New Successful Strategy by Application of Antibiotic and Foliar Fertilizer for Controlling of *Meloidogyne javanica* Infected Gladiolus Plants and its Connectedness of Plants Characteristics

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Abstract: Pot experiment under field condition was carried out during two successive seasons (2013/2014and2014/2015)to evaluate the effect of various levels of foliar fertilizer (Nofatrien) at (0,4,8and12 ml/L) solely or combined with different concentrations of Streptomycin (0,25,50,75 and 100 ppm) for controlling *Meloidogyne javanica* infected *Gladiolus grandiflorus* cv., white prosperity plants in relation to its flowering growth parameters; corms and cormels production, as well as, chemical composition. Generally, most of treatments significantly reduced number of root galls; egg masses; soil and root population density of *M. javanica* and increased all flowering growth parameters i.e. (flowering stem length; flowering stem diameter; number of florets/spike; inflorescence length; fresh and dry weights of inflorescence); corms and cormels production such as (corms diameter; corms fresh weight; number of cormels/plant; fresh and dry weights of cormels/plant) as well as chemical composition in both seasons compared with untreated plants. Combined treatment of (streptomycin50 ppm + foliar fertilizer 12ml/litter) gave the highest reduction percentages on *M. javanica* population (80.1 and84.4%) through the two successive seasons, respectively.In addition, application of the same previous combined treatment gave a best results of gall index (1.0and 1.0); egg-masses production (4.0 and 3.0), in the both seasons, respectively, and a better enhancement in Gladiolus morphological characters i.e. flowering stem length(80.37 and 79.2 cm);flowering stem diameter (0.90 and 0.95 cm), number of florets/spike(13.16,13.22); diameter of new corms (6.27 and 6.13 cm) and number of cormels(63.45 and 59.83) for both seasons, respectively.
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1. Introduction

Gladiolus grandiflorus L., commonly known as queen of bulbous flowers; it considered one of the most important florist crops which belong to family Iridaceae and native of south & central Africa as well as the Mediterranean region(De-Hertogh and Le Nard, 1995). In addition, gladiolus flowers are very much preferable in the gardens for its colory flower spikes, flowers with brilliant colors, attractive shapes and varying sizes (Rees, 1992). These florets open in sequence over longer duration and hence has an excellent keeping quality of cut spike. Also gladiolus flowers can achieve a considerable increase in the national income through its export as its flowers are highly needed for local and foreign markets especially in winter months (Sheela, 2008).

Root-knot nematode, *Meloidogyne javanica*, is one of the most destructive nematodes, sedentary endoparasite and are among the most destructive agricultural pests, cause more than 10% loss of the world's total crop production each year (Anastasiadis *et al.*, 2008).

Streptomycin is an antibiotic used to treat a number of bacterial infections and nematodes. Also used as a pesticide, to combat the growth of bacteria beyond human applications (Qian *et al.*, 2012). Streptomycin controls bacterial and nematodes diseases of certain fruit, vegetables, seed, and ornamental crops. It has been shown that Streptomycin affects target organisms to some extend (Wilson *et al.*, 2004).

Plant pathogens are managed by adopting the integrated disease management strategy and application of antibiotics is one of major component of that strategy (Chanda and Rakholiya 2011). Antibiotics bring forth biological effects, even at low concentrations. They are specifically constructed for this purpose, making them potentially more harmful on nematode than other chemical compounds (Williams, 2005).

Foliar fertilization or foliar feeding is gaining more importance in fertilization of various field and floricultural crops, in many Countries. The nutrients supplied by macro and micro-elements are necessary for the various biochemical processes that occur within the plant, and are essential for normal plant growth and development (Strik *et al*., 2003).

Also using foliar fertilization can decrease the pollution of soil with mineral fertilizers and hence reducing its mobility to underground water or surface water (Hassan *et al.,* 2011).Foliar feeding is recommended when environmental conditions limit the uptake of nutrients by roots. Such conditions may include high or low soil pH, temperature stress, too low or too high soil moisture, root disease, presence of pests that affect nutrient uptake, nutrient imbalances in soil etc. (Hamdi, 1979).

The present work was undertaken for exploration a successful strategy by application of both streptomycin and foliar fertilizer solely or combined for controlling *M. javanica* infected Gladiolus plants and its connectedness of plants properties; yield parameters and medicine components.

2. Materials and Methods

Field potted experiment was carried out at the Experimental Farm of the Faculty of Agriculture, Menoufia University, Shibin El-Kom, Egypt during two successive seasons of (2013/2014 and 2014/2015)to throw light on the impact of different levels of foliar fertilizer (Nofatrien) which contained both macro and micro nutrients solely or combined, with different concentrations of Streptomycin (SM) for controlling *Meloidogyne javanica* infected Gladiolus plants in relation to its flowering growth parameters, corms and cormels production, as well as, chemical composition.

Nematode culture:

Juveniles of the root knot nematode, *M. javanica* were obtained from the pure culture reared on black nightshade, planted with *Solanumnigrum* in the Nematode laboratory of the Entomology and Zoology Department, Faculty of Agriculture, Menoufia University.

