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INFLUENCE OF NITROGEN SOURCES ON Yield AND ANATOMICAL CHARACTERS OF DAMSISA (*Ambrosia maritime*, L). PLANTS UNDER SANDY SOIL CONDITIONS

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ABSTRACT

Effects of the three nitrogen sources (namely, ammonium nitrate, ammonium sulphate and urea) each at the rates of 0, 50, 100 and 200 kg/fed., on vegetative, yield, anatomical characters and chemical constituents of damsisa plants were studied. The experiment was carried out as a pot experiment in Faculty of Agriculture, Fayoum University during the two successive seasons (2006/2007 and 2007/2008). The results obtained showed that, all sources of nitrogen fertilizer greatly increased growth parameters. All treatments (mainly, urea and ammonium sulphate) greatly increased chlorophyll a, b, carotenoids in the leaves and total carbohydrates, N, P and K contents of herb.

All treatments (especially, ammonium sulphate) increased stem section diameter, due to the increase in paraenchymatous and vascular tissues. All N sources greatly increased section diameter of leaf petiole, midvein thickness, blade thickness and dimensions of the vascular bundle as well as diameter of xylem vessels. Treating plants by ammonium sulphate greatly increased total sesquiterpene lactones. The greatest increase was observed on most previous botanical characters by ammonium sulphate. Thus, it can be recommended to use ammonium sulphate as nitrogen fertilizer for improving a yield and quality of damsisa plants under sandy soil conditions.

Keywords: Damsisa, Nitrogen fertilizer, Growth and Yield.

INTRODUCTION

Damsisa (*Ambrosia maritima* L). is one of the medicinal plants used colic and to expel renal stones (Mahran, 1967). In addition, damsisa usually grown near the bank of canals, where the snails of bilharziasis escape far from these plants and even it can kill some of these snails. On the other side, *Ambrosia maritima* is known to have molluscicidal properties, it is also exhibit an insecticidal activity against the larvae and pupae of *Anopheles pharoensis* (Teriest *et al.*, 1989).

Many investigators reported the importance of nitrogen fertilization for medicinal and aromatic plants. However, fertilization treatments at suitable level and source showed primitive effects on the plant growth, root system characters as well as active ingredients.

In this respect, Moa and Craker (1991) stated that an adequate supply of nutrients particularly nitrogen is one of the several factors responsible for increasing essential oil yield as well as vegetative growth. Also, this fact reported by several researchers El-Saeid *et al.*, (1996) on *Tagetes patula*, Hassanein *et al.*, (1998) on *Pelargonium graveolens*, Mansour *et al.*, (1999) on spearmint and major am plants and Mohamed and

Matter (2001) on marigold. Also, Jimenez *et al.* (2006) they found that the use of different nitrogen (N) forms (NH_4^+-N or No_3^--N) shows benefits and limitations. For example, one of the advantages of (NH_4^+-N) is that it is fixed to the soil or substrate particles thanks to the caution exchange capacity of these materials and, therefore, it is not leached, decreasing (No_3^--N) pollution. Most plants can use both N forms, but the use efficiency and the preference for each form depend on the species, variety and plant age (Abbes *et al.*, 1995). Nitrogen and P uptake rates are higher in the plants supplied with NH_4^+ or No_3^- + NH_4^+ than in plants provided No_3^- alone (Jimenez *et al.*, 2007).

The present investigation was undertaken to study the effect of nitrogen source on the vegetative growth, chemical composition and anatomical characters of damsisa plants under sandy soil conditions.

MATERIALS AND METHODS

This investigation was conducted as a pot experiment during the two successive growing seasons of 2006/2007 and 2007/2008 at the Experimental Station, Faculty of Agriculture, Fayoum University to study the effect of nitrogen source on the vegetative growth, chemical composition and anatomical characters of damsisa (*Ambrosia maritime*, L) plants under sandy soil conditions.

. Pots (30cm diameter and 50cm height) were filled with air dried sandy soil. The physical and chemical analysis of the tested soil used was carried out according to Olsen and Sommers (1982) and Page *et al.*, (1982).

Seeds of damsisa were sown in prepared seed beds on September 15^{th} for both seasons. Uniform seedlings of 10-15cm length were transplanted into pots after 50 days from sowing.

The study included three sources of nitrogen; ammonium nitrate (33.5%N), ammonium sulphate (20%N) and urea (46.5%N). Four nitrogen levels were used for each (0, 50, 100 and 200 kg/fed.).The amounts of nitrogen fertilizers were divided into two equal doses and they were added twice during the growing seasons. The first one was one month after transplanting and the second was one month later. Control treatment received no nitrogen fertilizer. All the agricultural practices cultural practices for growing damsisa plant prevailing in the locality were followed.

Table (1): Some physico-chemical characteristics of the tested soil.

