

# Effect of nitrogen fertilization, agricultural media, and pinching on the growth of geranium plants (*Pelargonium graveolens* L'Herit)

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**Abstract**— This study was carried out in the Nursery of the Park's Azade/ Sulaimanya city, from 15<sup>th</sup> Mar to 1<sup>st</sup> Dec 2012 to investigate the effect of nitrogen fertilizer (0, 150, 300) mg.l<sup>-1</sup> nitrogen, planting media (river soil, peat moss, and soilless (manner, sawdust, hay, lawn grasses clipping) 2:1:1:1 by volume and plant Pinching (without, once, twice) on the growth of Geranium *Pelargonium graveolens*. The results summarized as follows, Fertilization of geranium plants with 150 and 300 mg.l<sup>-1</sup> nitrogen caused significantly increased in plant height, branches number, leaves area, plant growth index, first cut of plants, in comparison with the control 0 mg.l<sup>-1</sup> nitrogen. Soilless media had an equal effect of peat moss in leaves area, while the peat moss were significantly superior than the soilless in plant height, branches number and the soilless were significantly superior than peat moss in plant growth index, and the first cut of plant. Increased Pinching number decreased the plant height. On the other hand, it increased vegetative dry weight, first cut of plant when compared with non-pinch that gave the least values. Generally, the highest value for most characteristics like branches number leaves area, and plant growth index were found in twice pinching plants that fertilized with 300 mg.l<sup>-1</sup> and planted in once and twice pinching.

**Keywords**— *Geranium; nitrogen fertilizer; media; Pinching.*

## I. INTRODUCTION

Rose geranium *Pelargonium graveolens* L'Herit Cv. rose is a perennial aromatic and medicinal herb that belonging to the Geraniaceae family, It is widely cultivated in Egypt, India, China, Japan, Central America and Europe(26). It is a much-branched shrub growing up to 1.3 meter high, having a fine, true-rose scent. The leaves are grey-green and slightly hairy. The peduncle has an umbel that bears 2-7 flowers with petals have narrowly obviated bases, (24). It use in perfume, cosmetic, and pharmaceutical industry. In addition, medicinally for relief of diarrhea and dysentery treating syphilis, menstrual flow and with celery or mint is used for abortions (28). Because of this plants are used in large amounts in the pharmaceutical, food and cosmetic industries and as container plant, herb gardens, edgings, and window boxes, this study were performed to evaluation the local potted media which consists of mixture of (manners, sawdust, hay, lawn grasses clipping) and to obtain the best treatment of nitrogen fertilizer and pinching for potted plant geranium.

Nitrogen is an important component of many structural, genetic and metabolic compounds that are found in the nucleic acids RNA and DNA and are essential for protein synthesis, (23). Nevertheless, the excessive use increases the risk of nitrate accumulation (14). Application of NPK In calendula at the rate of 100:50:25 kg.ha<sup>-1</sup> increased the height of plant, number of branches and leaves (20). Similarly, (16) noticed increased in the number of lateral branches per plant with the higher level of nitrogen 200 kg.ha<sup>-1</sup> in chrysanthemum. Rose geranium can be growing on a wide variety of soils, It prefers well-drained sandy to loam soils with a pH range of 5.8 to 8.5 and sunny, (1). The organic matter improve the physical and chemical properties and more suitable for the growth and activity of microorganisms in the soil and the most important of which is good drainage and aeration and water-holding capacity (5).(27) obtained earlier flowering and an increased stem branching in *Vinca rosea* when grown in media containing castings or mixtures of organic material with soil. Several studies have reported that cattle manure can increase the growth and yield of some medicinal plants such as geranium (2). Pinching is the removal of the apical bud to release the lower auxiliary

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buds from apical dominance in order to induce the growth of vegetative laterals and increase branching and stimulate auxiliary bud development (12). (3) reported that in marigold, pinching at 30 days after transplanting significantly reduced the plant height but increased the spread of plants. (8) found that maximum plant height, plant spread, numbers of Branches were noticed in plants pinched once (4 weeks after planting) as compared to plants pinched twice or thrice in chrysanthemum also (9) reported that pinching significantly increased fresh and dry weight of the plant compared to no pinching in marigold.

