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Effect of nitrogen fertilizers on productivity of *Urtica pilulifera* plant

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Abstract. *Wahba HE, Motawe HM, Ibrahim AY. 2014. Effect of nitrogen fertilizers on productivity of* Urtica pilulifera *plant. Nusantara Bioscience 6: 49-56. Urtica pilulifera* L. have been known for a long time as a medicinal plant for treatments of many diseases, but its agricultural studies and chemical composition did not have enough researches. Two field experiments were carried out at the experimental farm of the Faculty of Agriculture, Cairo University during two successive seasons 2009 and 2010, to study the effect of nitrogen dressing application (Urea, ammonium nitrate and ammonium sulfate) at different doses (0, 20, 40 and 60 N units/fed.) on growth, yield parameters and chemical composition of *Urtica pilulifera* plants. The results showed that the application of all nitrogen forms significantly increased the determined parameters as compared to untreated plants and the best treatment was ammonium sulfate at 60 N unit to increase quantitative and qualitative plant production.

Keywords: caffeic acid, lipids, nitrogen, *Urtica*

INTRODUCTION

Urtica pilulifera L. (Roman Nettle) (Figure 1) belongs to family Urticaceae and grown as an annual or perennial plant. *Urtica pilulifera* have been known for a long time as a medicinal plant for treatments of many diseases. *Urtica* sp. contains various constituents as histamine, acetyl-choline, coumaric acid, gallic acid, tannins, 5 hydroxytryptamine, vitamins A and C and mineral salts including calcium, potassium, silicon, iron, manganese, and sulfur Stuart (1982). *Urtica* sp. was reported as one of the most effective medicinal plants to treat benign prostate hyperplasia (Hirano et al. 1994; Vahlensiek 2002) also it is widely used folk remedy to treat hyperglycemia, hypertension, inflammation of some organs such as the uvula and uterus and fresh branches applied externally in rheumatism, uterus bleeding, anemia, wound healing and as toner tea. *Urtica* herb extract is useful for bladder disorder; it reduced postoperative blood loss, bacteriuria and prevented hemorrhagic and purulent inflammation following adenomectomy. The powdered leaf used as snuff stops nose bleeds and as lowering blood pressure agent as well as promoter of hair growth (Davidove et al. 1995).

Due to the increasing importance of such plant, there are several categories to enhance the growth and increase the active ingredients. One of these categories is the effect of fertilization. Nitrogen is considered a master element in plant nutrition. Nitrogen uptake as ammonium compounds form serves as starting material for amino acid biosynthesis and additional N-containing compounds such as pyrimidine, purine bases, chlorophyll, proteins, nucleic acid, vitamins, and other organic compounds, therefore, the higher plants require larger amount of nitrogen than is any of the mineral nutrients and the absence of an external supply of nitrogen reduced plant growth, root and stem growth also directly reduce photosynthesis, protein synthesis and respiration (Strafford 1973). Nitrogen has an important role in plant metabolism that affects quantitative and qualitative plant production by stimulating the growth and activating the vital processes in the plant to increase the active substances were studied by many investigators. Application of nitrogen at 150-200 kg/ha increased the yield, chlorophyll and Mg content of *Urtica dioica* (Biesiada 2003). The same trend was recorded by many scientists, Aziz (2004) on *Achillea millefolium* plants, Golcz et al. (2006) and Zheljazkov et al. (2008) on *Ocimum basilicum*, Ierna et al. (2012) and Leskovar et al. (2012) on globe artichoke plants. This research aimed to evaluate the effect of sources and doses of nitrogen fertilizers on productivity and chemical constituents of *Urtica pilulifera* plant.

