

# Effect of Nano fertilizer and Gibberellic acid application in vegetative and floral growth of *Gazania rigens* L.

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## ABSTRACT

The experiment was carried out in the lath house of the Agricultural Research and Experiment Station of the College of Agriculture/University of Kirkuk located in the area Kirkuk, for the period from 1/3/2019 to 20/5/2019 and at the age of one year and the rate of (5-8) leaves, The plants were treated with Nano fertilizers sprinkled on the leaves and three levels (0, 1.5, 1) gm.liter<sup>-1</sup> and with three levels of GA3 (0, 100, 200) mg/L<sup>-1</sup> and even full wetness. The experiment was carried out according to the design of complete random sectors (R.C.B.D.). The results were superior to Nano fertilizer treatment in plant height, number of leaves, number of flowers, flower diameter and length of floral, while the treatment with gibberellic acid, in the character of plant height and floral holder length, while the overlap between the two treatments gave significant differences in Most vegetative and floral traits except the number of flowers and the diameter of the floral holder.

**Key words:** *Gazania*, Nano fertilizers, GA3

## Introduction

*Gazania rigens* L. is a herbaceous plant belonging to the Asteraceae family, South Africa origin (Howis *et al.*, 2009.) Belongs to the genus *Gazania* 16 species are all herbaceous plants that can be grown in Temperate and cold areas, some of which are annuals, while others are bi-yearly or perennial Biennial. Because of its economic and medical and importance as well as its importance as a decorative plant In recent years, and has become the subject of study and revealed the qualities that characterize it (Nia *et al.*, 2015). It is characterized by the fact that the plants of one concern with leaves sheath and non-neck and parallel sweating, which is rich of cone-

shaped, while adults are divided into several small leaves, while the flowers are characterized by white, yellow, orange and red colors as well as some flowers which are colored in more than one color in the flower itself, which bloom when exposed to the sun and be closed or latent at night and cloudy weather (Youssef *et al.*, 2007). the word Nano is used in science refer to a unit of measurement of one millionths. For example we say Nanometer, 10<sup>-9</sup> meter, and the term Nanotechnology and at the Nano scale level. the production and application of structures devices and systems by controlling the shape and size at the Nanometer level (AL-Rubaie and AL-Jabouri, 2012). the time of Nanotechnology, as some call it has no limits to human imagination and am-

bition in it in recent years, a lot of studies and research have appeared on the introduction of Nanotechnology. which is called (Agro-Nanotechnology) in the agricultural field, and with the increase of the residual contamination rates in different agricultural crops and the consequent rejection of exported shipment causing a loss to the national economy, and therefore a different Nano composites have been used commercially in recent decades to overcome these problems (AL-Juthery *et al.*, 2018; Al-Taey and AL-Musawi, 2019), through the use of fertilizers and pesticides in the Nano scale image, especially with the availability of farmers and to reduce the amount of fertilizers added to the soil and reduce contamination with residues of fertilizers and pesticides, to preserve the environment, control insect pests, reduce losses in agricultural crops and purify the soil from heavy elements that hinder the absorption of nutrients by plants (Abobatta, 2016) priority on the plants very few decorations and almost rare, so it will limit ourselves to the revenue of some available, including some vegetable crops so that we can get an idea of concentrations affecting plants and thereby forming the entrance to the research as show (Kaviani *et al.*, 2016) in their experiment on plants *buxushyrcana* that treated with concentrations (0, 0.6, 1.2, 1.8, 2.4, 3) gm.anvil<sup>-1</sup> of Nano fertilizers had a significant effect in increasing plant height, number of branches, diameter number of leaves, improvement of root characteristics, wet and dry weight of total chlorophyll content of plants (Yassin and Mijbal, 2017). are mentioned in an experiment for them on the pepper *capsicum annum* L. the treatment is in different concentration of Nano gold and silver minutes (0,15 gold, 30 gold, 20 silver, 40 silver) mg.liter<sup>-1</sup> have shown a phenomenal improvement in floral qualities (Ajirloo *et al.*, 2015). have explained when treated with tomato plants, category *Lycopersicon esculentum* L. with potassium in its Nano particles from and in concentrations (0,100,200,300,400) Kg.hiktar<sup>-1</sup> hectares showed that treatment with different concentrations increased plant length and diameter. And number of fruits, weight, and diameter and thus increase the yield and quality.