## II. MATERIALS AND METHODS

This study was carried out in Sulaymaniya city from 15<sup>th</sup> Mar to 1<sup>st</sup> of December 2012 In the Nursery of the Park's Azade that belongs to Sulaymaniyah Municipal Government. The experiment was conducted to study the effect of three levels of nitrogen (0, 150, and 300) mg.l<sup>-1</sup>, Three agriculture media (River soil, Peat moss and Soilless which consist of mixture of (sheep manure: sawdust: hay: lawn grasses clipping) 2:1:1:1 by volume, and Pinching of the shoots (without, once, and twice) time after it reach to lengths consist of 5 nodes. Cuttings of *Pelargonium*

*graveolens* Rose cultivar with length  $10 \pm 2$  cm treated with 500 mg.l<sup>-1</sup> IBA by a quick-dip method for 10 second, thereafter the base of cutting treated with 1 ml.l<sup>-1</sup> (Beltanol 50% SL) were planted firstly in the (sand and peat moss 1:1 by volume), in 15<sup>th</sup> Mar 2012 After those were transported to (2) liter pot size.

Factorial experiment  $3 \times 3 \times 3 = 27$  treatment was conducted by Completely Randomized Block Design with 3 replicate and 10 plants for each one. The plant's characteristics which are recorded are Plant Height (cm), Branches Number, Leaves area (cm<sup>2</sup>) which has been measured by using a special digital device (AM300 2003.Bioscientific ltd. SG129TA.U.K), Plant Growth Index (cm<sup>3</sup>): which calculate according to (7) by the following formula: **Growth index (cm<sup>3</sup>) = 3.14 {[(less width + large width of plant)/2]/2}<sup>2</sup> × plant height. Total weight of the first cut per plant in (gm).**

The data has been analyzed by using computer through the SAS program, and the means comparison was done by Duncan's Multiple Ranges Test under 5% which was claimed by (19).

Table.1: Some physical and chemical characteristics of the media.

Name	River soil	Peat moss	Soilless
Organic material %	1.17	4.03	5.47
Ph	7.81	5.49	7.72
Ec dS / m	0.328	0.246	0.342
N mg.l <sup>-1</sup>	63	245	98
P mg.l <sup>-1</sup>	7.17	121.69	103.03
K mg.l <sup>-1</sup>	0.29	8.001	34.34
Cl mmolc.l <sup>-1</sup>	0.9	1.7	9.4
Mg mmolc.l <sup>-1</sup>	4	20.2	30.6
Na mmolc.l <sup>-1</sup>	2.01	3.02	24.22
Ca mmolc.l <sup>-1</sup>	2.6	9	17.6
Co <sub>3</sub> mmolc.l <sup>-1</sup>	1.6	1.2	3
Specific gravity c <sup>3</sup> /gm	1.39	0	0.97
weight of one liter /gm	1300	350	500
Textural for river soil	sand %	50.5%	Sandy clay loam
	clay %	31.5%	
	silt%	18%	

The soil was analyzed at Soil & Water Dept. Laboratories/ College of Agriculture/ Duhok University.

## III. RESULT

## 1. Plant Height

The data in table (1) showed that fertilized geranium plants with 150 and 300 mg.l<sup>-1</sup> nitrogen gave significantly higher plant 36.21 and 36.77 cm in comparison with the control 0 mg.l<sup>-1</sup> 33.30 cm. On the

other hand, plant height decreased significantly to 35.66 and 33.53cm as a result to pinch the plant once and twice when compared each one with other and with non-pinch 37.09 cm. In addition, the peat moss media showed significantly increased in plant height

Table.1: Effect of nitrogen, media, and pinching on the plant height (cm) of *Pelargonium graveolens* plant.