MATERIALS AND METHODS

This experiment was carried out at the experimental farm of the Faculty of Agriculture, Cairo University, Giza, Egypt in two successive seasons (2009 and 2010) to investigate the response of *Urtica pilulifera* to dressing application of (urea, ammonium nitrate and ammonium sulfate) at different doses (0, 20, 40 and 60 N unit /fed). Seeds of *Urtica pilulifera* were obtained from Borg El-Arab location. The seeds were propagated in Faculty of Agriculture Experimental Farm, then the harvested seed was used as plant material in this experiment. The seeds were sown in different dates as well as it was sown in the nursery and directly on row 60 cm apart and 40 cm in between. The observation indicated that the best date and method of agriculture were direct sowing at the end of

Figure 1. *Urtica pilulifera* L. (Roman Nettle)

Table 1. Physical and chemical analysis of the experimental soil

Soil physical analysis				Soil chemical analysis											
Texture	Sand	Silt	Clay	pH	E.C	Total N	Total P	Total K	Cation Meq/L Na^+	K^+	Ca^{++}	Mg^{++}	Anion HCO^-	SO_4	Cl^-
Sandy loam	55%	29.75%	14.93%	8.23	2.8 mmohs	480 ppm	37.80 ppm	35.10 ppm	9.50	0.70	14.00	8.20	4.40	25.00	13.00

September; therefore, *Urtica pilulifera* were sown at the end of September in both seasons. Three forms of nitrogen were applied at the rate of 0, 20, 40 and 60 units/fed and the nitrogen sources, urea (46%), ammonium nitrate (33%) and ammonium sulfate (21%) were applied as two separate side dressing. The first addition was after two months from planting and the second was after one month from the first addition. Before planting the physical and chemical properties of the soil were determined using the method of Chapman and Pratt (1978) (Table 1).

The plants were fertilized with 100 kg phosphorus/fed as calcium superphosphate (15.5%) and 100 kg/fed potassium as potassium sulfate (48%). Calcium superphosphate was added during the preparation of soil, while potassium sulfate was added to the experimental plots into two equal amounts with an interval of one month starting after two months from planting date. All other horticultural practice was made up when needed. Plant height (cm), number of branches/ plant as well as fresh and dry weight of herb g/plant, fresh and dry weight of leaves g/plant were recorded for each replicate at the vegetative stage, while the totally fresh and dry weight of flowers g/plant were recorded at the flowering stage. The yield of seeds was calculated as g/plant and kg/fed by collecting the seeds for each treatment at the end of growth.

Total carbohydrate percentage in herb, flowers, and seeds were determined colorimetrically (Dubois et al. 1956). Total caffeic acid derivative content in the plant parts of *Urtica pilulifera* was determined as chicoric acid (Bauer and Wagner 1988). Total lipid content in the dried herb, roots, flowers and seeds was determined according to AOAC (1995).

Urtica pilulifera were sown at the end of September in both seasons in rows 60 cm apart at 40cm in between plants in plots 2 x3 m. Each plot contained eighteen plants. The experiment included 10 treatments with three replicates. The experiment was designed in a split-split design. All obtained data were subjected to statistical analysis according to Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Effect of nitrogen application on growth parameters

Vegetative parameters

Application of all nitrogen sources and doses increased all growth parameters (plant height, number of branches, fresh and dry weight of the root, herb, and leaves) in both seasons as compared to untreated plant (Table 2 and 3).

Plant height. The maximum mean values of plant height have resulted from ammonium sulfate followed by urea treatment. Regarding the effect of doses on plant height, data in the same Table 2 show that the best application in this concern was 60 units of nitrogen. The effect of interaction between the sources and doses of nitrogen was significant for ammonium sulfate at 60 units of nitrogen /fed. These results agreed with Abbaszadeh et al. (2009) showed that the highest biological yield and plant height of *Melissa officinalis* were produced by applying 90 kg N ha^{-1} as urea. Ezz El-Din et al (2010) reported that the maximum values of plant height of *Carum carvi* were obtained from the addition of 200kg N/fed as ammonium nitrate.

Number of branches/ plant. The fertilized plants with ammonium nitrate were superior to those of plants fertilized with ammonium sulfate or urea in both seasons. On the other hand, the differences between ammonium nitrate and urea were significant while the differences between ammonium nitrate and ammonium sulfate were insignificant; this trend was true in both seasons. As for doses of nitrogen application, the dose of nitrogen at 40 units/fed in the first season and 60 units/fed in the second season was more effective in promoting numbers of branches. Ammonium nitrate at 60 units/fed showed promising effects on growth parameters. The same results obtained with Ozguven and Sekeroglu (2007) showed that N 60 kg /fed nitrogen fertilization gave the highest value of black cumin number of branches. Also, Bala and Fagbayide (2009) reported that application of N significantly increased plant height and number of branches of rosell plant.