Experimental preparation and design:

The corms of gladiolus for this study were imported from Holland with size of (8-10 cm in circumference) and planted in PVC pots (30 cm in diameter) on the first of October during two growing seasons.

Each pot was filled with 4 kg of air-dried clay soil. Physical and chemical properties of the soil used in this study were determined according to the method which described by (Cottenieet al.,1982), as follows: pH 7.9, Ec 1.73 ds/m; 2.80 % organic matter, 44.24% silt; 3.84% coarse sand, 27.40% fine sand; 23.20% clay, the texture grade was a clay loam soil. The available macronutrients were 2.30% CaCo3; 0.12% N and 0.25% P2O5. Streptomycin treatments were prepared and mixed with the experimental soil at five concentrations (0,25,50,75 and 100 ppm). 1000 J_2 of *M. javanica* per 1kg soil were added by pipette into three holes around the base stem of each seedling.

Each concentrate received four levels of Nofatrien (0,4,8and12 ml/L) to produce 20 treatments. The chemical composition of Nofatrien as follows: nitrogen 5%; phosphorus5%; potassium 5%; chelating ferrous 0.15%; chelating manganese 0.10%; chelating zinc 0.15%; boron0.05% and molybdenum 0.02%.

Nofatrien fertilizer was sprayed every two weeks, started four weeks after planting until collected new corms in both seasons. The soil moisture levels were kept at about 60% from its water capacity during the growing period by daily weighting. The experiment layout was randomized complete block design. Each treatment was represented with three replicates.

Nematode Extraction and Enumeration:

Each composite soil sample was carefully mixed, and an aliquot of 100 cm^3 was processed for nematode extraction according to methods described by (Southey, 1970), each treatment was replicated three times. An aliquant of 1 ml each of nematode suspensions were pipetted off, placed in a Hawksley counting slide and examined by using a stereomicroscope.

Nematode counts were done after 30;60;90and 120 days of application, and the identification to generic level were based on morphology of the adult and larval forms, according to the description of (Mai and Lyon, 1975).Roots were carefully washed, and the nematode galls were counted and rated as mentioned in Table (1), as well as one gram per root was stained by acid fuchsin elactophenol to counted root knot nematode stages inside the roots with the aid of a dissecting microscope. Egg masses were assessed by staining the roots with Phloxin-B solution (0.15 g/l tap water) for 20 minutes according to (Daykin and Hussey 1985).

Table (1): Rating scale levels of resistance or susceptible by gall numbers (Southey, 1970)

Number of galls/ root system	Gall index	Resistance rating
0	0	Immune
1-2	1	Highly resistant
3-10	2	Resistant
11-30	3	Moderately resistant
31-70	4	Moderately susceptible
71-100	5	Susceptible
<100	6	Highly susceptible

Morphological Attributes:

Morphological parameters including flowering stem length (cm); flowering stem diameter (cm); number of florets/spike; inflorescence length (cm); fresh and dry weights of inflorescence (g/plant)were recorded after opening of the first floret of a spike which were cut and leaving three leaves on each gladiolus plant. After flowering diminished, underground parts were lifted 5 weeks after cut spikes

to determine the following data: corms diameter (cm);corms fresh and dry weights (g); number of cormels/plant; fresh and dry weights of cormels/plant (g).

Chemical analysis:

Total carbohydrate percentages in the aerial part of gladiolus plants were determined by using the colorimetric method of (Dubios*et al.,* 1956). Nitrogen, phosphorus and potassium percentages were determined in the dried herb by Kjeldah methods, Spectrophotometericly and Flame photometer methods, respectively as reported by (Cottenie *et al.,*1982).

Statistical analysis:

The obtained data were subjected to analysis of variance (ANOVA) using Co Stat Software, Version 6.4 (2008). The mean differences were compared by Least Significant Difference (L.S.D.5%).

Reduction percentages were computed according to Abbott formula (1925).

Increase or decrease % = Control – treatment / Control x 100

3. Results and Discussion

In the first season (2013/2014):

Data presented in Table (2) indicated that the average numbers of *M. javanica* larvae per 100 g soil 30, 60, 90and 120 days after the application of five streptomycin concentrations (0,25,50,75 and 100 ppm) and four foliar fertilizer (Nofatrien) levels (0, 4, 8 and 12ml/litter) solely or combined for controlling *M. javanica* infected Gladiolus plants under field plantation conditions.

Statistical analysis indicate that, the most treatments significantly suppressed nematode population in the soil treated after 30, 60, 90and 120days compared with control treatment.

The highest reduction percentages of the soil nematode population were recorded by application of combined treatment (Streptomycin50 ppm + Foliar Fertilizer 12ml/litter) followed by (Streptomycin75 ppm + Foliar Fertilizer 12ml/litter)with (80.1 and 77.8 %), respectively.

The obtained results are in agreements with (Abbas *et al.,* 2015) who reported that the Streptomycin is one of many factors contributing to reductions in nematode damage. Our findings that Streptomycin had more inhibitory effect against plant pathogen are also in consistent with the findings of (Sarkar *et al.,* 2007).

In the second season (2014/2015):

Data presented in Table (3) show that, the side effect of applied treatments on the population density and reduction percentages (%) of *M. javanica* infected Gladiolus plants under field plantation conditions.