Nitrogen mg.l <sup>-1</sup>	Media	Pinching			Nitrogen × Media	Nitrogen effect
		without	Once	Twice		
0	River Soil	24.83 <sup>s</sup>	24.85 <sup>s</sup>	23.48 <sup>t</sup>	24.39 <sup>g</sup>	33.30 <sup>c</sup>
	Peat moss	44.37 <sup>a</sup>	44.11 <sup>ab</sup>	40.48 <sup>e</sup>	42.99 <sup>a</sup>	
	Soilless	32.96 <sup>m-p</sup>	34.52 <sup>kl</sup>	30.11 <sup>r</sup>	32.53 <sup>f</sup>	
150	River Soil	33.79 <sup>l-n</sup>	33.74 <sup>l-n</sup>	32.48 <sup>pq</sup>	33.34 <sup>e</sup>	36.21 <sup>b</sup>
	Peat moss	43.40 <sup>bc</sup>	40.30 <sup>ef</sup>	38.59 <sup>gh</sup>	40.76 <sup>b</sup>	
	Soilless	37.25 <sup>i</sup>	33.59 <sup>l-o</sup>	32.70 <sup>op</sup>	34.52 <sup>d</sup>	
300	River Soil	35.13 <sup>jk</sup>	32.81 <sup>n-p</sup>	31.60 <sup>q</sup>	33.18 <sup>e</sup>	36.77 <sup>a</sup>
	Peat moss	42.60 <sup>c</sup>	41.41 <sup>d</sup>	38.52 <sup>h</sup>	40.84 <sup>b</sup>	
	Soilless	39.46 <sup>fg</sup>	35.63 <sup>j</sup>	33.81 <sup>lm</sup>	36.30 <sup>c</sup>	
Pinching effect		37.09 <sup>a</sup>	35.66 <sup>b</sup>	33.53 <sup>c</sup>	Media effect	
Nitrogen × Pinching	0	34.05 <sup>f</sup>	34.49 <sup>ef</sup>	31.36 <sup>g</sup>		
	150	38.15 <sup>b</sup>	35.88 <sup>d</sup>	34.59 <sup>e</sup>		
	300	39.06 <sup>a</sup>	36.62 <sup>c</sup>	34.65 <sup>e</sup>		
Media × Pinching	River Soil	31.25 <sup>g</sup>	30.47 <sup>h</sup>	29.19 <sup>i</sup>	30.30 <sup>c</sup>	
	Peat moss	43.46 <sup>a</sup>	41.94 <sup>b</sup>	39.20 <sup>c</sup>	41.53 <sup>a</sup>	
	Soilless	36.56 <sup>d</sup>	34.58 <sup>e</sup>	32.21 <sup>f</sup>	34.45 <sup>b</sup>	

Means with same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Rang Test.

41.53 cm with increasing percentage 20.55 % and 37.06 % than the soilless and river soil media respectively. The dual interaction between all factors showed significantly difference in this character. Generally the highest values for plant height were recorded for the plants that planted in peat moss and fertilized with 0 mg.l<sup>-1</sup> nitrogen and non-pinch 44.37.

## 2. Branch Number

The data in table (2) indicated that 150 and 300 mg.l<sup>-1</sup> of nitrogen increased this character significantly when compared with the control with increasing percentage reached 30.18, and 40.54% for the two concentrations respectively. On the other hand, the branches number increased significantly to 2.58 and 2.74 branches when pinched the plants once and twice respectively also the

soilless media in turn significantly surpassed than the river soil media with increasing percentage reach 32.64%. In addition, the peat moss media showed significantly increased in branches number 2.94 branches with increasing percentage 14.84%, 52.33% than the soilless and river soil media respectively. The dual interaction between nitrogen fertilizer, media and pinching showed significantly difference in this character. The highest value for branches numbers was recorded for the plants that planted in peat moss and fertilized with 300 mg.l<sup>-1</sup> nitrogen and pinched once 3.77 and twice 3.47 with increasing percentage 178.57, 202.68% respectively than the least value 1.24 for plants that non-pinched, non-fertilized and planting in river soil media.

Table.2: Effect of nitrogen, media, and pinching on the branches number of *Pelargonium graveolens* plant.