Fresh and dry weight of root. The response of fresh and dry weight of roots for *Urtica pilulifera* to the nitrogen source application was varied during the two seasons. During the first season, urea treatment produced the least mean values of root yield, while ammonium nitrate and ammonium sulfate gave about the same values. However, in the second season, urea treatments showed a remarkable influence on the fresh weight of root as compared to ammonium nitrate and ammonium sulfate treatments (Table 2).

Table 2. Effect of different nitrogen sources and doses on vegetative growth parameters of *Urtica pilulifera* during 2009 and 2010 seasons.

Treatments		Plant height cm/plant		Number of branches/plant		Root weight g/plant Fresh		Root weight g/plant Dry	
		S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2
Control		128.67	134.69	15.33	17.67	181.6	191.70	21.78	23.00
Urea (N unit)	20.00	134.67	147.67	16.33	18.00	203.30	251.70	22.40	30.50
	40.00	146.67	150.33	19.33	21.67	241.70	298.30	30.00	38.00
	60.00	138.70	144.23	17.67	20.67	211.70	291.70	24.60	35.00
Mean		140.01	14741	17.78	20.11	218.90	280.60	25.70	37.80
Ammonium	20.00	131.33	135.67	19.00	22.33	210.00	220.00	25.20	26.40
nitrate	40.00	133.33	144.67	22.67	23.33	228.30	246.70	27.90	30.10
(N unit)	60.00	138.70	150.67	24.00	25.00	255.03	268.70	30.98	32.20
Mean		134.45	143.67	21.89	23.56	231.20	245.10	27.90	29.60
Ammonium	20.00	137.67	139.00	19.00	21.67	206.70	221.70	24.00	26.80
sulfate	40.00	141.00	150.33	19.33	22.33	226.7	236.70	27.60	28.90
(N unit)	60.00	149.33	153.67	20.33	23.33	258.3	267.00	30.90	32.70
Mean		142.67	149.52	19.55	22.44	230.50	241.8	27.5	29.5
Means of dose	Control	128.67	134.67	15.33	17.67	191.70	181.70	23.00	21.80
(N unit)	20.00	137.56	140.78	16.33	20.67	206.67	231.11	24.60	27.89
	40.00	140.33	148.44	19.33	22.44	232.22	260.56	28.46	31.98
	60.00	142.22	149.52	17.67	23.00	241.78	275.78	27.96	33.61
LSD (0.05) of N.S.		7.40	8.70	2.40	2.50	10.40	14.60	2.80	3.10
LSD (0.05) of N.D.		6.88	8.54	2.20	2.34	3.60	12.30	2.00	2.40
LSD (0.05) of N.S.xN.D		6.60	6.40	2.10	2.30	8.40	1.80	1.90	1.40

Note: S_1: First season, S_2: Second season, N.S.: Nitrogen source, N: Nitrogen N.D.: Nitrogen Doses

Table 3. Effect of different nitrogen sources and doses on vegetative growth parameters of *Urtica pilulifera* during 2009 and 2010 seasons