Physical properties				
Coarse sand	Fine sand	Silt	Clay	Soil texture
70.98	22.99	2.33	3.70	Sandy

Chemical properties												
O. matter%	EC dsm-1	pH	N %	P %	$CaCO_3$ %	Ca^{++}	Mg^{++}	N^{a+}	K^+	HCO_3^-	Cl^-	SO_4^-
0.67	4.5	7.5	0.06	0.07	10	0.52	0.12	0.04	0.02	0.05	0.48	0.55

The present experiment contained 10 treatments were distributed in a complete randomized block design with three replicates, each replicate contained five pots (one plant pot^{-1}). At the flowering stage, the following data were recorded as follows:

a) Vegetative growth characters per plant, i.e., plant height (cm), number of branches plant^{-1}, number of inflorescences plant^{-1}, inflorescences fresh weight /plant (g), plant fresh and dry weight (g) were estimated.

b)Chemical composition:

Chlorophylls (a&b) and carotenoids concentrations (mg g^{-1} fresh weight of leaf) were determined using colorimetric method as described by Welburn and Lichtenthaler (1984). Total carbohydrates (%) were colorimetrically determined according to the method described by Herbert *et al.,* (1971). Nitrogen% was colorimetrically determined by using the orange G dye according to the method of Hafez and Mikkelsen (1981). Phosphorus% was determined according to method described by A.O.A.C. (1995). Potassium %was determined by Flame-Photometer Parkin-Elmer model 52 with acetylene burner according to Page *et al.,* (1982). Total sesquiterpene lactones content (mg/g) was determined colorimetrically in dry herb according to the method described by El-Sawy *et al.*, (1987).

c) Anatomical studies:

At 90 days after transplanting, samples for anatomical study were taken during the second season from the 5th internodes of the apex and its leaf (petiole and blade). Samples were killed and fixed, for two days, in FAA. solution (10 ml formalin+5 ml glacial acetic acid+35 ml distilled water+50 ml ethyl alcohol 95%). Samples were dehydrated and cleared in normal butyl alcohol series and embedded in paraffin wax (56-58°C m.p.). Cross and longitudinal sections 15µ thick were cut using a rotary microtome, adhesive with Haupts and stained with crystal violet erythrosine combination, cleared in carol xylene and mounted in Canada balsam (Willey, 1971).

The results were statistically analyzed using the LSD at probability level of 5% for comparison (Gomez and Gomez, 1983).

RESULTS AND DISCUSSION

a) Vegetative growth characters:

Plant height:

The results obtained in Table (2) revealed that, the most sources of N-fertilizers significantly increased plant height in comparison to the control. The greatest increase (20.48% and 37.40 %) of plant height was attained by addition of urea at 200 kg/fed. in the first and second season, respectively. These results are in accordance with the findings of many investigators as Mohamed (1999) on *Mentha longifolia* L. who found that increasing N level (urea) from 100 to 200 kg/fed., significantly increased plant height and Mohamed (2000) on *Nigella sativa* L. who concluded that the highest nitrogen level urea significantly increased plant height.

Number of branches plant^{-1}:

Data presented in Table (2) show that all sources and levels of N-fertilizers significantly increased number of branches plant^{-1} as compared to control in the two seasons. However, the plants treated with ammonium sulphate gave the highest values for number of branches plant^{-1} while, ammonium nitrate treatment gave the lowest values in comparison with the control in the first season. These results are in accordance with the findings of Kandeel *et al.*, (1992) on rosemary plant who found that adding (ammonium sulphate) at any level resulted in a significant increase in the number of branches plant^{-1} and Faid (1993) on *Carum carvi* plants, who stated that number of branches plant^{-1} was increased by increasing nitrogen rate from ammonium sulphate.

Table (2): Effect of the different nitrogen sources on vegetative characters of damsisa plants at the flowering stage during the two seasons

Characters / Treatments Kg/ fed.		Plant height (cm)	No. of branches plant^{-1}	No. of inflorescences plant^{-1}(g)	F.W. of inflorescences plant^{-1}(g)	F.W. of herb plant^{-1}(g)	D.W. of herb plant^{-1} (g)
First season (2006/2007)							
Control		41.5	26.6	23.0	11.6	83.0	35.6
Urea	50	47.3	35.3	28.6	12.1	111.0	43.9
	100	45.6	34.6	26.6	12.2	115.3	46.1
	200	50.0	38.0	34.0	14.2	134.0	53.4
ammonium sulphate	50	47.0	35.0	35.0	13.5	111.3	45.5
	100	44.3	38.3	28.6	14.1	129.0	50.8
	200	46.0	40.0	35.1	17.2	136.0	54.8
ammonium nitrate	50	46.0	32.0	25.3	11.4	96.0	35.2
	100	42.0	33.0	25.0	11.7	109.6	40.9
	200	42.3	36.0	26.1	14.1	93.0	36.7
LSD 5%		4.1	4.6	3.9	0.2	8.9	3.5
Second season (2007/2008)							
Control		39.3	29.8	24.5	11.8	85.2	35.5
Urea	50	43.7	35.5	29.1	12.0	105.3	45.5
	100	45.7	36.6	31.4	13.3	105.8	42.4
	200	54.0	37.7	35.3	14.1	128.4	53.8
ammonium sulphate	50	50.7	37.3	34.0	16.4	110.8	45.5
	100	50.6	40.5	35.6	15.1	118.3	53.0
	200	49.7	46.7	36.2	15.6	131.2	55.0
ammonium nitrate	50	49.7	36.3	25.7	11.4	97.3	35.9
	100	44.6	37.3	25.7	12.0	94.6	44.0
	200	43.7	38.0	27.5	12.1	89.3	38.3
LSD 5%		4.3	3.2	3.8	0.2	8.4	3.6