Statistical analysis indicate that, the most treatments significantly suppressed nematode population in the soil treated after 30,60,90 and120days compared with control treatment. The combined treatment of (Streptomycin50 ppm + Foliar Fertilizer 12ml/litter) recorded the least mean of population density of *M. javanica* in the four months.

Highest reduction percentages of nematode, were recorded in the combined treatments of (Streptomycin50 ppm + Foliar Fertilizer 12ml/litter) followed by (Streptomycin75 ppm + Foliar Fertilizer 12ml/litter) with (84.4 and 81.0%), respectively, discerningly.

Streptomycin is a protein synthesis inhibitor (aminoglycoside) and used as a pesticide, to combat the growth of bacteria and nematode beyond human applications. It works by killing bacteria and nematode by stopping the production of essential proteins needed by the bacteria and nematode to survive. (Sharma *et al.,* 2007)**.**

Data presented in Table (4) indicated that most of plant treatments decreased the gall index and egg-masses production. The combined treatment of (Streptomycin50 ppm + Foliar Fertilizer 12ml/litter) recorded the highest decrease percentages in root gall index (-80.0 and -80.0 %) and egg masses production (-90.0and -92.3 %) in the two seasons, respectively.

Studies on the impact of foliar fertilizer on plant-parasitic nematodes are scarceness and scantiness. Explication of our results forthright and succinctness sheds a light of application by foliar fertilizer (No fatrien) may be gave indirect effect against nematode infection because it causes a fitness exuberant and well responsiveness of Gladiolus plants, consequently increment in its immunity against nematode infection.

Hence, in a combined treatment gave great utility of nematodes control which safety and inexpensive compared with commercial nematicides application and occurred accumulative of effectiveness for both streptomycin as a pesticide and foliar fertilizer with its own previous properties which yielded the highest reduction percentages on *M. javanica* to take into enhancement of Gladiolus morphological characters; yield parameters and chemical components.

Flowering growth parameters:

Data in Table (5) show that, there was a positive relationship between all flowering growth parameters such as (flowering stem length; flowering stem diameter; number of florets/spike; inflorescence length;f resh and dry weights of inflorescence) and different levels of foliar fertilization (Nofatrien). This means, as the levels of foliar fertilizer increased, all flowering growth parameters have proportionally increased until reached to their maximum values by spraying Gladiolus plants at 12 ml/L, compared with untreated plants, in both seasons. These results could

be explicated by using macro elements (Nitrogen, Phosphorus and Potassium) in building protein molecules and enhancing cell division & cell elongation which in turn encourage growth of plants.

Table 2: Effect of Streptomycin and foliar fertilizer concentrations on the population density and reduction percentages of *M. javanica* infected Gladiolus plants under field conditions in the first season (2013/2014).

Days post treatments	Foliar fertilizer concentrations ml/litter	Average no. of parasitic nematodes / 100 g Streptomycin concentrations (ppm)					Mean
		control	25	50	75	100	
30	0	939.5	720.0	512.3	520.0	615.0	**661.4**
	4	911.0	701.0	430.5	456.3	598.0	**619.4**
	8	873.0	685.0	405.0	410.0	420.0	**558.6**
	12	850.0	649.3	391.0	399.5	403.0	**538.6**
	Mean	**893.4**	**688.8**	**434.7**	**446.5**	**509.0**	-
	LSD 5% Fert.=25.36Strep.= 20.74 Fert. X Strep. = 41.48						
60	0	1037.0	497.3	301.0	330.0	411.0	**515.3**
	4	980.0	512.0	287.3	302.0	322.3	**480.7**
	8	949.3	479.0	263.0	281.0	291.0	**452.7**
	12	976.3	446.0	210.0	241.0	250.0	**424.7**
	Mean	**985.7**	**483.6**	**265.3**	**288.5**	**318.6**	-
	LSD 5% Fert.=19.14Strep.= 17.62 Fert. X Strep. = 35.24						
90	0	1149.3	375.0	241.3	250.0	351.5	**473.4**
	4	1103.3	402.3	200.0	210.0	196.0	**422.3**
	8	1085.0	394.3	140.0	192.0	188.0	**399.9**
	12	991.0	301.3	98.0	111.0	129.0	**326.1**
	Mean	**1082.2**	**368.2**	**169.8**	**190.8**	**216.2**	-
	LSD 5% Fert.=30.11Strep.= 25.16 Fert. X Strep. = 50.31						
120	0	1260.0	310.0	175.0	195.0	297.5	**447.5**
	4	1198.3	300.0	110.0	126.0	158.0	**378.5**
	8	1119.0	235.0	75.0	108.0	113.0	**330.0**
	12	1007.5	205.0	21.3	61.0	87.0	**276.4**
	Mean	**1146.2**	**262.5**	**95.3**	**122.5**	**163.9**	-
	LSD 5%Fert.=46.28 Strep.= 39.93 Fert. X Strep. = 79.86						
Reduction percentages %							
30	0	-	23.4	45.5	44.7	34.5	-
	4	-	23.1	52.7	49.9	34.4	-
	8	-	21.5	53.6	53.0	51.9	-
	12	-	23.6	54.0	53.0	52.6	-
60	0	-	52.0	70.9	68.1	60.4	-
	4	-	47.8	70.7	69.2	67.1	-
	8	-	49.5	72.3	70.4	69.4	-
	12	-	54.3	78.5	75.3	74.4	-
90	0	-	67.4	79.0	78.2	69.4	-
	4	-	63.5	81.9	80.9	82.2	-
	8	-	63.7	87.1	82.3	82.7	-
	12	-	69.6	90.1	88.8	86.9	-
120	0	-	75.4	86.1	84.5	76.4	-
	4	-	75.0	90.8	89.5	86.8	-
	8	-	79.0	93.3	90.4	89.9	-
	12	-	79.7	97.9	93.9	91.3	-
Over all mean	0	-	54.6	70.4	68.9	60.2	-
	4	-	52.4	74.0	72.4	67.6	-
	8	-	53.4	76.6	74.0	73.5	-
	12	--	56.8	**80.1**	77.8	76.3	--

