and compact pot plants of Chrysanthemum by foliage single spray of 100 ppm PP-333 one month after potting.

Kirstensen and Adriansen (1988) found that, one spray with 10 mg/L PP-333 doubled inflorescence No. \ per pot, of *Franciscana variegata*.

Wilkinson and Richards (1988) found that foliar spray of *Camellia willia* cvs Water Lily and Debbie with PP-333 reduced plant height of both cultivars by about 30% and increased the total number of open flowers .

Tayama and Carver (1990) sprayed *Pelargonium hortorum* plants with PP-333 at 15 ppm. They controlled the stem elongation but did not affect days to anthesis or inflorescence number.

Therefore, the main objective of this study is to gain more new gerbera offsets around mother plants with great degree of flowers quality.

## MATERIALS AND METHODS

**Plant material:**

*Gerbera jamesonii* mother plants were selected from a flowering local variety with a rose color flower, which were grown in Floriculture Farm of Faculty of Agriculture, Moshtohor, Benha University on October 2004. The uniformly plants were planted in nursery, then their offsets around the mother plants were harvested and planted in a half shade place until rooted. The uniformly seedling. with 4-6 leaves, 10-17 cm length and average weight of 105-109 g were planted on first week of April 2005 in soil of the field, both physical and chemical properties of it were as follows:

The physical properties of the soil:

| Coorse sand (%) | Fine sand (%) | Silt (%) | Clay (%) | Organic matter (%) |
|---|---|---|---|---|
| 7.45 | 16.40 | 33.63 | 40.90 | 1.62 |

**The chemical properties of the soil:**

| $CO_3$ | $HO_3$ | $Cl^-$ | $SO_4$ | $Ca^{++}$ | $Mg^{++}$ | $Na^+$ | $K^+$ | Available | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | N | P |
| 0.00 | 1.99 | 1.40 | 0.68 | 1.28 | 0.71 | 1.70 | 0.33 | 82.51 | 1.98 |

* Soil extraction 1.20 calculated as mille equivalents in 100 g of the soil.

The plants subjected to study of the three objectives as follows:

1- Effect of nutrient fertilizers.
2- Effect of irrigation regime.
3- Effect of growth retardants.

**Effect of nutrient fertilizers:**

The selected seedlings were planted in plots of 1x1 $m^2$, each one contained 8 uniformly seedlings at a distance of 25x50 cm. The treatments were as follows:

1- Control 0.0 g ammonium nitrate/plant.
2- Ammonium nitrate at 12.509g /plant.
3- Ammonium nitrate at 18.759 g /plant.
4- Ammonium nitrate at 25.000 g /plant.
5- Calcium super phosphate at 15.51 g /plant.
6- Calcium super phosphate at 23.25 g /plant
7- Calcium super phosphate at 31.00 g /plant
8- Potassium sulphate at 48.00 g /plant.
9- Potassium sulphate at 72.00 g /plant.
10- Potassium sulphate at 96.00 g /plant.
11- The formula of NPK at 12.5:15.5:48 g/plant.
12- The formula of NPK at 18.8:23.3:72 g/plant.

- Ammonium nitrate (33.3%).
- Calcium super phosphate (15.5% $P_2O_5$)
- Potassium sulphate (48% $K_2O$).

The amount of fertilizers was divided in to three equal parts and dressed at 3 times after one, two and three months from trans-planting, respectively.

**Effect of regime irrigation:**

This part of investigation aimed to study the effect of period of irrigation on gerbera flowers quality and average of offsets/ plant. Gerbera seedlings were placed in 3 different plots which were separated by a walking area of 1.5 m in wide. The plot area was 1x1 $m^2$ and contained 8 seedlings. The treatments of regime irrigation were as follows:

1- Irrigate every 7 days in summer or every 10 days in winter to attain 80-90% F.C.* ( 4000 $m^3$/feddan).
2- Irrigate every 10 days in summer or every 15 days in winter to attain 70-80% F.C. (2080 $m^3$/feddan).
3- Irrigate every 13 days in summer or every 20 days in winter to attain 50-59% F.C. ( 1000 $m^3$/feddan).