Number and fresh weight of inflorescences plant^{-1}:

Concerning the effect of N-sources fertilizers on number and fresh weight of inflorescences plant^{-1}, the data in Table (2) show that ammonium sulphate was more effective in enhancing number and fresh weight of inflorescences plant^{-1} than urea and ammonium nitrate fertilizers. The high rate of ammonium sulphate (200 kg/fed.) gave the best results with increase as

(55.61% and 47.67%) and (48.28% and 32.20%) during the first and second season, respectively as compared to the control.

Fresh and dry weights of herb plant^{-1}:

The data obtained in the same Table (2) indicate that both fresh and dry weights of damsisa herb were greatly increased by application of different sources of nitrogen fertilizers. The best results were attained by ammonium sulphate, especially at the high level (200 kg/fed) that recorded the highest increase were (63.86 and 53.99%) and (54.93% and 53.93%) followed by urea treatment at the same level with increases (61.45% and 50.70%) and (51.55% and 50.00%) in both seasons as compared to the control treatment. Several species of ornamental plants have produced greater dry weight when supplied with 50% or more ammonium compared to nitrate (Aiello and Graves, 1997).

Attia and Ahmed (1997) treated *Chrysanthemum millefoliatum* with three N-fertilizer sources, namely urea, ammonium nitrate and ammonium sulphate. They found that, all nitrogen fertilizer sources significantly increased plant height, number of branches plant^{-1}, fresh and dry weight of the herb, number of flowers plant^{-1} and total flowers weight plant^{-1}.

The positive effects of N on morphological parameters may be due to the important role of these elements in protoplasm formation and all proteins e.g. amino acids, nucleic acid, many enzymes and energy transfer materials (ADP and ATP, Russel, 1973). Therefore, the increase of plant growth with adding N fertilizers is attributed to the increase of the synthesized metabolites. The high amount of synthesized metabolites caused an increment of cell number and cell size (as indicated by anatomical observations) in different plant organs which resulted in more plant height, length of peduncle, number of branches plant^{-1} and number of inflorescences plant^{-1}. Consequently, the fresh and dry weight of herb and inflorescences plant^{-1} were increased. The present results are similar to those obtained by Kandeel *et al.*, (1992) on rosmary, El-Sherbeny *et al.*, (1997) on *Lavandula officinalis*, Medani (1998) on damsisa, Mohamed (2000) on *Coriandrum sativum* and Mohamed and Matter (2001) on marigold plants.

b) Chemical constituents:

Pigments and total carbohydrates concentration:

In both seasons chlorophylls and carotenoids as well as total carbohydrates increased as a result of treating plants with used N-sources at all levels Table (3) indictable. The highest values were obtained by treated plants with (100kg/fed.) with increases reached to 27.9%, 55.3% and 16.0% for chlorophyll a, b and carotenoids, respectively in the first season as compared to control. The same trend was found during the second season.

Total carbohydrates (%) were increased due to the three N sources. The greatest increases (65.6% and 59.1%) were obtained from ammonium sulphate at the medium rate of 100kg/fed. in the first and second seasons, respectively, as compared to control.

N, P and K concentrations:

Data in Table (3) show that nitrogen% increased as a result of all treatments. The highest values in this respect were recorded by ammonium sulphate at the rate of 200kg/fed.

Table (3): Effect of the different nitrogen sources on chemical constituents of damsisa plants at the flowering stage during the two seasons