Table 3: Effect of Streptomycin and foliar fertilizer concentrations on the population density and reduction percentages of *M. javanica* infected Gladiolus plants under field conditions in the second season (2014/2015).

Days post treatments	Foliar fertilizer concentrations ml/litter	Average no. of parasitic nematodes / 100 g Streptomycin concentrations (ppm)					Mean
		control	25	50	75	100	
30	0	1118.0	697.0	494.0	509.0	584.0	**673.2**
	4	1047.0	676.0	411.3	439.0	566.0	**627.9**
	8	970.0	613.0	399.0	435.0	393.0	**562.0**
	12	913.0	599.0	360.3	383.0	391.3	**529.3**
	Mean	**1012.0**	**642.3**	**416.2**	**416.5**	**483.6**	-
	LSD 5% Fert.= 40.08Strep.=33.25 Fert. X Strep. = 66.49						
60	0	1197.0	512.3	303.0	374.0	409.0	**559.1**
	4	1092.0	498.0	279.0	304.3	391.0	**512.9**
	8	1047.0	475.0	213.0	271.0	224.0	**446.0**
	12	1027.0	411.0	149.0	176.0	204.0	**393.4**
	Mean	**1090.8**	**474.1**	**236.0**	**281.3**	**307.0**	-
	LSD 5% Fert.= 38.92 Strep.= 34.55 Fert. X Strep. = 69.10						
90	0	1235.0	371.0	231.0	251.0	334.0	**484.4**
	4	1178.3	341.0	149.0	178.0	210.0	**411.3**
	8	1109.0	287.0	128.0	146.0	197.0	**373.4**
	12	1094.5	263.0	80.0	114.0	106.0	**331.5**
	Mean	**1154.2**	**315.5**	**147.0**	**172.3**	**211.8**	-
	LSD 5% Fert.=24.81 Strep.= 31.73 Fert. X Strep. =63.46						
120	0	1302.0	284.0	124.0	162.0	237.0	**421.8**
	4	1279.0	260.0	97.0	120.0	116.0	**374.4**
	8	1169.0	201.0	43.0	93.0	108.0	**322.8**
	12	1108.0	181.0	13.0	51.0	63.0	**283.2**
	Mean	**1214.5**	**231.5**	**69.1**	**106.2**	**131.0**	-
	LSD 5% Fert.= 23.54Strep.= 18.95 Fert. X Strep. =37.90						
Reduction percentages %							
30	0	-	37.7	55.8	54.5	47.8	-
	4	-	35.4	60.7	58.1	45.9	-
	8	-	36.8	58.9	55.1	59.5	-
	12	-	34.4	60.5	58.1	57.1	-
60	0	-	57.2	74.7	68.8	65.8	-
	4	-	54.4	74.5	72.1	64.2	-
	8	-	54.6	79.7	74.1	78.6	-
	12	-	59.9	85.5	82.9	80.1	-
90	0	-	69.9	81.3	79.7	72.9	-
	4	-	71.1	87.4	84.9	82.2	-
	8	-	74.1	88.5	86.8	82.3	-
	12	-	75.9	92.7	89.6	90.3	-
120	0	-	78.2	90.5	87.6	81.8	-
	4	-	79.7	92.4	90.6	90.9	-
	8	-	82.8	96.3	92.0	90.8	-
	12	-	83.7	98.8	95.4	94.3	-
Over all mean	0	-	60.8	75.6	72.7	67.1	-
	4	-	60.2	78.8	76.4	70.8	-
	8	-	62.1	80.9	77.0	77.8	-
	12	--	63.5	**84.4**	81.0	80.5	--

Our results are in harmony of that found by (EL–Naggarand EL-Sayed, 2008) on *Dianthus caryophyllus* and (Kashif *et al.*,2014) on *Dahlia hybrid.*

Furthermore, data presented in Table (5) indicated that all concentrations of streptomycin showed statistically significant increase in flowering growth parameters when compared to untreated plants during the two seasons. Moreover, it's shown that by especially using the streptomycin concentration of (50ppm) induced the highest mean values in this context. By using higher streptomycin concentrations (from 50 up to100 ppm) these parameters has gradually decreased. These results could be explicated by the application of streptomycin to produce the highest reduction percentages on *M. javanica* and consequently increasing flowering growth parameters and the production of corms and cormels.