Phytohormones are considered the most important endogenous substances for modulating physiological and molecular responses, a critical requirement for plant survival as sessile organisms, Phytohormones act either at their site of synthesis or elsewhere in plants following their transport (AL-Taey,

2018a). Gibberellins influence the elongation of the stems by stimulating cell elongation and overcoming genetic stunting (Genetic dwarfish) Gibberellins regulate the permeability of cell membranes ,the physiological effect of gibberellins is attributed to its control of enzymatic activity such as increased dissolution of carbohydrates through activation of the alpha-amylase enzyme, the synthesis of carboxylase enzyme, the formation of nucleic acids and the further conversion of nutrients towards the growth site (AL-Taey, 2018b).

Studies have shown that foliar nutrition is an effective way to transfer nutrients better within the plant and then followed by its contribution to the natural growth of the plant where (Sultan and others, 1994) when sprayed with gibberellic acid on plants *Geranium (Geranium pelargonium sp.)*. In concentrations (50, 100, 200) mg.liter<sup>-1</sup> indicated a significant increase in plant height (Abdel Fattah, 1995) mentioned that the treatment of GA3 spraying for hybrid tea rose plants. *Rosa hybrid* L. increased the leaf content of dry weight and in a study indicated (AL Khuzai, 2013) that the treatment of enamel plants *verbena hybrida* in concentration (0, 150, 250) mg.liter<sup>-1</sup> of gibberellic acid had a significant effect in increasing plant length, number of leaves, dry weight vegetative total, increasing leaf content of total chlorophyll and carbohydrates, increasing the number of flowers length of floral, increasing the concentration of anthocyanin pigment and also improving the root growth characteristics of the plant. Due to the lake of research on the impact of Nanotechnology fertilizers in flowering plants especially *Gazania*, the aim of this research was to investigate the effect of Nano fertilizers and GA3 on the growth and flowering of *Gazania*.

## Materials and Methods

The experiment was carried out in the period from 1/3/2019 until 20/5/2019 in the lath house of the Agricultural research and experiment station –University of Kirkuk in the Sayada area the seedlings of *Gazania* were obtained from a local nursery in Kirkuk province on 1/3/2018 at the age of 5 to 8 leaves and the seedlings were transferred to plastic pots with a diameter of (20) cm. tow experiments were used, one of which was Magrow-Nano Mix fertilizer consisting of (6) basic elements (Fe, Zn, Mn, Cu, B, Mo) in their Nanoparticles, and the second is GA3 acid with a concentration of 90 %. Spray

treatment were carried out on leaves for both Nano fertilizers and in three concentration (0, 5.0, 1) gm/L<sup>-1</sup> and spraying with three levels GA3 (0, 100, 200) mg/L<sup>-1</sup> spraying was carried out in the morning until full wetness, while the first spray was carried out with Nano material on 8/3/2018, followed by a week after spraying with gibberellic acid and two sprayings for each worker. Each worker was sprayed again after 15 days of the first spray the experiment was carried out according to (Randomized complete block design) with three segments three levels of Nano fertilizers and three levels of gibberellin at rate of three pears per experimental unit. thus, the number of plants involved is 81 plants. The results were analyzed according to the design used by SAS (1999). The results were tested according to the Duncan Multi-range test at 5% probability level (AL-Rawi and Khalafallah, 2000).

**Studied parameters :** Measurement of the studied qualities of all plants were taken in each repetition of each treatment after the full opening of the first flower as follows:

**Vegetative parameters :** plant height (cm) (measure the height of plants using the ruler starting, number of leaves per plant<sup>-1</sup>, number of flower holder perplant<sup>-1</sup>, total chlorophyll content Plant content of total chlorophyll (a chlorophyll field measuring device (CCM 200 Plus) was used that measures chlorophyll in a CCI unit (Biber, 2007).

**Floral parameters :** number of flowers.plant<sup>-1</sup>, number of petals flower<sup>-1</sup>, the diameter of the flower (cm), the length of floral holder (cm) (the length of floral holder was measured using the ruler from the contact area of the plant to the flower base), diameter of floral holder (cm) (diameter was measured using the vernier caliper).

## Results and Discussion

First: effect of spraying with Nano fertilizers and GA3 on some vegetative growth characteristics of Gazania plant.

According to Table 1 there are significant differences in plant height, as the level exceeded 1 gm/L<sup>-1</sup> of Nano fertilizer which reached (15.89 cm) comparison treatment, while the level exceeds 200 mg/L<sup>-1</sup> of gibberellin acid which reached (15.55cm) compared to the comparison treatment. The treatment gave 1 mg/L<sup>-1</sup> of Nano fertilizers and the treatment of 200 mg/L<sup>-1</sup> of GA3 the highest height reached

**Table 1.** The effect of spraying with Nano fertilizers and GA3 on some characteristic of vegetative growth of Gazania plant.