Treatments Kg/ fed. \ Characters		Chlorophyll a mg/g	Chlorophyll b mg/g	Carotenoids mg/g	T. carbohydrates mg/g	N %	P %	K %	Total sesquiterpenes mg/g
First season (2006/2007)									
Control		1.29	0.85	0.31	11.85	2.31	0.07	1.48	5.15
Urea	50	1.62	1.29	0.33	15.53	3.14	0.16	1.70	6.07
	100	1.65	1.32	0.36	14.69	3.85	0.22	1.70	9.17
	200	1.33	0.90	0.33	12.34	3.76	0.15	1.59	6.08
ammonium sulphate	50	1.36	0.89	0.34	14.86	3.45	0.29	1.58	8.15
	100	1.34	0.92	0.35	18.62	3.25	0.22	1.55	6.77
	200	1.47	0.98	0.33	15.59	3.98	0.36	1.69	9.80
ammonium nitrate	50	1.33	0.90	0.35	13.89	3.71	0.15	1.66	9.53
	100	1.42	0.95	0.33	13.52	3.77	0.29	1.98	6.60
	200	1.39	0.94	0.34	12.38	3.97	0.22	1.44	7.60
Second season (2007/2008)									
Control		1.02	0.71	0.25	11.56	2.95	0.08	1.43	8.65
Urea	50	1.52	0.83	0.28	15.68	2.96	0.18	1.67	8.79
	100	1.70	1.15	0.40	14.18	3.16	0.21	1.65	11.35
	200	1.61	0.88	0.33	11.45	3.09	0.16	1.62	8.87
ammonium sulphate	50	1.22	0.90	0.36	14.94	3.04	0.28	1.61	10.82
	100	1.44	0.90	0.37	18.35	3.08	0.28	1.60	10.26
	200	1.62	0.98	0.37	15.79	3.27	0.34	1.67	11.61
ammonium nitrate	50	1.34	0.71	0.35	14.20	3.09	0.16	1.67	11.05
	100	1.43	0.77	0.34	13.17	3.12	0.23	1.96	9.74
	200	1.44	0.97	0.34	11.67	3.26	0.24	1.50	9.55

Phosphorus and potassium were generally increased by the three N sources application. The greatest increase in phosphorus was observed by ammonium sulphate at the rate of 200kg/fed. While, the lowest K% was recorded by ammonium nitrate at the rate of 100kg/fed. in the first season. The same trend was also observed during the second season.

The high P uptake observed in the NH_4^+-N treatments may be the result of a stimulation of the H_2PO_4 uptake when the No_3^- uptake is strongly depressed (Mengel and Kirkby, 2001). Also, it was observed that plants treated with NH_4^+-N source contained higher concentrations of inorganic anions (PO_4^{-2}, $H_2PO_4^-$, Cl^-), whereas caution (Ca^{2+}, Mg^{2+}, K^+) were found in lower concentrations. In contrast, the plants supplied with the NO_3^--N form contained higher caution content (Bar-Tal *et al.*, 2001). Nitrogen and P uptake rates are higher in the plant supplied with NH_4^+ or NO_3^-+NH_4^+ than in plants provided with NO_3^- alone (Jimenez *et al.*, 2007).

Sesquiterpene lactones:

Data tabulated in Table (3) indicate that total sesquiterpene lactones were greatly increased by application of all treatments. The maximum increase was obtained by the treatment 200kg/fed. of ammonium sulphate. This revealed increments of 90.9% in the first season. The same trend was also obtained in the second one in comparison to the control.

Collectively, the increase of leaf pigments to N may be attributed to the role of N in the pigment synthesis, especially N which is a component of chlorophyll molecule. The increase in total carbohydrates concentration resulting from N may be directly due to their effect on chlorophyll and indirectly activation of the anabolic processes of carbohydrates metabolism. Increases of N, P and K by N attributed to that nitrogen increases the capacity of the plants to absorb nutrients by increasing the size of plant root surface/ unit of soil volume, as well as the high capacity of the plants supplied with nitrogen in building metabolites, which in turn, contributes much to the increase of nutrient uptake (Mandour *et al.*, 1986). The increased in total sesquiterpene lactones by nitrogen fertilization was expected and agrees with Sidky and El-Mergawi (1997). They found on damsisa plant that good production of total sesquiterpene lactones was observed in plants fertilized by nitrogen.

c) Anatomical studies:

1- Stem stricture:

Microscopical counts and measurements of certain characters in transverse sections of damsisa stem treated with the three N-sources at all levels are given in Table (4). Likewise, microphotographs illustrating these treatments are shown in Figures (1and 2).

Table (4): Effect of the different nitrogen sources on anatomical structures of damsisa stem.

Characters \ Treatments		Control	Urea			Amm. sulphate			Amm. nitrate		
			Kg/fed.								
			50	100	200	50	100	200	50	100	200
Section diameter µ		2425	2950	3213	3088	3250	3388	3675	2975	3025	3225
Cortex	Thickness µ	173	205	177	183	176	195	195	180	190	205
	No. of layers	7.7	8.5	8.3	8.3	8.0	8.5	8.5	7.0	8.7	8.0
	Length of cells µ	67	103	93.3	107	90	87	90	90	93	93
No. of vascular bundles		18	20	22	20	21	22	22	21	19	22
Vascular bundle dimensions	Length µ	407	540	600	610	575	590	567	650	557	685
	Width µ	307	317	300	433	360	390	410	375	387	377
Av. Xylem vessel diameter		33	40	40	39	50	39	38	41	45	39
Medullary rays	Width µ	125	75	80	115	110	100	90	100	115	100
	No. of layers	6	7	6	8	7	6	7	6	7	7
Pith	Diameter µ	1250	1625	1675	1688	1625	1813	2000	1625	1713	1838
	No. of layers	29	35	34	34	29	37	39	35	37	36
	Length of cells µ	47	90	73	100	73	73	77	87	83	77