**Effect of some growth retardants:**

This part of investigation aimed to obtain good appearance and quality of gerbera flowers yield, as the treatments were as follows:

1- Control.
2- Cycocel at 500 ppm.
3- Cycocl at 1000 ppm.
4- Dikegulac sodium at 0.2%.
5- Dikegulac sodium at 0.4%.

**Data recorded:**

The final data were recorded during the second week of October as follows:

1- Number of offsets/plant.
2- Number of leaves/plant.
3- Leaf length (cm).
4- Number of flower head/plant.
5- Diameter of flower head at 9-10 cm up the soil surface.
6- Flower head length (cm).
7- Flower head fresh weight (g).
8- Flower heads dry weight (g).

Three replicates of each treatment of nutrient fertilizers, regime irrigation and foliar application of growth retardants treatments were used. Using analysis of variances was carried out, significant differences among the means of various treatments were compared using the L.S.D. at 5 and 1% levels according Snedecor and Cochran (1982). The same work was repeated in the second season at the same date following the same method to prepared the new offsets, and all mention treatments were repeated for plants of the second season.

* F.C.: Field capacity.

## RESULTS AND DISCUSSION

**Effect of NPK nutrient fertilization on vegetative growth and offsets production:**

Data presented in Table (1) show the effect of commercial NPK nutrient fertilizers on leaf number, leaf length and offsets production/plant during the seasons of 2005 and 2006. It is quite noticed that increasing the added amount of ammonium nitrate/plant caused an increase in leaf number/plant in both seasons. However, the longest leaves were notice with adding 18.8 g/plant or adding N:P:K formula at 12.5 + 15.5 + 48.0 g/plant.

The above results of vegetative growth are in parallel with those obtained by Vass and Hargital (1986) who found that gerbera cv. Marlcen demanded a continuous nitrogen supply, during vegetative growth. They added that, the soluble nitrogen content of the soil gradually decreased even when nutrient solutions were applied.

As for the offsets production it is quite noticed that adding the NPK nutrient fertilizers at the formula of 12.5:15.5:48.0 g/plant, respectively, significantly increased offsets number per plant. The next value of this respect resulted from the plants which received complete nutrient fertilizer as NPK at 18.8:23.3:72.0 g/plant. The above results of offsets production are in agreement with those obtained by Naser (1997) who found that adding NPK fertilizers at formul of 1:2:1 or 2:1:1 were the most effective treatments for increasing offsets number of gerbera.

**Effect of NPK nutrient fertilizers on flowering parameters:**

Data in Table (2) shows the effect of commercial NPK nutrient fertilizers on gerbera flowering parameter during seasons of (2005) and (2006), it quite notice that, the second level of ammonium nitrate 18.8 g/plant significant increase flower number/plant, flower fresh and dry weights in both seasons. However, the third level 25.0 g/plant decrease the flower number/plant, also both fresh and dry weight of flower (Table 3), it could due to increase the concentration of fertilizers around the root of plants. The same pattern was found with flower diameter, where the highest level of ammonium nitrate 25.0 g/plant produced the smallest flower diameter in two seasons.

**Table (1): Effect of commercial (NPK) nutrient fertilizers on offsets production and vegetative growth of Gerbera (*Gerbera jamesonii* L.) during 2005 and 2006 seasons.**

