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The effects of some organic fertilizers on nutrient contents in hybrid *Gladiolus*

Ferit Sönmez [a], Arzu Çığ [b], Füsun Gülser [a,*], Gülcinay Başdoğan [c]

[a] Yüzüncü Yıl University Faculty of Agriculture, Department of Soil Science and Plant Nutrition, Van, Turkey
[b] Siirt University Faculty of Agriculture, Department of Horticulture, Siirt, Turkey
[c] Yüzüncü Yıl University Faculty of Agriculture, Department of Landscape Architecture, Van, Turkey

Abstract

The objective of this research was to determine the effects of organic fertilizers on nutrient contents in leaves and corms of hybrid *Gladiolus* sp. used as a cut flower in landscape arrangement. This study was conducted in a randomized experimental design with three replications. Chicken manure, farmyard manure, peat and waste mushroom compost were used as organic fertilizers. As a result, while the highest mean contents of nitrogen (1.97%), iron (160 ppm) and manganese (128 ppm) in leaves were obtained in chicken manure application, the highest mean contents of potassium (2.01%), calcium (1.80%) and magnesium (0.25 ppm) were determined in waste mushroom compost application. The highest mean contents of phosphorus (0.30%), zinc (25.3 ppm) and copper (9.29 ppm) in leaves were found with peat, control and farmyard manure applications, respectively. The highest mean contents of phosphorus (0.83%), potassium (1.47%), calcium (0.57%), manganese (73 ppm) and zinc (67.3 ppm) in corms were obtained in farmyard manure applications. While the highest mean contents of nitrogen (4.86%) and copper (20.9 ppm) in corms were determined in chicken manure application, the highest mean contents of iron (17.6 ppm) and magnesium (0.20 %) in corms were obtained in peat and waste mushroom compost applications, respectively. Application of organic fertilizers increased macro and micro nutrient contents in leaves and corms of hybrid *Gladiolus* sp.

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Introduction

Flowers not only supplies aesthetical beauties, but also have become a commercial object. Flower production is a branch of agricultural cultivation today in several countries and can contribute to national economies by providing millions of dollars (Bulut, 1994).

Cut flowers cultivation is a subdivision of ornamental plant production having the largest part either in production or economic value (Anonymous, 2000). Nearly 50 countries produce cut flower. Turkey is among the most important countries having the largest potential for cut flower production with its climatic and geographical properties. It is reported that, Turkey shares 0.7% of all ornamental plant growing amount in the world (Anonymous, 2009). *Gladiolus* has been grown as a cut flower very widely on the continent of Europe, especially Holland, Italy and Southern France.

Gladiolus (*Gladiolus grandiflorus*) is an herbaceous annual flower belongs to the family *Iridaceae*, is one of the most important cut flower in Turkey. It is an important cut flower in both domestic and international market (Chanda et al., 2000)

* Corresponding author.
Yüzüncü Yıl University Faculty of Agriculture, Department of Soil Science and Plant Nutrition, 65080 Van, Turkey
Tel.: +90 432 2251024 E-mail address: gulserf@yahoo.com
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Gladiolus is known as queen of the bulbous plants, which is valued for its beautiful flower spike. *Gladiolus* responds well to well balanced nutrition for maximum flower production and better growth. Inadequate plant nutrition causes serious disorders and many lead to decline of plant vigor and yield (Bhattacharjee, 1981).

Sustainable agriculture has become a concern, due to the pressures of the energy crisis and issues of environmental protection. The use of organic fertilizer reduces the consumption of fossil energy as well as phosphorus and potassium deposits. The objective of this study was to determine the effects of chicken manure, barnyard manure, peat and waste mushroom compost as organic fertilizer on nutrients contents of Hybrid *Gladiolus* "Dolce Vita".

Material and Methods

This study was carried out of the experimental field of Agricultural Faculty in Yüzüncü Yıl University. Organic fertilizers were applied into soil with three replication in randomized complete block design. The some properties of experimental area soil were give in Table 1.

Table 1. Some properties of experimental soil

Treatments	Soil Texture	pH (1:2.5)	Total Salinity (µS/cm)	Lime (%)	Organic matter (%)
Control		8.49	93	2.46	0.94
CM		8.33	143	2.35	1.26
WMC	Sandy-loamy	8.48	120	2.22	0.99
BM		8.27	172	2.18	1.00
P		8.41	103	2.42	0.91

C, Control; CM, Chicken manure; WMC, Waste mushroom compost; BM, Barnyard manure; P, Peat

Standard soil analyses methods were used to determine of some soil properties. The soil used in this study had a sandy loamy texture, non-saline, slightly alkaline, low in organic matter and lime. The same doses (2 ton/da) of chicken manure, barnyard manure, waste mushroom compost and peat were incorporated into the soil before the *Gladiolus* bulbs were planted. *Gladiolus* bulbs were planted to 15 cm depth of soil in each parcel (20 cm x 20 cm) having 16 plants leaf and corm samples were collected from the *Gladiolus*. The plant analyses were done according to Kacar and Inal (2008). The statically analyses of data obtained in this study were done using MSTAT package program.

Results and Discussion

Variance analyses results for the nutrient contents are give in Table 2. The applications of different organic fertilizers had significant effects on manganese ($P<0.05$) and copper ($P<0.01$) contents of *Gladiolus* leaves. The effects of different organic fertilizers on nutrient contents of corms were significant for nitrogen ($P<0.05$), calcium ($P<0.05$) and magnesium ($P<0.01$) contents.