On the other side, all combined treatments of foliar fertilizer and streptomycin concentrations induced a remarkable increments in these parameters, with the highest mean values were recorded by using foliar fertilizer12 ml/L + streptomycin at 50ppm in both seasons.

Corms and cormels production:

Data outlined in Table (6) showed that, the effect of Nofatrien on corms and cormels production i.e.corms diameter; corms fresh weight; number of cormels/plant as well as fresh and dry weights of cormels/plant were progressively affected by spraying No fatrienat different concentrations, where the highest significant increment in corms and cormels production occurred by application of the highest levels of foliar fertilizer. It is obvious that micronutrients in foliar fertilizer such as (iron; manganese; copper and zinc) are co-factor of many enzymes and play an important role in many biological processes such as photosynthesis reactions; nucleic acids metabolism; protein and carbohydrate biosynthesis as well as growth regulation (Negm *et al*., 2004).

This was clearly reflected in promoting growth characters and consequently increasing the production of corms and cormels. These results could be explained through the finding of (Abd El-Samad *et al*., 2011) who mentioned that bulb yield and quality of onion was mostly enhanced by the application of different levels of foliar fertilizer. It's also shown that, there are high increments in corms and cormels production as a result of using various concentrations of streptomycin which reached its maxima by using 50 ppm compared to control.

A steady increments in all of the above mentioned parameters were also observed by the interaction treatments of both No fatrien and streptomycin. It could be concluded that, the combined treatment between No fatrien at 12 ml/L and streptomycin at 50 ppm resulted the highest parameters in both corms and cormels production in the first and second seasons.

Table 4: Increase or decrease of gall index and egg-masses production on Gladiolusplantsas influenced by treatments application in the two successive seasons.

Root gall index & Egg-masses	**1st season**						**Increase or decrease %**			
	Foliar fertilizer contraptions ml/litter	**Streptomycin concentrations (ppm)**					**Streptomycin concentrations (ppm)**			
		Control	**25**	**50**	**75**	**100**	**25**	**50**	**75**	**100**
root gall index	0	6.0	4.0	3.0	3.5	4.0	-33.3	-50.0	-41.1	-33.3
	4	6.0	4.0	2.0	2.5	3.0	-33.3	-66.7	-58.3	-50.0
	8	5.5	3.5	2.0	2.0	2.0	-36.4	-63.6	-63.6	-63.6
	12	5.0	3.0	**1.0**	1.5	2.0	-40.0	**-80.0**	-70.0	-60.0
Egg-mass production	0	52.0	30.0	21.0	25.0	29.0	-42.3	-59.6	51.9	-44.2
	4	50.0	29.0	14.0	17.0	20.0	-42.0	-72.0	-66.0	-60.0
	8	44.0	26.0	12.0	13.0	15.0	-40.9	-72.7	-70.4	-65.9
	12	40.0	23.0	**4.0**	10.0	13.0	-42.5	**-90.0**	-75.0	-67.5
2nd season							**Increase or decrease %**			
root gall index	0	6.0	4.5	2.0	2.5	4.0	-25.0	-66.6	-58.0	-33.3
	4	5.5	4.0	1.5	2.0	3.0	-27.3	-27.8	-63.6	-45.5
	8	5.5	3.0	1.5	1.5	2.0	-45.5	-27.8	-27.8	-63.6
	12	5.0	3.0	**1.0**	1.5	1.5	-40.0	**-80.0**	-70.0	-70.0
Egg-mass production	0	48.0	35.0	12.0	16.0	27.0	-27.1	-75.0	-66.7	-43.8
	4	43.0	29.0	10.0	13.0	19.0	-32.6	-76.7	-69.8	-55.8
	8	42.0	22.0	10.0	10.0	13.0	-47.6	-76.2	-76.2	-69.0
	12	39.0	21.0	**3.0**	10.0	10.0	-46.2	**-92.3**	-74.4	-74.4

Chemical determinations:

The presence of N, P, K and total Carbohydrate contents in *Gladiolus grandiflorus* to the different levelsof No fatrien illustrated in Table (7). It's shown that, all tested No fatrien levels increased leaf N, P, K and total Carbohydrates contents in most cases; No fatrien at (8 ml/L)induced the highest values in this concern, while for total Carbohydrate % in the second year reached its maximum value by the application of No fatrien at 12ml/L. The stimulatory effect of foliar fertilizer may be due to the role of supplying the plants with carbohydrates and proteins products which are necessary for vegetative, flowering, bulbs growth and chemical constituents of gladiolus (Marschner, 1997).Similar results were obtained by (Khalid and Shedeed, 2015) on *Nigella sativa*.

Interestingly conclusion from Table (7) is that, different concentrations of streptomycin had effectiveness on the most studied traits, where the highest increments in N, K and total Carbohydrates (%) were observed of streptomycin at 75ppm. Meanwhile, the application of streptomycin at 50ppm produced the highest P (%) in the aerial part of gladiolus plants during two seasons.

Dual application interactions of (streptomycin 75 ppm and 8 ml/l) caused increments of leaf mineral (N and K) and total carbohydrate (%). While the application of combined treatment (streptomycin 50 ppm and 8 ml/l) gave the best result relative to P (%) in both seasons respectively.