| Treatments | No. of offsets/plant | | No. of leaves/plant | | Leaf length (cm) | |
|---|---|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season |
| Control (0.0 g/plant) | 6.3 | 12.3 | 46.0 | 73.0 | 29.3 | 36.0 |
| Ammonium nitrate | | | | | | |
| 12.5 g/plant | 8.3 | 14.7 | 51.7 | 72.0 | 33.7 | 40.0 |
| 18.8 g/plant | 7.0 | 15.3 | 67.7 | 95.7 | 37.0 | 44.7 |
| 25.0 g/plant | 6.7 | 14.3 | 81.0 | 111.7 | 32.0 | 38.7 |
| Calcium super phosphate | | | | | | |
| 15.5 g/plant | 7.0 | 13.3 | 65.7 | 80.7 | 29.3 | 38.3 |
| 23.3 g/plant | 7.3 | 14.0 | 64.3 | 97.0 | 30.0 | 35.0 |
| 31.0 g/plant | 7.0 | 12.3 | 68.0 | 108.7 | 30.3 | 39.0 |
| Poatassium sulpate | | | | | | |
| 48.0 g/plant | 7.7 | 12.7 | 46.3 | 86.0 | 29.0 | 39.0 |
| 72.0 g/plant | 5.7 | 14.3 | 47.0 | 74.7 | 31.3 | 41.3 |
| 96.6 g/plant | 5.3 | 13.0 | 46.7 | 90.0 | 31.0 | 40.7 |
| N : P : K 12.5+15.5+48 g/plant | 10.3 | 17.3 | 67.3 | 151.0 | 37.0 | 46.0 |
| N : P : K 18.8+23.3+72 g/plant | 10.0 | 15.7 | 69.7 | 107.0 | 32.0 | 44.3 |
| L.S.D. at 5% | 1.7 | 3.2 | 7.1 | 14.9 | 5.1 | 3.1 |
| L.S.D. at 1% | 2.3 | 4.4 | 9.7 | 20.3 | 6.9 | 4.2 |

Table (2): Effect of commercial (NPK) nutrient fertilizers on flowering parameters of Gerbera (*Gerbera jamesonii* L.) during 2005 and 2006 seasons.

| Treatments | No. of flower head | | Diameter of flower head (cm) | | Thickness of flower head (cm) | | Length of flower head (cm) | |
|---|---|---|---|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season |
| Control (0.0 g/plant) | 6.0 | 8.3 | 5.0 | 5.3 | 0.377 | 0.387 | 28.0 | 41.3 |
| Ammonium nitrate | | | | | | | | |
| 12.5 g/plant | 7.7 | 11.7 | 8.3 | 8.7 | 0.453 | 0.401 | 29.3 | 42.7 |
| 18.8 g/plant | 8.0 | 13.0 | 7.3 | 8.0 | 0.497 | 0.539 | 36.7 | 48.3 |
| 25.0 g/plant | 6.3 | 11.0 | 7.7 | 6.0 | 0.468 | 0.512 | 38.3 | 51.3 |
| Calcium super phosphate | | | | | | | | |
| 15.5 g/plant | 6.7 | 10.3 | 5.0 | 5.7 | 0.369 | 0.408 | 28.3 | 35.7 |
| 23.3 g/plant | 7.0 | 10.3 | 5.0 | 5.7 | 0.432 | 0.503 | 30.0 | 41.0 |
| 31.0 g/plant | 7.3 | 10.7 | 5.3 | 6.0 | 0.474 | 0.486 | 28.0 | 42.7 |
| Poatassium sulpate | | | | | | | | |
| 48.0 g/plant | 6.7 | 8.7 | 6.7 | 7.3 | 0.325 | 0.396 | 31.7 | 46.7 |
| 72.0 g/plant | 7.0 | 9.0 | 6.3 | 6.3 | 0.398 | 0.417 | 26.3 | 40.0 |
| 96.6 g/plant | 6.0 | 9.0 | 7.3 | 8.0 | 0.461 | 0.452 | 28.3 | 41.3 |
| N : P : K 12.5+15.5+48 g/plant | 9.3 | 13.3 | 8.3 | 8.0 | 0.492 | 0.585 | 32.0 | 59.7 |
| N : P : K 18.8+23.3+72 g/plant | 10.3 | 13.3 | 9.0 | 7.7 | 0.53 | 0.597 | 31.3 | 45.7 |
| L.S.D. at 5% | 1.9 | 1.5 | 1.9 | 2.0 | 0.05 | 0.08 | 6.0 | 6.7 |
| L.S.D. at 1% | 2.6 | 2.1 | 2.6 | 2.7 | 0.07 | 0.10 | 8.1 | 9.1 |

On the other hand, increasing the amount of calcium super phosphate did not affect the most parameters of gerbera flowers. However, adding potassium sulphate at 96.0 g/plant increased length, diameter and thickness of flower heads.