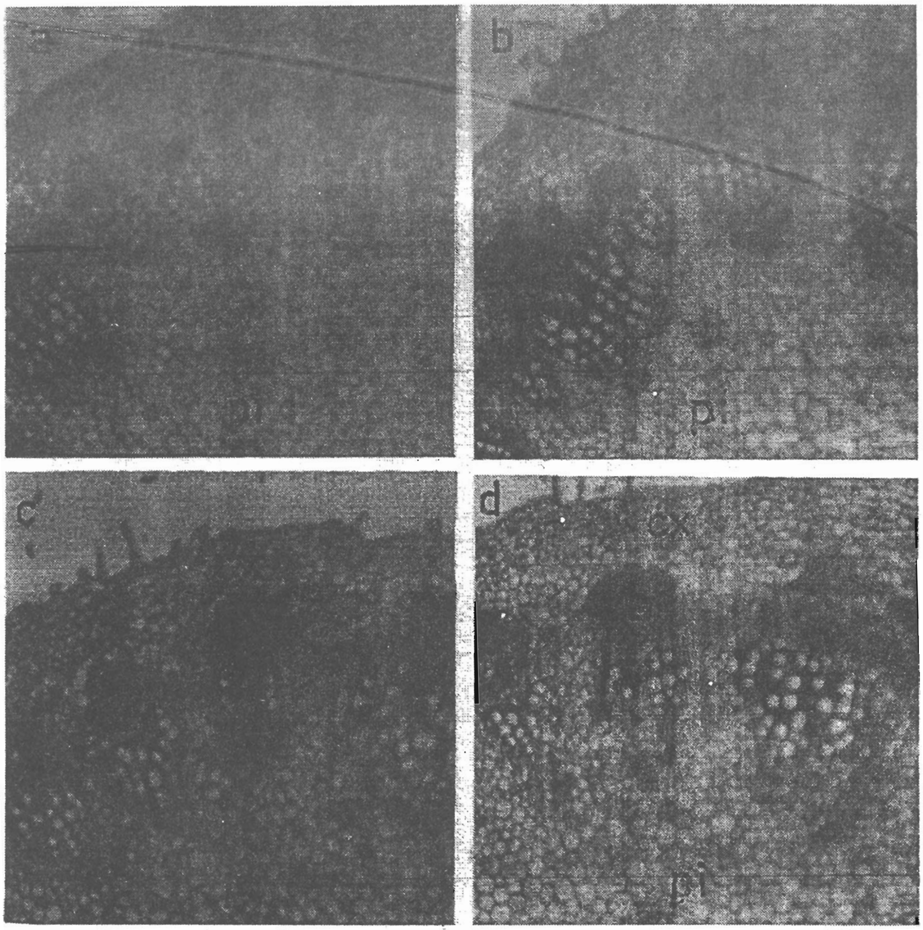

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Fig (1): Trans sections in damsisa stem at different sources of nitrogen:
a: Control **b: Urea at 200 kg/fed.**
c:Ammonium sulphate at 200 kg/fed. **d: Ammonium nitrate at 200 kg/fed.**
(cx: Cortex **pi: Pith** **vb : Vascular bundle)**

Treating the plants with nitrogen sources caused a simulative effect on stem structure and its tissues especially ammonium sulphate. Treating the plants with 200kg. ammonium sulphate/fed. increased diameter of the stem by 51.55% over the control. This increase resulted from increasing number and thickness of cortical cells, number and dimensions of vascular bundles that were accompanied by an increase of diameter of their vessels as well as number and average diameter of pith cells. In addition, length of cortical and pith cells was greatly increased due to treatment with all N-forms mainly urea at 200kg/fed. This induced the highest increase (37.49% and 53.30%, respectively). On the other hand, width of modularly rays was decreased as response to the addition of all N-forms and levels. The highest decrease in width of modularly rays (40%) was achieved by urea at 50kg /fed. Swaefy Hend *et al.* (2007) on peppermint found that treating the plants with 100%N+P (ammonium sulphate) increased dimensions of the stem.