Table 5: Effect of various levels of No fatrien; different concentration of streptomycin and their interactions on flowering growth parameters of Gladioli plants during two successive seasons.

Treatments	2013/2014					2014/2015				
	0ml /L NT	4ml /L NT	8ml /L NT	12ml/L NT	Mean	0ml /L NT	4ml /L NT	8ml /L NT	12ml/L NT	Mean
Strep. Conc.	Flowering stem length									
0ppm	50.35	52.72	55.26	59.50	54.45	53.21	55.44	56.27	58.18	55.77
25ppm	63.85	64.70	67.03	71.93	66.87	66.61	69.33	69.28	73.51	69.68
50ppm	69.36	74.80	78.47	80.37	75.75	71.19	73.25	74.71	79.20	74.58
75ppm	61.33	61.75	63.21	68.69	63.74	64.88	67.46	68.50	70.20	67.76
100ppm	56.09	59.18	59.71	62.11	59.27	60.14	62.86	65.62	65.05	63.41
Mean	60.19	62.63	64.73	68.52	-	63.20	65.66	66.87	69.22	-
LSD 5%	NT = 2.32 Strep.= 5.11NTX Strep. =10.22					NT = 2.08 Strep.= 4.10 NTX Strep. =8.20				
Flowering stem diameter										
0ppm	0.71	0.75	0.77	0.77	0.75	0.73	0.75	0.76	0.80	0.76
25ppm	0.80	0.81	0.83	0.85	0.82	0.84	0.84	0.88	0.89	0.86
50ppm	0.83	0.86	0.90	0.90	0.87	0.90	0.92	0.92	0.95	0.92
75ppm	0.78	0.80	0.80	0.82	0.80	0.77	0.79	0.82	0.85	0.80
100ppm	0.75	0.79	0.82	0.84	0.80	0.75	0.78	0.78	0.82	0.78
Mean	0.77	0.80	0.82	0.83	-	0.79	0.81	0.83	0.86	-
LSD 5%	NT =ns Strep.= 0.05 NTX Strep. =0.10					NT = ns Strep.=0.08 NT X Strep. =0.15				
Number of florets/spike										
0ppm	9.77	10.07	10.33	10.42	10.14	9.38	9.62	10.75	10.71	10.11
25ppm	11.40	11.75	12.09	12.46	11.92	11.61	12.07	12.57	12.80	12.26
50ppm	11.69	12.81	13.00	13.16	12.66	12.13	12.61	12.92	13.22	12.72
75ppm	11.15	11.27	11.82	11.80	11.51	11.05	11.45	12.13	12.20	11.70
100ppm	10.71	10.86	11.15	11.46	11.04	10.62	10.59	10.83	10.92	10.74
Mean	10.94	11.35	11.67	11.86	-	10.95	11.26	11.84	11.97	-
LSD 5%	NT = 0.42 Strep.= 0.64 NT X Strep. = 1.27					NT =0.71 Strep.= 0.67 NT X Strep. = 1.34				
Inflorescence length										
0ppm	26.33	28.81	28.11	31.67	28.73	29.18	30.25	32.11	33.63	31.29
25ppm	34.78	35.92	37.90	39.75	37.08	36.17	36.89	38.50	40.82	38.09
50ppm	36.83	39.31	40.50	43.94	40.14	39.65	41.39	41.77	44.15	41.74
75ppm	31.45	34.74	36.41	36.18	34.69	32.29	35.90	36.66	39.49	36.08
100ppm	28.05	30.13	33.96	34.62	31.69	30.18	32.62	32.89	37.50	33.29
Mean	31.48	33.78	35.37	37.23	-	33.49	35.41	36.38	39.11	-
LSD 5%	NT = 2.87 Strep.=3.21 NT X Strep. =6.40					NT = 2.14 Strep.= 4.05 NTX Strep. = 8.09				
Fresh weight of inflorescence (g/plant)										
0ppm	25.64	26.49	27.52	29.06	27.17	27.40	29.66	30.02	30.83	29.47
25ppm	31.71	33.18	34.25	36.64	33.94	32.77	34.91	35.86	38.80	35.58
50ppm	35.22	36.50	38.91	41.18	37.95	37.64	40.76	40.56	42.41	40.34
75ppm	29.47	32.31	32.57	33.11	31.86	30.10	31.19	33.90	37.81	33.25
100ppm	27.07	28.20	30.62	31.59	29.37	29.09	29.80	32.55	33.73	31.29
Mean	29.52	31.33	32.77	34.31	-	31.40	33.26	34.57	36.71	-
LSD 5%	NT = 3.26 Strep.= 2.87 NTX Strep. =5.74					NT = 3.84Strep.= 3.04 NTX Strep. = 6.08				
Dry weight of inflorescence (g/plant)										
0ppm	3.06	3.13	3.27	3.35	3.20	3.21	3.19	3.41	3.56	3.34
25ppm	4.25	4.37	4.35	4.46	4.35	4.34	4.51	4.57	4.61	4.50
50ppm	4.62	4.60	4.83	4.91	4.74	4.70	4.72	4.69	4.89	4.75
75ppm	3.57	3.71	3.80	3.78	3.71	4.09	4.17	4.16	4.22	4.16
100ppm	3.13	3.41	3.39	3.45	3.34	3.60	3.71	3.85	4.13	3.82
Mean	3.72	3.84	3.92	3.99		3.98	4.06	4.13	4.28	
LSD 5%	NT = 0.11 Strep.= 0.23 NTX Strep. =0.45					NT = 0.13 Strep.= 0.31 NTX Strep. =0.61				

NT= Nofatrien , Strep.= Streptomycin ,NT× Strep.= Interaction

Table 6: Effect of various levels of No fatrien; different concentration of streptomycin and their interactions on corms and cormels production of gladiolus plants during two successive seasons.