As for adding the mixture of NPK fertilizers at 18.8:23.3:48.0 g/plant it registed the maximum flower number/plant with the largest flower length and thickness in both seasons. The next values were noticed with plants witch received the of mixture NPK fertilizers at 12.5:15.5:48.0 g/plant.

Regard the ornamental showing value, the treatments of 18.8 g ammonium nitrate/plant, 23.3 g calcium super phosphate/ plant, 96.0 g potassium sulphate and the treatment of mixture NPK fertilizer of both levels produced an attractive ornamental plant with good appearance between length of leaves and flowers (Tables 1 and 2). On the other hand, the last treatment of mixture of NPK fertilizers (both levels)did not create attractive ornamental plant, but produced the maximum offsets number around the mother plants (Tables 1 and 2).

**Effect of irrigation intervals:**

In general, water regime for gerbera irrigation may be useful to maximize cut flowers of gerbera that means the first irrigation regime (every 7 days in summer then 10 days in winter) was very useful to produce the highest number of fresh leaves (113 leaves/plant) (Table 4).

Table (3): Effect of commercial (NPK) nutrient fertilizers on flower head fresh and dry weights of Gerbera (*Gerbera jamesonii* L.) during 2005 and 2006 seasons.

| Treatments | Fresh weight (g) | | Dry weight (g) | |
|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season |
| Control (0.0 g/plant) | 22.0 | 26.3 | 2.4 | 2.6 |
| Ammonium nitrate | | | | |
| 12.5 g/plant | 25.7 | 24.0 | 2.8 | 3.0 |
| 18.8 g/plant | 28.0 | 27.3 | 3.2 | 4.0 |
| 25.0 g/plant | 26.0 | 23.0 | 3.0 | 3.7 |
| Calcium super phosphate | | | | |
| 15.5 g/plant | 22.3 | 26.7 | 2.7 | 2.9 |
| 23.3 g/plant | 23.0 | 23.7 | 3.3 | 3.9 |
| 31.0 g/plant | 26.0 | 32.7 | 3.6 | 4.9 |
| Poatassium sulpate | | | | |
| 48.0 g/plant | 22.7 | 26.3 | 2.2 | 2.3 |
| 72.0 g/plant | 24.7 | 28.0 | 2.9 | 2.8 |
| 96.6 g/plant | 25.0 | 27.0 | 2.2 | 2.9 |
| N : P : K 12.5+15.5+48 g/plant | 30.7 | 39.3 | 4.3 | 5.6 |
| N : P : K 18.8+23.3+72 g/plant | 29.0 | 32.7 | 4.8 | 4.5 |
| L.S.D. at 5% | 3.0 | 3.8 | 0.4 | 0.5 |
| L.S.D. at 1% | 4.1 | 5.2 | 0.6 | 0.7 |

Table (4): Effect of irrigation period on offsets production and vegetative growth of Gerbera (*Gerbera jamesonii* L.) during 2005 and 2006 seasons.

| Treatments | No. of offsets/plant | | No. of leaves/plant | | Leaf length (cm) | |
|---|---|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season |
| Control | 6.3 | 12.3 | 46.0 | 73.0 | 29.3 | 36.0 |
| Regime irrigation A* | 6.0 | 9.7 | 46.3 | 113.3 | 31.0 | 36.7 |
| Regime irrigation B** | 6.7 | 12.3 | 40.0 | 101.0 | 29.0 | 33.7 |
| Regime irrigation C*** | 5.7 | 19.3 | 31.0 | 53.0 | 25.0 | 32.7 |
| L.S.D. at 5% | 1.4 | 2.2 | 19.3 | 21.9 | 2.9 | 2.8 |
| L.S.D. at 1% | 2.1 | 3.4 | 29.2 | 33.2 | 4.4 | 4.2 |

Control: weekly irrigation in 10th summer or winter.
* A: irrigation every 7 days in summer, then every 10 days in winter.
** B: irrigation every 10 days in summer, then every 15 days in winter.
*** C: irrigation every 13 days in summer, then every 20 days in winter.