Gibberlic acid mg.L <sup>-1</sup>	Plant height (cm)		Effect rate of gibberillic acid		Effect of leaves/plant <sup>-1</sup>		Effect rate of gibberillic acid		Number of leaves plant <sup>-1</sup>		Effect rate of gibberillic acid	
	0	0.5	0	1	0	0.5	0	1	0	0.5		1
0	13.44D	13.61d	13.00D	13.27C	76.22ab	78.11ab	83.22ab	70.77a	5.94B	6.66B	7.22b	6.74A
100	12.93D	14.20cd	15.38bc	14.59b	66.33B	83.22ab	94.67A	78.99a	7.83B	7.22B	6.77B	7.37A
200	13.43D	15.96b	18.27A	15.55A	69.78A	75.67ab	73.44ab	80.44a	6.44a	8.22ab	10.44A	8.14A
Nano fertilizer impact rate	13.35B	14.17b	15.89A	15.55A	75.85a	81.41a	72.96A	80.44a	6.61B	7.27Ab	8.37A	8.14A

The averages with similar letters for each individual factor and its interventions do not differ according to the Duncan polynomial test at the 5% probability level.

(18.27cm) compared to treatment with 100 mg/L<sup>-1</sup> which reached a height of (12.93 cm).

As for the number of leaves the effect of Nano fertilizer and GA3 acid showed no significant difference. While the interaction between plants treatment gave 1 gm/L<sup>-1</sup> of Nano fertilizer and 100 mg/L<sup>-1</sup> of gibberellin had the highest value (94.67 leaf.plants<sup>-1</sup>) compared to the comparison treatment of Nano fertilizer and spraying with 100 mg/L<sup>-1</sup> of GA3 which gave the lowest value (66.33 leaf.plants<sup>-1</sup>).

As for the number of flower holder , the level 1 of Nano fertilizer was significantly higher than the value of (8.37 holder, plant<sup>-1</sup>) the overlap between the treatment of plants gave 1 gm/L<sup>-1</sup> of Nano fertilizer and 200 mg/L<sup>-1</sup> of gibberellin the highest value (10.44 plant<sup>-1</sup>) compared with Nano fertilizer and gibberellin treatment, which gave the lowest value (5.94 successes.plant<sup>-1</sup>).

**Second: the effect of spraying with Nano fertilizers and GA3 acid in some characteristics of the floral growth of Gazania plant.**

Table 2 shows that there was no significant difference with respect to the characteristic in flowers. as for the petals , it was found that there was a significant difference at the level of non-spraying of Nano fertilizer and GA3 acid (19.44 flower.petlas<sup>-1</sup>) compared to the level of 1 gm/L<sup>-1</sup> of Nano fertilizers and the concentration of 100 gm/L<sup>-1</sup> sour gibberellin reached in recipe ( 17.33 petals.Flower<sup>-1</sup>).

As for the characteristic of the diameter of the flower has given significant moral differences as the treatment exceeds the concentration (5.0) gm/L<sup>-1</sup> of Nano fertilizer which was (8.29 cm) significantly compared to the other concentration. as for the overlap between the two workers, the treatment of Nano fertilizer exceeded the level of 0 gm/L<sup>-1</sup> the level of 100 gm/L<sup>-1</sup> was (8.44) compared with the addition of 1 gm/L<sup>-1</sup> of Nano fertilizer and 200 gm/L<sup>-1</sup> of gibberellin acid which has a diameter of (7.11cm).

**Third: effect of spraying with Nano fertilizers and GA3 acid on some characteristic of floral growth and chlorophyll content of the Gazania plant .**

It is clear from Table 3 that there were significant differences between the treatment in the length of floral. the level 1 g/L<sup>-1</sup> of Nano fertilizer was significantly higher than comparative treatment and reached (12.07 and 9.39) cm and respectively, while the level 200 mg/L<sup>-1</sup> higher than of gibberlicacid were significantly compared to the two treatments which reached (11.29 and 9.54 ) cm and respectively ,as for the interference treat-

**Table 2.** The effect of spraying with Nano fertilizers and GA<sub>3</sub> on some characteristics of the floral growth of Gazania plant.