Treatments		Herb weight g/plant Fresh		Herb weight g/plant Dry		Leaves weight g/plant Fresh		Leaves weight g/plant Dry	
		S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2
Control		1514.70	1695.00	246.30	273.48	655.33	742.33	72.09	81.66
Urea N (unit)	20.00	1903.33	1915.00	300.00	309.73	943.67	859.00	104.75	95.35
	40.00	239.00	2726.67	372.82	427.77	1203.00	1340.00	133.65	148.87
	60.00	1971.67	2331.67	309.00	370.33	982.00	1103.33	108.02	121.37
Mean		2088.00	2324.44	327.27	369.28	1042.89	1100.78	115.47	121.86
Ammonium	20.00	2258.33	2450.00	327.50	366.04	1369.67	1358.33	150.66	149.42
nitrate N (unit)	40.00	2490.00	2771.67	370.14	416.53	1518.00	1635.00	170.02	183.12
	60.00	2749.33	2891.17	422.51	446.23	1583.33	1645.68	174.17	181.02
Mean		2499.22	2704.28	373.38	409.60	1490.33	1546.33	164.95	171.19
Ammonium	20.00	2221.67	2496.67	363.92	41.63	1025.67	1094.00	112.82	120.34
sulfate N (unit)	40.00	2548.33	2785.00	404.06	450.22	1229.00	1291.00	141.01	144.59
	60.00	2881.33	3145.00	473.16	515.31	1340.00	1474.67	151.42	166.64
Mean		2550.44	2808.89	413.71	460.05	1198.22	1286.56	135.08	143.86
Mean of dose	Control	1514.70	1695.00	246.60	273.48	655.33	742.33	72.09	81.66
N (unit)	20.00	2127.78	2287.22	330.47	363.46	1113.00	1103.78	122.74	121.70
	40.00	2475.78	2761.11	382.34	431.51	1316.67	1422.00	148.23	158.86
	60.00	2534.11	2789.28	401.56	443.96	1301.78	1407.89	144.54	156.37
LSD (0.05) of N.S.		59.00	66.00	24.30	19.70	44.00	51.00	8.60	7.50
LSD (0.05) of N.D.		55.00	64.21	23.13	20.18	41.76	48.06	7.90	7.27
LSD (0.05) of N.S.xN.D		58.70	64.30	12.98	11.92	34.20	30.91	7.62	7.24

Note: S_1: First season, S_2: Second season, N.S.: Nitrogen source, N: Nitrogen N.D.: Nitrogen Doses

The response of root yield to doses of nitrogen application was with 60 unit nitrogen /fed which produced the maximum values in this concern followed by 40 units/fed. The effect of interaction between nitrogen sources and doses of the application was different in both seasons. In the first season, treating the plants with ammonium sulfate at 60 units/fed produced the maximum fresh weight of the root, while in the second season the medium level of urea (40 units/fed) was the best one in this concern. The dry weight of root gave similar trend of results as fresh weight. The treatments which encouraged the fresh weight of roots were as the same of which produced the high values of the dry weight of roots.

Fresh and dry weights of herb. Ammonium sulfate significantly increased fresh weight of herb comparing to ammonium nitrate and urea in both seasons (Table 3). The heaviest mean values of herb fresh weights (2550.44 and 2808.89 g/plant (were obtained with ammonium sulfate, whereas urea treatment gave the least mean values (2088.00 and 2324.44g/plant) in the first and second seasons, respectively. Concerning the effect of nitrogen application, it is clear that the total fresh weight of herb per plant was significantly and gradually increased with increasing the dose of nitrogen up to 60 units/fed. Also, the differences between doses of nitrogen were significant. In other words, application of nitrogen at 60 units/fed produced the maximum values in this concern (2534.11 and 2789.28 g/plant (followed by 40units of nitrogen/fed (2475.78 and 2761.11 g/plant (then 20 units of nitrogen/fed which produced the least value (2127.78 and 2287.22 g/plant (in the first and second season, respectively.

Concerning the interaction effect between sources and doses of nitrogen significant responses were observed in both seasons. The heaviest herb fresh weights (2881.33 and 3145.00g/plant (were produced with ammonium sulfate at 60 units/fed in both seasons, respectively. The dry weight of total herb (g/plant) had a similar trend of results of fresh weights, treatments which encouraged the fresh weight were the same produced the high values of herb dry weight. The obtained results agreed with Shaheen et al. (2007) showed that treating *Cynara scolymus* with 100 – 120 kg N/fed as ammonium sulfate gained the best values of fresh and dry weight yield. El-Sayed et al. (2012) found that the highest level of nitrogen (300kg/fed.) on *Echinacea paradoxa* L. significantly improved plant height, fresh and dry weight of herb, fresh and dry weight of whole plant.

Fresh and dry weights of leaves. Data presented in Table 3 indicate that the most effective source of nitrogen was ammonium nitrate, which gave the highest mean values at high dose (1583.00 and 1645.67 g/plant), while the least mean values (943.67 and 859.0 g/plant) were obtained from urea treatment. Differences between the three forms of nitrogen were significant. Concerning the effect of nitrogen doses on leaves fresh weight, the medium dose (40 units/fed) produced the highest values followed with 60 units/fed then 20 units/fed. These differences between low dose (20 units/fed) of nitrogen and other two doses (40 and 60 units/fed) were significant, while the differences between medium and high dose of nitrogen were insignificant (Table 3).