However the second irrigation regime (every 10 days in summer then every 15 days in winter) was useful to produce good pot plant. On the other hand, the third irrigation regime (every 13 days in summer than every 20 days in winter) was useful to produce the highest new offsets number (19.3 offsets/ plant).

As for, the ornamental show, it could be noticed that the effect of interval irrigation was more promouncae with gerbera two years old since the flower heads of plants were taller than leaves which added more attractive appearance to plants, while all leaves plants of the first season (one year old) were shorter than their flower stalks.

Table (5): Effect of irrigation period on flowering parameters of Gerbera (*Gerbera jamesonii* L.) during 2005 and 2006 seasons.

| Treatments | No. of flower head | | Diameter of flower head (cm) | | Thickness of flower head (cm) | | Length of flower head (cm) | |
|---|---|---|---|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season |
| Control | 6.0 | 8.3 | 5.0 | 5.3 | 0.377 | 0.387 | 28.0 | 41.3 |
| Regime irrigation A* | 7.3 | 7.0 | 7.3 | 6.3 | 0.342 | 0.366 | 29.3 | 44.0 |
| Regime irrigation B** | 6.0 | 8.0 | 5.3 | 5.7 | 0.379 | 0.399 | 23.3 | 38.3 |
| Regime irrigation C*** | 5.7 | 6.7 | 4.7 | 4.7 | 0.288 | 0.291 | 21.0 | 34.0 |
| L.S.D. at 5% | 1.6 | 1.8 | 1.6 | 1.5 | 0.03 | 0.03 | 6.4 | 9.7 |
| L.S.D. at 1% | 2.4 | 2.7 | 2.4 | 2.2 | 0.05 | 0.04 | 9.6 | 14.6 |

Control: weekly irrigation in 10th summer or winter.
* A: irrigation every 7 days in summer, then every 10 days in winter.
** B: irrigation every 10 days in summer, then every 15 days in winter.
*** C: irrigation every 13 days in summer, then every 20 days in winter.

Table (6): Effect of irrigation period on flower head fresh and dry weights of Gerbera (*Gerbera jamesonii* L.) during 2005 and 2006 seasons.

| Treatments | Fresh weight (g) | | Dry weight (g) | |
|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season |
| Control | 22.0 | 26.3 | 2.4 | 2.6 |
| Regime irrigation A* | 26.7 | 30.0 | 2.7 | 3.1 |
| Regime irrigation B** | 19.3 | 27.3 | 2.3 | 2.9 |
| Regime irrigation C*** | 16.0 | 19.7 | 2.7 | 2.6 |
| L.S.D. at 5% | 6.2 | 6.5 | 0.4 | 0.6 |
| L.S.D. at 1% | 9.4 | 9.8 | 0.6 | 0.9 |

Control: weekly irrigation at 10th days in summer or winter.
* A: irrigation every 7 days in summer, then every 10 days in winter.
** B: irrigation every 10 days in summer, then every 15 days in winter.
*** C: irrigation every 13 days in summer, then every 20 days in winter.

**Effect of some growth retardants (cycocel and dikegulac sodium):**

Data presented in Tables (7 and 8) showed the effect of cycocel at 500 ppm and 1000 ppm, dikegulac sodium at 0.2 and 0.4% on gerbera growth during seasons of 2005 and 2006. It was clear that, spraying with 500 ppm cycocel or 0.4% dikegulac sodium significantly reduced leaf length, flower length and both flowers and offsets number per plant. However spraying 1000 ppm cycocel produced the most attractive plants where increased both vegetative and flowering parameters as leaf length, leaf number, flower number, flower diameter, flower thickness, flower length and offset number/plant in both seasons.

The reductory effect of the low concentration of cycocel was in complete agreement with the finding of Wilkinson and Richards (1988) who found that foliar spray of *Camellia willia* reduced plant height. Also Tayama and Carver (1990) found that, spraying *Pelargonium hortorum* plants with PP-333 at 15 ppm controlled stem elongation. However, the stimulatory effect of some growth retardants agreed with those obtained by Kirstensen and Adriansen (1988) who found that, one spray with 10 mg/L PP-333 doubled inflorescences number per pot of *Francisceana variegata*.