Gibberlic acid mg.L <sup>-1</sup>	Number of flowers.		Effect rate of gibberlic acid		The number of petals.		Effect rate of gibberlic acid		The diameter of the flower (cm)		Effect rate of gibberlic acid	
	Plant <sup>-1</sup>		of gibberlic acid		Plants <sup>-1</sup>		gibberlic acid		The effect of Nano-fertilizer g L <sup>-1</sup>			
	0	1	0	1	0	1	0	1	0	1		
0	3.56A	4.11a	4.11a	4.37a	19.44A	18.44AB	18.33Ab	18.55A	8.29Ab	7.91Ab	8.03abc	8.26A
100	4.89A	4.67a	5.22a	4.07a	18.56Ab	17.5Ab	17.33B	18.44a	8.44A	8.19Ab	8.24ab	7.81A
200	4.67A	3.45a	4.67a	4.67a	17.66Ab	19.33A	18.44Ab	18.04a	8.07abc	7.33Bc	7.11c	7.79A
Nano fertilizer impact rate	3.93A	4.26a	4.93a		18.74A	17.81A	18.48A		8.08a	8.29A	7.50b	

The averages with similar letters for each individual factor and its interventions do not differ according to the Duncan polynomial test at the 5% probability level.

ment the maximum length of the floral holder was found at level 1 gm/L<sup>-1</sup> of Nano fertilizer and the level 200 gm/L<sup>-1</sup> of gibberellin which reached (14.03) cm compared to the comparison transaction of Nano fertilizer and the level 100 gm/L<sup>-1</sup> from the gibberllic acid which reached the least (9.08) cm no significant difference was observed floral, as for the characteristic of plant content of chlorophyll, the interference treatment exceeds the level 0.5 gm/L<sup>-1</sup> of Nano fertilizer and the level 200 gm/L<sup>-1</sup> of gibberellin significantly at level 1 gm/L<sup>-1</sup> of Nano fertilizer comparative treatment of gibberllicacid which reached (47.73 and 30.49) CCI and respectively.

## Discussion

### Vegetative growth

The reason for the positive development in plant growth, especially some of the characteristics of vegetative growth may be attributed to the role of Nano fertilizers by increasing the active substances which promote vegetative growth and thus increase the efficiency of the plant especially in the process of photosynthesis through the participation of zinc fertilizer in the opening stomatal cells as a component of the enzyme (carbonic anhydrase) necessary to maintain sufficient (HCO) in the guard cells and also as a factor affecting the absorption (K<sup>+</sup>) by the guard cells, Which leads to an increase in the efficiency of photosynthesis and the active substance that depends on the manufacture and accumulation of nutrients and secondary metabolites resulting from this process, thus increasing vegetative growth (Mohebodini and Ghalehtaki, 2015; Bisht and Tripathi, 1995).

It also has a great role through the stimulating effect of vegetative growth which is caused by the overlap between the added gibberellin and the naturally occurring oxygen inside the plant cells. Vegetative growth, as well as the role of gibberellin in the formation of proteins and nucleic acids and reduce the decomposition of chlorophyll and thus increase the number of chloroplasts that play a role in the process of photosynthesis and thus the nutrient pool which works to stimulate vegetative growth (Trehame *et al.*, 1970).

### Floral growth

The positive effect of some floral properties may be

**Table 3.** The effect of spraying with Nano fertilizers and GA3 on some characteristics of floral growth and the chlorophyll content of the Gazania plant.

Gibberllic acid mg.L <sup>-1</sup>	The length of the flower holder (cm)		The diameter of the flower holder (cm)		Effect rate of gibberllic acid	Effect rate of gibberllic acid	Clorophyll content		Effect rate of gibberllic acid	
	The effect of Nano-fertilizer g L <sup>-1</sup>	0	0.5	1			The effect of Nano-fertilizer g L <sup>-1</sup>	0		0.5
0	9.89C	9.14c	9.13c	2.55A	9.54A	2.43a	38.76abc	43.00ABc	30.94c	39.04A
100	9.08A	10.66bc	10.70bc	2.43A	10.77A	2.41a	32.16bc	39.56ABc	42.27Abc	43.3A
200	9.67A	12.50a	14.03a	2.30a	11.29A	2.39a	46.20a	47.73A	36.44Abc	36.55A
Nano fertilizer impact rate	9.39a	10.14a	12.07a	2.39a			37.56a	38.00A	43.46A	

The averages with similar letters for each individual factor and its interventions do not differ according to the Duncan polynomial test at the 5% probability level.



due to the fact that Nano fertilizer affects the synthesis of enzyme that participate in photosynthesis as well ferredoxin which acts as a transporter of electrons in photosynthesis, which stimulates the growth of seedlings especially flowers , thus increasing the demand for elements.

Nutrient concentrations increase in plant and thus increase in concentrations in flowers in addition to this increase is due to the ability of these plants to produce a strong radical total able to absorb nutrient in the soil. It may also be due to the role of GA3 acid in the formation of protein and nucleic acid as well as cell division, which increases the number of chloroplasts and thus increase the total chlorophyll and reduce its decomposition and increase photosynthesis process and thus increase the manufacture of carbohydrates and thus increase the transfer of nutrients from leaves to flower which works to stimulate sypphilis growth (Saleh, 1991).

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