Generally, the fresh weight of leaves increased gradually with increasing the doses of ammonium nitrate and ammonium sulfate, while the medium level of urea produced the highest values as compared to high and low doses of urea. The heaviest fresh weight of leaves per plant was observed with ammonium nitrate at 60 units/fed. The same trend was observed during the two seasons with dry weight (Table 3). The treatments which produced the heaviest fresh weights of leaves were those which produced the greatest dry weights. The differences between treatments in this concern were significant in the two seasons. These results on the effect of nitrogen on the vegetative growth of some medicinal plants are in harmony with Mousa (2000) on *Ocimum basilicum*, Sabra (2002) on *Ocimum americanum*, Biesiada et al. (2008) on *Lavandula angustifolia*, Abbaszadeh et al. (2009) on *Melissa officinalis* and El-Habbasha and Abd-Salam (2010) on *Brassica napus*. They found that fresh and dry weight of leaves was stimulated by increasing nitrogen rate.

Flowering parameters

The flowers yield. Data in Table 4. show that nitrogen sources and doses significantly affected flower yield of *Urtica* plants in both seasons as compared to untreated plant. The most effective treatment which gave the heaviest flower yield (272.89 and 294.44 g/plant) in the first and second seasons, respectively, was ammonium sulfate. On the other hand, the differences between the source of nitrogen urea and ammonium nitrate were insignificant in both seasons. Concerning the effect of nitrogen doses on flower yield, data in Table 4) show that the low doses of nitrogen (20 units/fed) gave the least mean values (248.66 g and 265.11 g/plant for first and second seasons, respectively) (Table 3). Increasing the dose of nitrogen from 20 to 40 units/fed increased the flower fresh weight. On the other hand, the treatment of nitrogen at 60 units/fed produced about the same value of 40 units/fed and the differences between them was insignificant, this trend was observed in the two seasons. In regard to the interaction between nitrogen sources and doses in both seasons, the maximum values of flowers fresh weight have resulted from plants fertilized with both ammonium nitrate and ammonium sulfate at high dose (60 units/fed). Regarding the effect of the used nitrogen sources and doses on flower dry weight, the treatments which increased the fresh weight of flowers were parallel to those increased the dry weight of flowers. The same results were reported by Biesiada et al. (2008) on *Lavandula angustifolia* found that supplying 100kg N /ha as ammonium nitrate was suitable for fresh and dry weight inflorescence yield.

The seed yield

The seed yield as g/plant, g/ plot and kg/fed were significantly increased with different sources and doses of nitrogen fertilizer (Table 4). Nitrogen as ammonium sulfate was superior to the other two nitrogen sources in seed production; it produced the highest mean values of seed yield followed by ammonium nitrate then urea. The differences in the seed yield kg/fed due to three forms of nitrogen were significant in both seasons. The total yield of

seed (kg/fed) of ammonium sulfate treatment was higher than the ammonium nitrate by 14.33% and 9.76%, while ammonium sulfate produced an increment in seed yield by 17.61% and 19.57% higher than urea treatment for the first and second seasons, respectively. Regarding nitrogen doses, dose of 60 units/fed gave the maximum values in both two seasons. The effect of interaction between nitrogen sources and doses showed that both nitrogen sources as ammonium nitrate and ammonium sulfate gradually increased seed yield by increasing the applied dose. Generally, the maximum values of the seed yield in both seasons resulted from ammonium sulfate with 60 units/fed. A similar trend of results was reported by Refaat et al. (2000) on *Borago officinalis* found that foliar nutrient with urea at 2% produced the highest seed yield as compared to 0.5% or 1%. Kewalanand et al. (2001) treated dill plants with 0, 35, 70, and 105kg N/ha. They recorded that umbels per plant and seeds yield increased with the increase in the nitrogen rate. El-Leithy et al. (2011) found that nitrogen fertilization at 300 kg /fed significantly increased seed yield /plant of *Ricinus communis* L.

Effect of nitrogen application on chemical composition

The carbohydrate percentage

All nitrogen sources and doses significantly increased the percentage of total carbohydrate content in the root, herb, flowers, and seeds in both seasons as compared to untreated plants (Table 5).