Nitrogen mg.l <sup>-1</sup>	Media	Pinching			Nitrogen × Media	Nitrogen effect
		without	once	Twice		
0	River Soil	1.24 <sup>k</sup>	1.50 <sup>j</sup>	2.04 <sup>f-k</sup>	1.59 <sup>e</sup>	2.01 <sup>b</sup>
	Peat moss	1.77 <sup>h-k</sup>	2.51 <sup>c-h</sup>	2.93 <sup>b-e</sup>	2.40 <sup>cd</sup>	
	Soilless	1.80 <sup>j-k</sup>	2.03 <sup>f-k</sup>	2.23 <sup>e-j</sup>	2.02 <sup>de</sup>	
150	River Soil	1.74 <sup>h-k</sup>	2.46 <sup>d-i</sup>	2.43 <sup>d-i</sup>	2.21 <sup>cd</sup>	2.61 <sup>a</sup>
	Peat moss	2.73 <sup>b-g</sup>	2.87 <sup>b-f</sup>	3.33 <sup>a-c</sup>	2.98 <sup>b</sup>	
	Soilless	2.23 <sup>e-j</sup>	2.93 <sup>b-e</sup>	2.77 <sup>b-g</sup>	2.64 <sup>bc</sup>	
300	River Soil	1.63 <sup>i-k</sup>	2.00 <sup>g-k</sup>	2.33 <sup>d-j</sup>	1.99 <sup>de</sup>	2.82 <sup>a</sup>
	Peat moss	3.13 <sup>a-d</sup>	3.77 <sup>a</sup>	3.47 <sup>ab</sup>	3.46 <sup>a</sup>	
	Soilless	2.73 <sup>b-g</sup>	3.13 <sup>a-d</sup>	3.17 <sup>a-d</sup>	3.01 <sup>b</sup>	
Pinching effect		2.11 <sup>b</sup>	2.58 <sup>a</sup>	2.74 <sup>a</sup>	Media effect	
Nitrogen × Pinching	0	1.61 <sup>e</sup>	2.01 <sup>de</sup>	2.40 <sup>b-d</sup>		
	150	2.24 <sup>cd</sup>	2.75 <sup>ab</sup>	2.84 <sup>ab</sup>		
	300	2.50 <sup>bc</sup>	2.97 <sup>a</sup>	2.99 <sup>a</sup>		
Media × Pinching	River Soil	1.54 <sup>f</sup>	1.99 <sup>e</sup>	2.27 <sup>ed</sup>	1.93 <sup>c</sup>	
	Peat moss	2.55 <sup>cd</sup>	3.05 <sup>ab</sup>	3.24 <sup>a</sup>	2.94 <sup>a</sup>	
	Soilless	2.26 <sup>ed</sup>	2.70 <sup>b-d</sup>	2.72 <sup>bc</sup>	2.56 <sup>b</sup>	

Means with same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Rang Test.

### 3. Leaves Area (cm<sup>2</sup>)

The data in Table (3) showed that fertilized geranium plants with 300 mg.l<sup>-1</sup> nitrogen increased the leaves area of plant significantly than the 150 mg.l<sup>-1</sup> and the control (0 mg.l<sup>-1</sup>) with increasing percentage reached to 9.42, 17.22 % than the two treatments respectively. On the other hand, it decreased significantly to 4290 cm<sup>2</sup> in non-pinched plants when compared with 4644 cm<sup>2</sup> pinched once and 4755 cm<sup>2</sup> pinched twice. In addition, the peat moss media showed significantly increased in this characteristic 4689 cm<sup>2</sup> whereas not superior than the soilless 4677 cm<sup>2</sup> but the two mediawere significantly increased than the river soil media 4323 cm<sup>2</sup>. The dual interactions showed significantly difference in this characteristic. Generally the highest value for leaves area 5372 cm<sup>2</sup> was recorded for the plants that were planted in soilless and fertilized with 300 mg.l<sup>-1</sup> nitrogen and pinched twice and the least value for non-pinched plants that planted in river soil and fertilized with 0 mg.l<sup>-1</sup> nitrogen 3427 cm<sup>2</sup> with increasing percentage reached 56.74 % .

### 4. Plant Growth Index (cm<sup>3</sup>)

The data in Table (4) showed that fertilized geranium plants with 300 mg.l<sup>-1</sup> nitrogen gave the highest plant growth index value 127.22 cm<sup>3</sup> while 150 mg.l<sup>-1</sup> nitrogen gave 117.76 cm<sup>3</sup> with increasing percentage 18.42, 27.93% than the least value 99.45 for control respectively. On the other hand, plant growth index decreased significantly to 99.31 cm<sup>3</sup> in non-pinched plants when compared with 118.18 and 126.93 cm<sup>3</sup> for once and twice pinching plant respectively and the highest increasing percentage 27.82% was for twice pinched plants when compared with the least value for non-pinch plant. In addition, the soilless media showed significantly increased in plant growth index 130.10 cm<sup>3</sup> when compared with peat moss 116.36 cm<sup>3</sup>, which in turn showed significantly difference than the river soil media 97.97 cm<sup>3</sup>. Generally, the triple interaction between the three factors gave the highest value for the plants that were planted in soilless and fertilized with 300 mg.l<sup>-1</sup> nitrogen and once pinching beside twice pinching 160.50, 155.29 cm<sup>3</sup> and the least value was for the plants that were planted in river soil and

fertilized with 0 mg.l<sup>-1</sup> nitrogen and non-pinch 62.66 cm<sup>3</sup> % respectively with increasing percentage reached 156.14 %, and 147.82

Table.3: Effect of nitrogen, media, and pinching on the leaves area (cm<sup>2</sup>) of *Pelargonium graveolens* plant.