Treatments	2013/2014					2014/2015				
	0ml/LNT	4ml/LNT	8ml/LNT	12ml/LNT	Mean	0ml/LNT	4ml/LNT	8ml/LNT	12ml/LNT	Mean
Strepto.Conc.	Diameter of new corms									
0ppm	3.49	3.71	4.03	4.18	3.85	3.80	3.85	3.97	4.22	3.96
25ppm	4.56	4.93	5.38	5.70	5.14	4.29	4.65	4.73	4.96	4.65
50ppm	5.41	5.82	6.16	6.27	5.91	5.17	5.64	6.01	6.13	5.73
75ppm	4.21	4.66	5.15	5.33	4.83	4.06	4.11	4.48	4.70	4.33
100ppm	3.79	4.08	4.60	5.13	4.40	3.91	4.12	4.39	4.36	4.19
Mean	4.29	4.64	5.06	5.32	-	4.24	4.47	4.71	4.87	-
LSD 5%	NT = 0.45 Strep.= 0.61 NTX Strep. =1.2					NT = 0.31 Strep.=0.52 NTX Strep. =1.04				
Fresh weight of new corms										
0ppm	19.27	21.49	25.63	29.18	23.89	21.16	21.58	24.69	28.73	24.04
25ppm	30.75	33.60	41.57	45.91	37.95	29.55	32.20	36.19	37.17	33.77
50ppm	43.29	47.85	50.31	54.66	49.02	40.54	43.96	48.36	49.60	45.61
75ppm	29.70	31.68	36.72	39.08	34.29	27.34	27.71	31.09	32.80	29.73
100ppm	24.15	27.93	30.31	34.48	29.21	26.53	28.80	29.11	31.94	29.09
Mean	29.43	32.51	36.90	40.66	-	29.02	30.85	33.88	36.04	-
LSD 5%	NT = 5.34 Strep.= 7.21 NTX Strep. = 14.4					NT = 4.29 Strep.= 6.88 NTX Strep. =13.8				
Dry weight of new corms										
0ppm	5.65	5.57	6.90	7.61	6.43	6.61	6.68	6.82	7.45	6.89
25ppm	7.90	8.67	9.11	9.52	8.80	7.57	8.36	8.79	8.95	8.41
50ppm	9.21	9.57	10.19	10.62	9.89	8.96	9.15	9.50	10.05	9.41
75ppm	7.76	8.19	8.67	9.31	8.48	7.54	7.59	8.15	8.51	7.94
100ppm	6.58	7.19	7.77	8.29	7.45	6.92	7.11	7.53	8.17	7.43
Mean	7.42	7.83	8.52	9.07	-	7.52	7.77	8.15	8.62	-
LSD 5%	NT = 1.03 Strep.= 0.97 NTX Strep. =1.9					NT = 0.84 Strep.= 1.11 NTX Strep. =2.2				
Number of cormels/plant										
0ppm	29.46	31.16	34.78	36.15	32.88	32.28	34.90	39.88	41.71	37.19
25ppm	40.20	43.67	49.84	52.61	46.58	38.23	42.63	47.10	50.11	44.15
50ppm	44.15	52.29	57.37	63.45	54.31	45.53	49.67	56.77	59.83	52.95
75ppm	36.15	39.21	44.01	47.19	41.64	35.20	38.47	41.52	48.71	40.97
100ppm	33.52	36.36	42.75	43.92	39.13	35.62	38.80	40.18	45.58	40.04
Mean	36.69	40.53	45.75	48.66	-	37.37	40.89	45.09	49.18	-
LSD 5%	NT = 4.85 Strep.= 6.47 NTX Strep. =12.9					NT = 5.01 Strep.= 8.12 NTX Strep. =16.2				
Fresh weight of cormels/plant										
0ppm	14.25	14.42	16.23	18.33	15.80	13.18	15.77	18.65	19.42	16.75
25ppm	19.52	19.92	21.37	24.74	21.38	21.74	23.20	24.09	26.60	23.90
50ppm	20.49	21.80	24.63	28.11	23.75	24.19	27.69	27.91	29.83	27.40
75ppm	16.47	18.37	19.61	23.55	19.50	19.62	21.23	20.87	25.17	21.72
100ppm	15.10	15.71	17.09	21.63	17.38	14.33	18.21	20.19	23.95	19.17
Mean	17.16	18.04	19.78	23.27	-	18.61	21.22	22.34	24.99	-
LSD 5%	NT = 3.27 Strep.= 2.64 NTX Strep. =5.28					NT = 2.94 Strep.= 2.12 NTX Strep. =4.2				
Dry weight of cormels/plant										
0ppm	2.83	2.89	3.17	3.38	3.06	2.92	3.25	3.40	3.46	3.25
25ppm	3.96	4.07	4.60	5.14	4.44	4.73	4.89	5.09	5.27	4.99
50ppm	4.89	5.31	5.70	6.08	5.49	5.20	5.96	5.85	5.91	5.73
75ppm	3.41	3.52	4.30	4.71	3.98	4.16	4.55	4.49	5.22	4.60
100ppm	3.05	3.26	3.52	3.57	3.35	3.58	3.76	3.98	4.62	3.98
Mean	3.62	3.81	4.25	4.57	-	4.11	4.48	4.56	4.89	-
LSD 5%	NT =0.53 Strep.= 0.57 NTX Strep. = 1.1					NT = 0.42 Strep.= 0.69 NTX Strep. =1.4				