Roots. From the data in Table 5 show that the urea treatment produced the maximum values in both seasons. In regard to the effect of different nitrogen applied doses, Table 5 shows that all Urea treatment produced the maximum carbohydrate percentage values in both seasons. All used doses increased the percentage of total carbohydrates in the roots. The best values were recorded with nitrogen at 40 units/fed. Regarding the interaction between nitrogen sources and doses of application in both seasons, addition of urea at high dose (60 units/fed) produced the maximum value of total carbohydrate percentage.

Herb. The results in Table 5 show that treating the plants with urea as a source of nitrogen was enhanced the accumulation carbohydrate as compared to ammonium nitrate and ammonium sulfate in two seasons. As for the doses of nitrogen, all doses of nitrogen significantly increased the carbohydrate content. The increments were

Table 4. Effect of different nitrogen sources and doses on flowers weight and yield of seed of *Urtica pilulifera* during 2009 and 2010 seasons

Treatments		Flower weight g/plant Fresh S_1	Fresh S_2	Dry S_1	Dry S_2	Yield of seed g/plant S_1	g/plant S_2	g/ plot (6m) S_1	g/ plot (6m) S_2	Kg/fed. S_1	Kg/fed. S_2
Control		236.50	242.00	52.03	53.24	13.50	15.20	243.00	273.60	162.00	182.40
Urea N (unit)	20.00	258.00	264.33	57.79	59.21	17.20	18.30	309.60	329.40	206.40	219.60
	40.00	282.00	303.33	62.89	67.64	22.60	23.12	406.80	416.16	271.20	277.44
	60.00	248.33	261.67	54.63	57.57	147.40	19.50	313.20	351.00	208.80	234.00
Mean		262.78	276.44	58.44	61.47	19.07	20.31	343.20	365.52	228.80	243.68
Ammonium nitrate N (unit)	20.00	236.33	250.00	52.85	52.50	15.60	16.20	280.80	291.60	187.20	194.40
	40.00	250.00	260.00	57.20	61.02	21.30	22.80	383.40	410.40	255.60	273.60
	60.00	290.00	300.66	63.51	65.85	24.60	27.12	442.80	488.16	295.20	325.44
Mean		258.78	276.06	57.85	58.52	20.50	22.04	396.00	369.5	246.00	264.48
Ammonium sulphate N (unite)	20.00	251.66	281.00	57.02	62.10	19.30	20.33	347.40	365.94	231.60	243.96
	40.00	475.30	297.00	61.40	66.23	24.15	24.00	432.00	434.70	288.00	289.80
	60.00	291.67	305.33	64.46	67.48	28.16	29.16	506.88	524.88	337.92	349.92
Mean		272.89	294.44	60.96	65.27	23.87	24.50	428.76	441.84	285.84	294.56
Mean of dose N (unit)	Control	236.50	242.00	52.03	53.24	13.50	15.20	243.00	273.60	162.00	182.40
	20.00	248.66	265.11	55.89	57.94	17.37	18.28	312.60	328.98	208.40	219.32
	40.00	269.11	286.78	60.50	64.97	23.18	22.81	417.30	410.52	278.20	273.68
	60.00	276.67	289.89	60.87	63.63	214.56	24.09	44.08	433.56	294.72	289.04
LSD (0.05) of N.S.		14.60	12.0	2.60	3.10	1.80	2.00	22.00	24.65	14.60	18.40
LSD (0.05) of N.D.		11.20	10.34	1.97	2.65	1.48	1.62	19.80	21.34	15.50	16.04
LSD (0.05) of N.S. x N.D		9.79	9.52	3.20	3.14	2.30	2.40	13.45	14.62	7.98	8.50

Note: S_1: First season, S_2: Second season, N.S.: Nitrogen source, N: Nitrogen N.D.: Nitrogen Doses

Table 5. Effect of different nitrogen sources and doses on the total carbohydrates percentage of *Urtica pilulifera* during 2009 and 2010 seasons.