Nitrogen mg.l <sup>-1</sup>	Media	Pinching			Nitrogen × Media	Nitrogen effect
		Without	Once	Twice		
0	River Soil	3427 <sup>e</sup>	4167 <sup>c-e</sup>	4298 <sup>b-e</sup>	3964 <sup>d</sup>	4190 <sup>c</sup>
	Peat moss	4078 <sup>de</sup>	4568 <sup>a-d</sup>	4538 <sup>a-d</sup>	4394 <sup>b-d</sup>	
	Soilless	4002 <sup>de</sup>	4052 <sup>de</sup>	4578 <sup>a-d</sup>	4211 <sup>cd</sup>	
150	River Soil	4288 <sup>b-e</sup>	4314 <sup>b-e</sup>	4324 <sup>b-e</sup>	4309 <sup>b-d</sup>	4584 <sup>b</sup>
	Peat moss	4520 <sup>a-d</sup>	4913 <sup>a-d</sup>	4851 <sup>a-d</sup>	4761 <sup>ab</sup>	
	Soilless	4530 <sup>a-d</sup>	4744 <sup>a-d</sup>	4775 <sup>a-d</sup>	4683 <sup>a-c</sup>	
300	River Soil	4484 <sup>a-d</sup>	4707 <sup>a-d</sup>	4897 <sup>a-d</sup>	4696 <sup>a-c</sup>	4915 <sup>a</sup>
	Peat moss	4433 <sup>a-d</sup>	5133 <sup>a-c</sup>	5169 <sup>ab</sup>	4912 <sup>a</sup>	
	Soilless	5092 <sup>b</sup>	5197 <sup>ab</sup>	5372 <sup>a</sup>	5138 <sup>a</sup>	
Pinching effect		4290 <sup>b</sup>	4644 <sup>a</sup>	4755 <sup>a</sup>	Media effect	
Nitrogen × Pinching	0	3836 <sup>d</sup>	4262 <sup>cd</sup>	4471 <sup>c</sup>		
	150	4446 <sup>c</sup>	4657 <sup>a-c</sup>	4650 <sup>bc</sup>		
	300	4588 <sup>bc</sup>	5012 <sup>ab</sup>	5146 <sup>a</sup>		
Media × Pinching	River Soil	4066 <sup>c</sup>	4396 <sup>a-c</sup>	4506 <sup>a-c</sup>	4323 <sup>b</sup>	
	Peat moss	4344 <sup>bc</sup>	4871 <sup>ab</sup>	4853 <sup>ab</sup>	4689 <sup>a</sup>	
	Soilless	4459 <sup>a-c</sup>	4664 <sup>ab</sup>	4908 <sup>a</sup>	4677 <sup>a</sup>	

Means with same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Rang Test.

Table.4: Effect of nitrogen, media, and pinching on the plant growth index (cm<sup>3</sup>) of *Pelargonium graveolens* plant.

Nitrogen mg.l <sup>-1</sup>	Media	Pinching			Nitrogen × Media	Nitrogen effect
		Without	Once	Twice		
0	River Soil	62.66 <sup>i</sup>	75.71 <sup>hi</sup>	84.01 <sup>f-i</sup>	74.13 <sup>d</sup>	99.45 <sup>b</sup>
	Peat moss	91.06 <sup>e-i</sup>	109.87 <sup>c-h</sup>	119.87 <sup>b-g</sup>	106.93 <sup>c</sup>	
	Soilless	99.40 <sup>d-i</sup>	120.08 <sup>b-g</sup>	132.36 <sup>a-d</sup>	117.28 <sup>bc</sup>	
150	River Soil	105.10 <sup>d-h</sup>	118.47 <sup>b-g</sup>	127.91 <sup>a-e</sup>	117.16 <sup>bc</sup>	117.76 <sup>a</sup>
	Peat moss	102.99 <sup>d-h</sup>	113.26 <sup>c-h</sup>	123.38 <sup>a-f</sup>	113.21 <sup>bc</sup>	
	Soilless	103.13 <sup>d-h</sup>	131.69 <sup>a-d</sup>	133.93 <sup>a-d</sup>	122.92 <sup>bc</sup>	
300	River Soil	81.47 <sup>g-i</sup>	105.48 <sup>c-h</sup>	120.90 <sup>b-f</sup>	102.62 <sup>c</sup>	127.22 <sup>a</sup>
	Peat moss	113.50 <sup>c-h</sup>	128.56 <sup>a-e</sup>	144.77 <sup>a-c</sup>	128.94 <sup>b</sup>	
	Soilless	134.50 <sup>a-d</sup>	160.50 <sup>a</sup>	155.29 <sup>ab</sup>	150.10 <sup>a</sup>	
Pinching effect		99.31 <sup>b</sup>	118.18 <sup>a</sup>	126.93 <sup>a</sup>	Media effect	
Nitrogen ×	0	84.37 <sup>c</sup>	101.89 <sup>de</sup>	112.08 <sup>b-d</sup>		