**Table (7): Effect of some growth retardants (cycocel and dikegulac sodium) on offsets production and vegetative growth of Gerbera (*Gerbera jamesonii* L.) during 2005 and 2006 seasons.**

| Treatments | No. of offsets/plant | | No. of leaves/plant | | Leaf length (cm) | |
|---|---|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season |
| Control | 6.3 | 12.3 | 46.0 | 73.0 | 29.3 | 36.0 |
| Cycocel at 500 ppm | 5.7 | 12.3 | 35.0 | 87.3 | 32.0 | 31.0 |
| Cycocel at 1000 ppm | 7.3 | 15.7 | 40.7 | 100.7 | 33.7 | 39.7 |
| Dikegulac at 0.2% | 3.7 | 12.0 | 36.0 | 49.3 | 26.0 | 28.0 |
| Dikegulac at 0.2% | 5.3 | 14.0 | 46.7 | 113.3 | 34.0 | 35.3 |
| L.S.D. at 5% | 2.7 | 3.3 | 11.3 | 18.9 | 7.0 | 5.6 |
| L.S.D. at 1% | 4.1 | 4.9 | 17.1 | 28.7 | 10.5 | 8.6 |

On the other hand, some growth retardants could be used to control the plant height of potting plants and increase flower number (Mao *et al.*, 1991), or produce an attractive and compact pot plant (Lozoyasaidana, 1994). However, all treatments of growth retardants produced good appearance plants (Tables, 7 and 8). Where always the leaves of all treatments were in lower level than their flower. Thus, it could be concluded that spraying gerbera with any concentration of growth retardants produce gerbera plants with good ornamental appearance.

**Table (8): Effect of some growth retardants (cycocel and dikegulac) on flowering parameters of Gerbera (*Gerbera jamesonii* L.) during 2005 and 2006 seasons.**

| Treatments | No. of flower head | | Diameter of flower head (cm) | | Thickness of flower head (cm) | | Length of flower head (cm) | |
|---|---|---|---|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season | 1st season | 2nd season |
| Control | 6.0 | 8.0 | 5.0 | 5.3 | 0.377 | 0.387 | 28.0 | 41.3 |
| Cycocel at 500 ppm | 5.0 | 7.7 | 7.7 | 6.3 | 0.393 | 0.391 | 37.7 | 37.7 |
| Cycocel at 1000 ppm | 8.0 | 14.7 | 9.3 | 7.7 | 0.518 | 0.563 | 55.0 | 44.7 |
| Dikegulac at 0.2% | 4.0 | 5.3 | 5.7 | 6.0 | 0.275 | 0.277 | 41.3 | 33.0 |
| Dikegulac at 0.2% | 4.3 | 6.0 | 7.3 | 7.3 | 0.324 | 0.303 | 48.0 | 38.3 |
| L.S.D. at 5% | 1.9 | 2.2 | 0.9 | 1.4 | 0.010 | 0.060 | 13.9 | 9.2 |
| L.S.D. at 1% | 2.9 | 3.4 | 1.3 | 2.1 | 0.020 | 0.100 | 21.0 | 13.9 |

**Table (9): Effect of some growth retardants (cycocel and dikegulac sodium) on flower heads fresh and dry weights of Gerbera (*Gerbera jamesonii* L.) during 2005 and 2006 seasons.**

| Treatments | Fresh weight (g) | | Dry weight (g) | |
|---|---|---|---|---|
| | 1st season | 2nd season | 1st season | 2nd season |
| Control | 22.0 | 26.3 | 2.4 | 2.6 |
| Cycocel at 500 ppm | 28.3 | 33.7 | 3.2 | 4.0 |
| Cycocel at 1000 ppm | 31.0 | 59.0 | 3.2 | 6.1 |
| Dikegulac at 0.2% | 13.3 | 22.0 | 1.9 | 2.1 |
| Dikegulac at 0.2% | 16.3 | 23.0 | 1.6 | 2.6 |
| L.S.D. at 5% | 3.7 | 2.8 | 0.6 | 0.7 |
| L.S.D. at 1% | 5.6 | 4.3 | 0.9 | 1.1 |