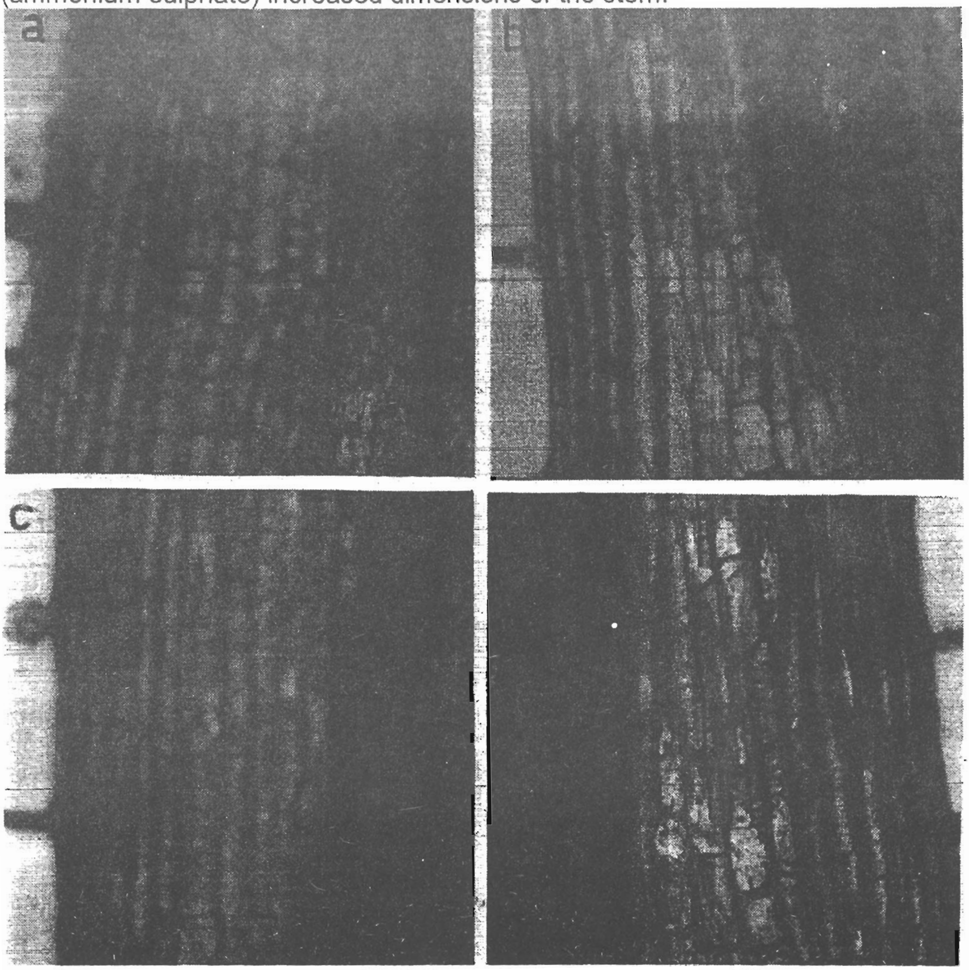

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Fig (2): Longitudinal sections in damsisa stem under different sources of nitrogen:

a: Control **b: Urea at 200 kg/fed.**
c: Ammonium sulphate at 200 kg/fed. **d: Ammonium nitrate at 200 kg/fed.**
(cx: Cortex)

2- Leaf petiole:

It is clear from Table (5) and Figure (3) that, treating with the three N-sources at all levels greatly increased leaf petiole section diameter by increasing its tissues. The highest increase of leaf petiole section diameter was recorded in response to ammonium nitrate at 100kg/fed. (42.07%) with a great increase of length and width of vascular bundles as well as diameter of xylem vessels (31.11%, 8.89% and 53.19%, respectively).

3-Leaf blade:

Data tabulated in Table (5) and illustrated in Figure (4) show that, application of all N-forms greatly increased midvein thickness, mainly ammonium nitrate at 200 kg/fed. that caused the highest value (76%) followed by ammonium sulphate at the same level. Also, addition the application of ammonium sulphate at 50kg/fed. caused an increase in leaf blade thickness (40%) as compared to the control. This increment was due to the increase in thickness of both upper and lower palisade tissue as well as spongy tissue. Moreover, ammonium sulphate mainly at 200kg/fed. showed the highest increase in length and width of vascular bundles (250% and 100%) in comparison to the control.

Collectively, the increase in stem, leaf petiole and leaf blade tissues due to N-sources treatments could be attributed to the role of nitrogen in increasing cell division and expansion and this, in turn, was reflected in an increase of number and diameter of parenchyma cells in cortex and pith of stem. Also, stimulating cell division in cambial zone and consequently increased dimensions of the vascular bundles and xylem vessels. This stimulate effect was reported by Mohamed (1989) on chamomile, Medani (1998) on damsisa, Agamy (2000) on *Ocimum basilicum*, Mohamed and Matter (2001) on marigold plants and Swaefy Hend *et al.* (2007) on peppermint.