The effects of different organic fertilizers on macro and micro nutrient contents in leaves and corms of *Gladiolus* were given Table 3. All of the nutrient contents of leaves, except zinc content, in all applications were higher than that in the control. The highest nitrogen (1.967%) and iron (160 ppm) contents of leaves obtained in chicken manure applications. The highest calcium (1.801%), magnesium (0.253%) and manganese (131 ppm) contents of leaves were determined in waste mushroom compost applications.

Similarly, the applications of organic fertilizers generally increased nutrient contents in *Gladiolus* corms. The highest phosphorus (0.836%), potassium (1.47%), calcium (0.569%), manganese (73 ppm) and zinc (67 ppm) contents of corms were obtained in barnyard manure applications. The nitrogen (4.861%) and copper (20.9 ppm) contents of corms obtained in chicken manure applications were higher than that in the other applications and control. The increases in nutrient contents with organic material applications were reported by several researchers (Böhme and Thi Lua, 1997; Mishra and Choudhuri, 1999; Kacar and Katkat, 1999). Similarly, Gülser et al. (2011) determined that macro and micro nutrient contents of *Tagates erecta* increased with applying of chicken manure and barnyard manure.

Table 2. Variance analyses results for the nutrient contents of *Gladiolus* leaves and corms

			Leaves		Corm	
Elements	V.K.	df	MS	F	MS	F
	Block	2	0.202	3.79 ns	4.138	3.45 ns
Nitrogen	Treatments	4	0.109	2.06 ns	5.621	4.69 *
	Error	8	0.053		1.197	
	Block	2	21621	0.15 ns	484928	0.34 ns
Phosphorus	Treatments	4	192470	1.34 ns	3837070	2.72 ns
	Error	8	142780		1409865	
	Block	2	0.036	0.83 ns	0.242	8.76 **
Potassium	Treatments	4	0.143	3.27 ns	0.002	0.09 ns
	Error	8	0.043		0.028	
	Block	2	0.231	2.66 ns	0.009	1.41 ns
Calcium	Treatments	4	0.054	0.62 ns	0.040	6.09 *
	Error	8	0.087		0.006	
	Block	2	27477	0.11 ns	421433	5.11 *
Magnesium	Treatments	4	715910	2.96 ns	91597	11.11 **
	Error	8	241478		82433	
	Block	2	55.47	0.13 ns	29.46	3.76 ns
Iron	Treatments	4	1209.23	2.83 ns	27.96	3.56 ns
	Error	8	426.63		7.83	
	Block	2	669.87	3.19 ns	722.47	3.75 ns
Manganese	Treatments	4	1110.17	5.29*	692.17	3.59 ns
	Error	8	209.62		192.47	
	Block	2	47.66	1.91 ns	751.61	2.97 ns
Zinc	Treatments	4	62.14	2.49 ns	108.85	0.43 ns
	Error	8	24.92		252.98	
	Block	2	0.734	0.79 ns	11.05	0.46 ns
Copper	Treatments	4	11.882	12.89 **	34.36	1.43 ns
	Error	8	0.921		24.03	

ns: not significant, *: significant at 0.05 level, **:significant at 0.01 level.

Table 3. The effects of applications on macro and micro nutrients in leaves and corms

Elements	Treatments	Leaves	Corm
Nitrogen (%)	Control	1.537	1.680 c
	Chicken manure	1.967	4.861 a
	Waste mushroom compost	1.670	2.431 bc
	Barnyard manure	1.943	4.343 ab
	Peat	1.650	2.467 bc
Phosphorus (%)	Control	0.235	0.610
	Chicken manure	0.262	0.827
	Waste mushroom compost	0.276	0.659
	Barnyard manure	0.269	0.836
	Peat	0.306	0.615
Potassium (%)	Control	1.451 b	1.397
	Chicken manure	1.524 b	1.461
	Waste mushroom compost	2.011 a	1.463
	Barnyard manure	1.719 ab	1.470
	Peat	1.744 ab	1.452
Calcium (%)	Control	1.496	0.290 b
	Chicken manure	1.548	0.442 ab
	Waste mushroom compost	1.801	0.371 b
	Barnyard manure	1.729	0.569 a
	Peat	1.532	0.541 ab
Magnesium (%)	Control	0.131 b	0.064 b
	Chicken manure	0.211 ab	0.104 b
	Waste mushroom compost	0.253 a	0.203 a
	Barnyard manure	0.172 ab	0.167 a
	Peat	0.150 b	0.107 b
Iron (ppm)	Control	104 b	10.1 b
	Chicken manure	160 a	13.2 ab
	Waste mushroom compost	124 ab	10.4 b
	Barnyard manure	126 ab	11.8 b
	Peat	122 b	17.6 a
Manganese (ppm)	Control	86 b	71 a
	Chicken manure	128 a	68 a
	Waste mushroom compost	131 a	36 b
	Barnyard manure	108 ab	73 a
	Peat	128 a	65 a
Zinc (ppm)	Control	25.3 a	56.1
	Chicken manure	19.7 ab	61.4
	Waste mushroom compost	21.6 ab	51.2
	Barnyard manure	19.0 ab	67.3
	Peat	12.8 b	59.9
Copper (ppm)	Control	4.26 b	11.5
	Chicken manure	5.38 b	20.9
	Waste mushroom compost	4.74 b	15.6
	Barnyard manure	9.29 a	16.9
	Peat	6.13 b	16.5

Conclusion

As a result, applications of organic fertilizer can be useful for increasing macro and micro nutrient contents in leaves and corms of Hybrid *Gladiolus* "Dolce Vita". On the other hand, it was thought that, using different application rates of chicken manure, barnyard manure, peat and waste mushroom compost can be useful for the similar investigations related to this subject.

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