NT= Nofatrien , Strep.= Streptomycin ,NT× Strep.= Interaction

Table 7: Effect of various levels of No fatrien; different concentration of streptomycin and their interactions on mineral and total carbohydrate percentages in the aerial parts of gladiolus plants during two successive seasons.

Treatments	2013/2014					2014/2015				
	0ml/LNT	4ml/LNT	8ml/LNT	12ml/LNT	Mean	0ml/LNT	4ml/LNT	8ml/LNT	12ml/LNT	Mean
Strepto. Conc.	N (%)									
0ppm	2.35	2.64	3.04	2.85	2.72	2.42	2.57	2.93	2.92	2.71
25ppm	2.50	2.48	2.99	2.96	2.73	2.81	2.94	3.12	2.90	2.94
50ppm	3.12	3.27	3.40	3.53	3.33	3.31	3.46	3.62	3.58	3.49
75ppm	3.32	3.61	3.83	3.57	3.58	3.09	3.50	3.70	3.68	3.49
100ppm	3.07	3.15	3.22	3.19	3.15	3.24	3.39	3.35	3.31	3.32
Mean	2.87	3.03	3.29	3.22		2.97	3.17	3.34	3.27	
P(%)										
0ppm	0.24	0.25	0.24	0.22	0.23	0.23	0.25	0.27	0.27	0.25
25ppm	0.24	0.25	0.25	0.24	0.24	0.25	0.27	0.26	0.24	0.25
50ppm	0.26	0.31	0.28	0.27	0.28	0.28	0.30	0.32	0.29	0.29
75ppm	0.25	0.24	0.26	0.25	0.25	0.26	0.27	0.28	0.25	0.26
100ppm	0.24	0.28	0.25	0.24	0.25	0.27	0.27	0.30	0.28	0.28
Mean	0.24	0.26	0.25	0.24		0.25	0.27	0.28	0.26	
K(%)										
0ppm	1.23	1.35	1.32	1.29	1.29	1.17	1.28	1.29	1.34	1.27
25ppm	1.32	1.57	1.68	1.53	1.52	1.45	1.59	1.58	1.64	1.56
50ppm	1.28	1.31	1.35	1.42	1.34	1.25	1.30	1.37	1.38	1.32
75ppm	1.36	1.48	1.41	1.40	1.41	1.40	1.42	1.45	1.37	1.41
100ppm	1.29	1.35	1.38	1.27	1.32	1.33	1.39	1.36	1.35	1.35
Mean	1.29	1.41	1.42	1.38		1.32	1.39	1.41	1.41	
Totalcarbohydrate (%)										
0ppm	10.50	10.50	11.20	11.60	10.95	10.80	10.90	11.50	11.40	11.15
25ppm	12.30	12.80	13.40	13.10	12.90	11.80	12.00	12.30	12.40	12.12
50ppm	12.50	12.90	13.50	13.70	13.15	12.10	12.50	12.50	12.80	12.47
75ppm	13.10	13.80	14.00	13.70	13.65	13.30	13.50	13.70	13.90	13.60
100ppm	12.50	12.70	12.50	11.90	12.40	12.80	12.80	12.40	12.10	12.52
Mean	12.18	12.54	12.92	12.80		12.16	12.34	12.48	12.52	

Finally, streptomycin its feasible as a soil pesticide bring forth and fortify biological effects even at low concentration. Its direct potentiality, more harmful effect on nematode control than other commercial chemical compounds and consequently reflected in increasing flowering growth parameters and the production of corms and cormels.

Adequacy of foliar fertilizer (No fatrien) and availableness from its conformity to fortify and enhancement the exuberant and plant growth, due to the nutrients supplied by macro and micro elements which are necessary and essential for gladiolus plants properties and development. This is indirect effect of foliar fertilizer on gladiolus plants to be forceful and immune against *M. javanica* infection.

Hence, application solely or combined of both experimental amendments (Streptomycin and No fatrien) and its accumulative effectiveness with each own previous properties gave the highest reduction percentages on plant-parasitic nematode and this must worth of new successful strategy for controlling plant-parasitic nematode *M. javanica* infected gladiolus plants in relation to its properties.

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