Table (5): Effect of the different nitrogen sources on anatomical structures of damsisa leaf petiole and blade

Treatments / Characters		Control	Urea			Ammonium sulphate			Ammonium nitrate		
			Kg/fed.								
			50	100	200	50	100	200	50	100	200
Leaf petiole											
Av. Section diameter μ		1338	1638	1563	1500	1588	1788	1575	1438	1900	1863
Vascular bundle dimensions μ	Length μ	450	460	480	530	470	600	500	510	590	580
	Width μ	450	360	370	360	340	430	400	400	470	520
Av. xylem vessel diameters μ		19	24	26	24	26	21	26	26	29	26
Leaf blade											
Midvein thickness μ		500	450	720	620	770	620	830	650	600	880
Blade thickness μ		250	220	250	250	350	250	250	280	290	330
Upper palisade thickness μ		100	88	98	93	113	100	105	113	120	118
Lower palisade thickness μ		50	40	50	38	43	43	38	80	40	43
Spongy thickness μ		50	63	75	78	105	88	75	43	75	93
Vascular bundles dimensions μ	Length μ	100	120	300	250	200	230	250	250	250	300
	Width μ	100	100	180	150	140	200	200	200	150	170

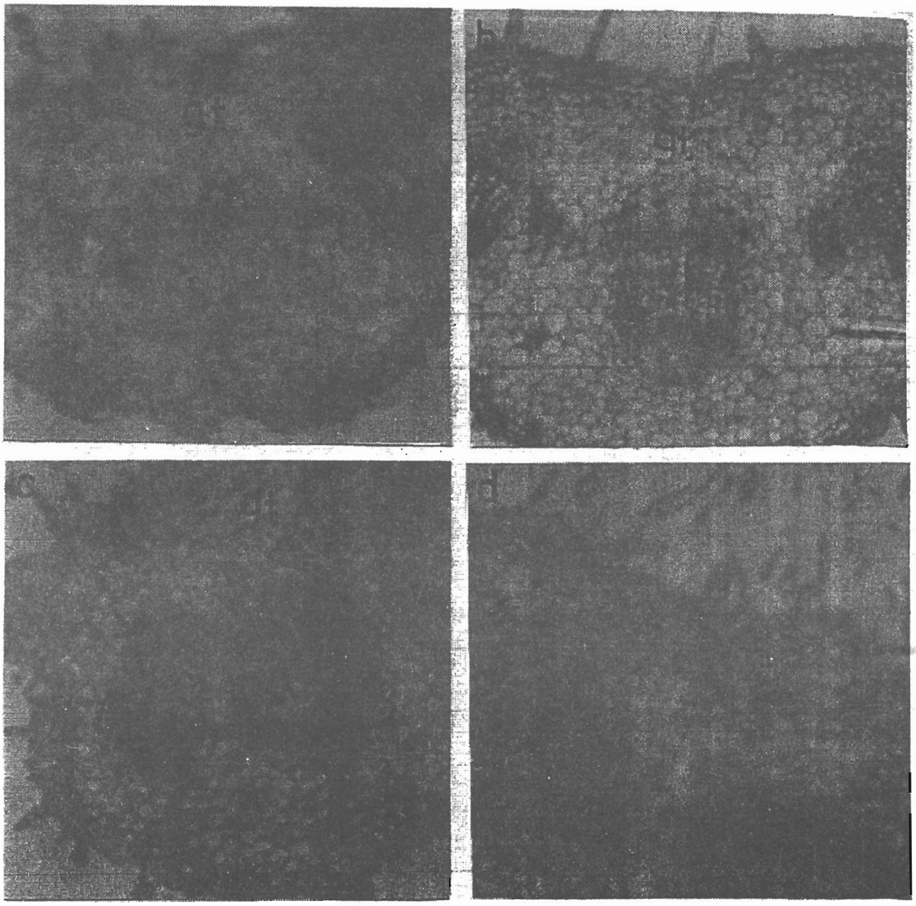

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Fig (3): Trans sections in damsisa leaf at different sources of nitrogen:
a: Control **b: Urea at 200 kg/fed.**
c: Ammonium sulphate at 200 kg/fed. **d: Ammonium nitrate at 200 kg/fed.**
(gt : Ground tissue **vb : Vascular bundle)**

Finally, from the presented results, it could be concluded that the application of N-sources greatly increased herb yield as well as improved quality of its chemical constituents due to that, N participates in the different metabolic processes which increased synthesis of chlorophyll and consequently increased total carbohydrates. Moreover, N increased the essential nutrients uptake such as P and K which increased the production of sesquiterpene lactones in herb. Thus, N fertilization could be used for getting a great herb yield with great major active constituents (sesquiterpene lactones).