<b>Pinching</b>	<b>150</b>	103.74 <sup>de</sup>	121.14 <sup>a-d</sup>	128.41 <sup>a-c</sup>	
	<b>300</b>	109.82 <sup>cd</sup>	131.51 <sup>ab</sup>	140.32 <sup>a</sup>	
<b>Media × Pinching</b>	<b>River Soil</b>	83.08 <sup>d</sup>	99.89 <sup>cd</sup>	110.94 <sup>bc</sup>	97.97 <sup>c</sup>
	<b>Peat moss</b>	102.51 <sup>cd</sup>	117.23 <sup>bc</sup>	129.34 <sup>ab</sup>	116.36 <sup>b</sup>
	<b>Soilless</b>	112.35 <sup>bc</sup>	137.42 <sup>a</sup>	140.53 <sup>a</sup>	130.10 <sup>a</sup>

Means with same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Rang Test.

**5. First Cut of Plants (gm/plant)**

The data in Table (5) demonstrated that the first cut of geranium plants were significantly affected as a result to fertilized with 150 and 300 mg.l<sup>-1</sup> nitrogen when compared with non-fertilized plants 0 mg.l<sup>-1</sup> and the highest value was 115.96 gm which decreased significantly to 105.53 gm as the nitrogen decreased to 150 mg.l<sup>-1</sup> while on the contrary the least value 56.70 was given by 0 mg.l<sup>-1</sup> nitrogen treatment with increasing percentage 86.11, 104.50% respectively. On the other hand, this characteristic was decreased significantly to 81.59 gm in non-pinch plant when compared with 94.79 and 101.81gm as a result to pinch the plant once and twice which in turn differ significantly than each another. In addition, the

soilless media caused significantly increased the first cut 100.75 gm when compared with peat moss 95.00 and river soil media 82.45 gm with increasing percentage reach 16.81, 24.79% than the least value. On the other hand soilless media in turn significantly suppressed than the river soil media with increasing percentage, reached 15.22%. The interaction between nitrogen, media and pinching showed significantly difference in this characteristic. The triple interaction treatment soilless and fertilized with 150 mg.l<sup>-1</sup> nitrogen and twice-pinching gave the highest value of the first cut 135.49 gm while the least value was for the non-pinch plants that planted in river soil and fertilized with 0 mg.l<sup>-1</sup> nitrogen 41.59 with increasing percentage reached 225.77 %.

Table.5: Effect of nitrogen, media, and pinching on the first cut (gm/plant) of *Pelargonium graveolens* plant.