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## استجابة الجربيرا للتسميد المعدنى وفترات الرى ورش مؤخرات النمو


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أجرى هذا البحث بمزرعة البحوث بقسم البساتين – كلية الزراعة – جامعة بنها خلال موسمين متتاليين ٢٠٠٥، ٢٠٠٦ لدراسة تأثير استخدام الأسمدة الأزوتية والفوسفورية والبوتاسية التجارية وتأثير تباعد فترات الرى وكذلك الرش ببعض معيقات النمو على النمو الخضرى والقياسات الزهرية ومحصول الخلفات لنباتات الجربيرا. وقد استخدمت نترات الأمونيوم بمعدلات ١٢,٥، ١٨,٨، ٢٥,٠ جرام/نبات بينما استخدم سوبر فوسفات الكالسيوم بمعدلات ١٥,٥، ٢٣,٣، ٣١,٠ جرام/نبات وكذلك استخدمت كبريتات البوتاسيوم بمعدلات ٤٨,٠، ٧٢,٠، ٩٦,٠ جرام/نبات. كما أضيفت الأسمدة الثلاثة معا فى مخلوط بمعدلين الأول ١٢,٥ + ١٥,٥ + ٤٨ جرام/نبات والثانى ١٨,٨ + ٢٣,٣ + ٧٢,٠ جرام/نبات على التوالي. وفى جميع نعاملات التسميد المعدنى اضيفت الكمية على ثلاث دفعات متساوية بحيث كانت الأولى بعد شهر والثانية بعد شهرين والثالثة بعد ثلاثة شهور من الزراعة.

وقد أظهرت النتائج المتحصل عليها ، أن إضافة نترات الأمونيوم بمعدل ١٨,٨ جم/نبات أدت إلى زيادة معنوية فى عدد الأزهار/نبات وكذلك فى وزن الأزهار الطازجة والجافة فى كلا الموسمين. بينما أدت

إضافة المخلوط السمادى NPK بالمستوى الأول إلى الحصول على أعلى زيادة فى كل من عـدد الأزهـار وعدد الخلفات الناتجة لكل نبات فى كلا الموسمين.

وقد استخدام ثلاثة معدلات للرى هى: الأول الرى كل ٧ أيام خلال الصيف وكـل ١٠ ايـام فـى الشتاء، الثانى الرى كل ١٠ أيام فى الصيف وكل ١٥ يوم فى الشتاء، والثالث الرى كل ١٣ يوم فى الصيف وكل ٢٠ يوماً فى الشتاء وكان ري معاملة الكنترول كل أسبوع سواء صيفا أو شتاءا.

ولقد أوضحت النتائج أن نظام الرى الثانى قد أعطى نباتات ذات صفات زهريـة جيـدة تصـلح كأزهار قطف جيدة للفازات. بينما نظام الرى الثالث أعطى كمية أكبر من الخلفات حول نباتات الأم وبالتالى فهو نظام جيد لمنتجى شتلات الجربيرا لاستخدامها فى التكاثر الخضرى.

أما النظام الأول فقد أعطى أعلى معدل من الأوراق الطازجة (١١٣ ورقة/نبات) هذا ولقد اشتملت معاملات مؤخرات النمو رش المجموع الخضرى للجربيرا بـ ٥٠٠، ١٠٠٠ جزء فى المليون سيكوسـيل وكذلك استخدم الدايكجولاك بمعدل ٠,٢، ٠,٤%.

وأوضحت النتائج أن رش المجموع الخضرى للجربيرا بمعدل ٥٠٠ جزء فى المليون قد أدى إلـى زيادة معنوية فى القياسات الزهرية مع زيادة أيضا فى عدد الخلفات الناتجة حول نباتات الأم.

ومن الناحية الجمالية فإن كل معاملات معيقات النمو أدت إلى إنتاج نباتات نموها الخضري أقصر من طول أزهارها وكان ذلك واضحا فى النباتات ذات عمر سنتين مما أضاف عليها شكل جماليا جيداً.