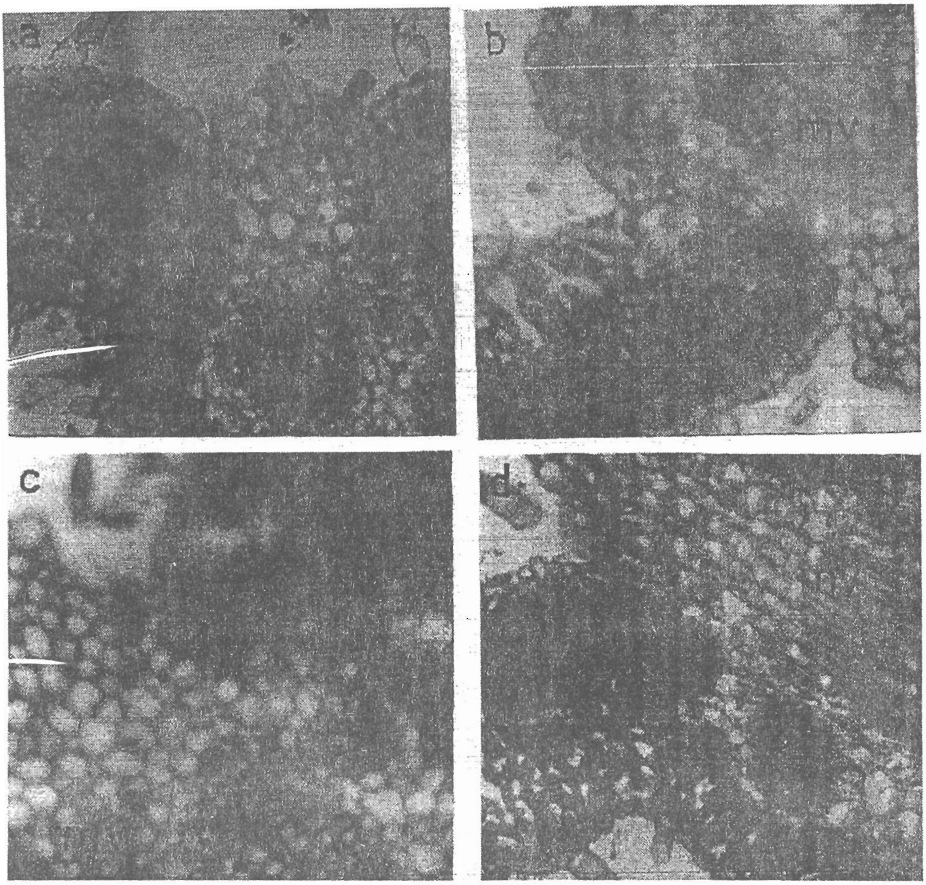

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Fig (4): Trans sections in damsisa leaf blade at different sources of nitrogen:

a: Control **b: Urea at 200 kg/fed.**
c: Ammonium sulphate at 200 kg/fed. **d: Ammonium nitrate at 200 kg/fed.**
(lb : Leaf blade **mv : Midvein)**

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تاثير مصادرالنيتروجين على المحصول والصفات التشريحية لنباتات الدمسيسة تحت ظروف الأرض الرملية

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درس تأثير ثلاثة مصادر من السماد النيتروجينى (نترات الأمونيوم-سلفات الأمونيوم- اليوريا) بالمعدلات صفر-٥٠-١٠٠&٢٠٠ كيلو جرام للفدان على الصفات المورفولوجية والتشريحية والمحصول والمكونات الكيماوية لنباتات الدمسيسة فى تجربة أصص بكلية الزراعة جامعة الفيوم خلال موسمى ٢٠٠٦-٢٠٠٧و ٢٠٠٧-٢٠٠٨.

وتشير النتائج المتحصل عليها أن كل مصادرالتسميد النيتروجينى أدت الى حدوث زيادة واضحة فى صفات النمو مثل إرتفاع النبات وعدد الفروع وعدد النورات ووزنها الطازج والوزن الطازج والجاف للعشب وكانت الزيادة السابقة على النحو التالى: سلفات الأمونيوم ثم اليوريا وأخيرا نترات الأمونيوم .

أظهرت كل المعاملات خاصة اليوريا وسلفات الأمونيوم زيادة واضحة فى محتوى الأوراق من كلوروفيلات أ و ب والكاروتينويدات وكذلك زاد محتوى العشب من الكربوهيدرات الكلية والنيتروجين والفوسفور والبوتاسيوم .

أيضا كل المعاملات خاصة سلفات الأمونيوم أدت إلى زيادة واضحة فى قطر قطاعات الساق وكانت هذه الزيادة ناشئة من حدوث زيادة فى كل من الأنسجة البرانشيميه والوعائية هذا بالإضافه إلى حدوث زياده فى قطر قطاعات عنق الورقه كنتيجه للزياده فى أنسجته, كما أظهرت كل مصادر السماد النيتروجينى زيادة واضحة فى سمك العرق الوسطى ونصل الورقة وأبعاد الحزم الوعائية وقطر أوعية الخشب.

أدت معاملة نباتات الدمسيسة بالمصادر المختلفة للسماد النيتروجينى (خاصة سلفات الأمونيوم) إلى حدوث زيادة واضحة فى محتوى العشب من السيسكوتربينات الكلية. لوحظ أن أعلى زيادة فى معظم الصفات السابقة لنباتات الدمسيسة تم الحصول عليها نتيجة أستخدام سلفات الأمونيوم لذا توصى الدراسة بإ ستخدامة كمصدر للسماد النيتروجينى للحصول على نباتات دمسيسة ذات محصول وجودة عالية.