Nitrogen mg.l <sup>-1</sup>	Media	Inching			Nitrogen × Media	Nitrogen effect
		Without	Once	Twice		
0	River Soil	41.59 <sup>p</sup>	49.63 <sup>o</sup>	65.20 <sup>l</sup>	52.14 <sup>g</sup>	56.70 <sup>c</sup>
	Peat moss	58.92 <sup>m</sup>	53.72 <sup>n</sup>	62.07 <sup>lm</sup>	58.24 <sup>f</sup>	
	Soilless	47.86 <sup>o</sup>	61.63 <sup>lm</sup>	69.70 <sup>k</sup>	59.73 <sup>f</sup>	
150	River Soil	47.10 <sup>o</sup>	89.41 <sup>j</sup>	92.39 <sup>j</sup>	76.30 <sup>e</sup>	105.53 <sup>b</sup>
	Peat moss	99.40 <sup>i</sup>	118.65 <sup>ef</sup>	123.14 <sup>cd</sup>	113.73 <sup>d</sup>	
	Soilless	115.26 <sup>fg</sup>	128.93 <sup>b</sup>	135.49 <sup>a</sup>	126.56 <sup>a</sup>	
300	River Soil	113.54 <sup>g</sup>	119.52 <sup>de</sup>	123.63 <sup>c</sup>	118.89 <sup>b</sup>	115.96 <sup>a</sup>
	Peat moss	104.48 <sup>h</sup>	115.17 <sup>fg</sup>	119.43 <sup>de</sup>	113.02 <sup>d</sup>	
	Soilless	106.14 <sup>h</sup>	116.43 <sup>e-g</sup>	125.28 <sup>c</sup>	115.95 <sup>c</sup>	
<b>Pinching effect</b>		81.59 <sup>c</sup>	94.79 <sup>b</sup>	101.81 <sup>a</sup>	<b>Media effect</b>	
<b>Nitrogen × Pinching</b>	0	49.46 <sup>h</sup>	54.99 <sup>g</sup>	65.66 <sup>f</sup>		
	150	87.25 <sup>e</sup>	112.33 <sup>c</sup>	117.01 <sup>b</sup>		
	300	108.05 <sup>d</sup>	117.04 <sup>b</sup>	122.78 <sup>a</sup>		
<b>Media ×</b>	<b>River Soil</b>	67.41 <sup>g</sup>	86.19 <sup>f</sup>	93.74 <sup>d</sup>	82.45 <sup>c</sup>	

Pinching	Peat moss	87.60 <sup>f</sup>	95.84 <sup>c</sup>	101.55 <sup>b</sup>	95.00 <sup>b</sup>
	Soilless	89.75 <sup>e</sup>	102.33 <sup>b</sup>	110.16 <sup>a</sup>	100.75 <sup>a</sup>

Means with same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Rang Test.

#### IV. DISCUSSION

The plant height table (1) increased significantly with increased nitrogen levels from zero to 300 mg.l<sup>-1</sup> this result might explants due to the fact that nitrogen, which is largely used for protein synthesis and height availability, had favorable effect on cell multiplication and elongation resulting in increased plant height. Therefore when nitrogen supply, adequate proteins are formed from manufactured carbohydrates which help in increasing plant height (13). The highest value of branches number and leaf area was recorded at the nitrogen level 300 mg.l<sup>-1</sup> these results may be refer to nitrogen supply that increases the extra protein which allows the plant foliage to grow larger and hence increases its surface area available for photosynthesis (17). Also increased Plant growth index significantly with increased in nitrogen levels from may be related to nitrogen supply which is related to carbohydrate utilization enhancing protein synthesis which allows the plants to grow faster, increase rate of metabolism, cell division, cell elongation and thereby stimulated apical growth as well as formation of leaves (25), or might be due to increased auxin activity, production of carbohydrates and other organic compounds (10) Who leading to accelerated meristematic activity at the shoot apex at high nitrogen level (15). As shown in table (1 and 2) Peat moss was significantly superior than soilless and river soil media on Plant height and branches number, this results may be refer to the highest organic matter content table (1) which responsible for improving the media structure and plays an important role in the water holding capacity of soils for a close relationship between the fraction loss on ignition and the water content of the soils (21), or to the application of Cattle manure which represent 40% of the soilless media through the improvement of biological activities of soil and mineral element absorption and caused more biomass production (19). The only character to be affected inversely as a result to pinching pelargonium plant as shown in table (1) is the height of plant which decreased significantly when increase the pinching time without (37.09 cm), once (35.66 cm), twice (33.53 cm). The reduction in plant height in pinched plants is mainly due to elimination of

apical dominance and diversion of the plant metabolites from vertical growth to horizontal growth and recording more branches per plant. As the apical dominance is removed the plant itself usually adjusts to encourage the growth of auxiliary buds which may be converted into branches (22). Increased number of pinching from once to twice didn't show any significant influence on branches number, leaf area, plant growth index, first cut production but each pinching once and twice significantly superior than non-pinching. This results may refer s to Pinching which remove the apical bud and release the lower axillary buds from apical dominance which has been linked to auxins produced and indirectly may inhibit lateral bud growth so it induce the growth of vegetative laterals and increase branching and stimulate axillary bud development (12). The increased of first cut production may be due to apical pinching of plants can be attributed to the proportionate increase in yield contributing characters.

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