Treatments		Total carbohydrate % Root % S_1	Root % S_2	Herb % S_1	Herb % S_2	Flowers % S_1	Flowers % S_2	Seed % S_1	Seed % S_2
Control		12.40	13.20	11.70	12.80	12.70	11.50	11.71	12.74
Urea N (unit)	20.00	15.00	14.73	15.00	14.80	13.31	15.00	93.96	13.58
	40.00	17.00	15.20	15.40	19.10	15.82	16.10	15.76	15.97
	60.00	20.00	17.20	18.80	20.00	14.69	15.10	15.25	13.48
Mean		17.33	15.71	16.40	17.97	14.61	15.40	14.99	14.34
Ammonium nitrate N (unit)	20.00	13.40	13.40	13.10	13.90	13.50	13.00	13.56	13.872
	40.00	158.30	15.60	15.70	16.50	14.60	14.30	13.65	16.92
	60.00	16.51	16.20	18.40	18.50	15.64	15.40	18.28	19.20
Mean		15.07	15.07	15.73	16.30	14.58	14.23	15.17	16.65
Ammonium sulfate N (unit)	20.00	13.70	13.03	14.10	14.90	14.40	13.91	14.00	14.50
	40.00	16.00	15.90	16.30	16.90	14.80	15.60	16.26	16.49
	60.00	16.90	17.70	17.60	18.00	16.34	17.90	19.03	19.54
Mean		15.53	15.54	16.00	16.60	15.18	16.43	16.84	16.84
LSD at (0.05)- N.S.		1.16	1.06	1.33	1.36	0.94	1.22	1.16	1.17
LSD (0.05) of N.D.		0.94	1.10	1.11	1.24	0.88	1.15	1.10	1.06
LSD (0.05) of N.S. x N.D		0.80	1.01	1.30	1.28	0.84	1.16	0.95	1.11

Note: S_1: First season, S_2: Second season, N.S.: Nitrogen source, N: Nitrogen N.D.: Nitrogen Doses

gradual with increasing the dose of nitrogen. The most promising effect on the accumulation of total carbohydrate was urea at a high level (60 units/fed).

Flowers. *Urtica pilulifera* flowers highly respond to ammonium sulfate in accumulation of total carbohydrate in flowers. As for nitrogen doses, the dose of nitrogen at 40 units/fed produced the maximum value of the total carbohydrate percent as 15.21% and 16.10% for first and second seasons, respectively, followed by the dose of 60 units/fed which produced 15.14% and 15.53%, then the low level (20 units/fed) which represented 14.71% and 14.57% for the first and second seasons, respectively. In regard to the interaction between sources and doses, ammonium sulfate gave the highest response to the accumulation of total carbohydrate.

Seeds. The maximum values of the total carbohydrate in the seed were recorded with ammonium sulfate treatment, while urea treatment produced the least mean values (Table 5). The differences between urea and the other two nitrogen sources were significant while the difference between ammonium sulfate and ammonium nitrate was insignificant. As for different doses, increasing the dose of nitrogen from 20 to 40 units/fed produced significant increments. The highest total carbohydrate was obtained as a result of 60 units/fed application. The effect of interaction between sources and doses of nitrogen was significant in both seasons (Table 5). The application of ammonium sulfate and ammonium nitrate at 60 units/fed increased the total carbohydrate in both seasons. Results are in accordance with Hammam (1996) fertilized anise plants with nitrogen at the rates of 20, 40 and 80 kg/fed He found that the contents of total carbohydrate, nitrogen, phosphorus and potassium in herb were increased steadily by raising the rate of nitrogen fertilization. Khalil et al. (2001) who showed that application of 40 units of nitrogen increased total carbohydrate content in seed of *Nigella sativa*.

Total caffeic acid derivatives (TCAD)

Flowers are the richest part in the total caffeic acid derivatives followed by the seed, then the herb while the

Table 6. Effect of different nitrogen sources and doses on the total caffeic acid derivatives content of *Urtica pilulifera* during 2009 and 2010 seasons.

Treatments		Total caffeic acid derivatives %							
		Herb		Roots		Flower		Seeds	
		S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2
Control		0.52	0.7	0.39	0.46	1.28	1.50	1.08	1.30
	20.00	1.39	1.28	0.99	0.89	2.04	2.64	1.22	1.96
Urea N (unit)	40.00	1.17	1.03	0.77	0.85	0.80	2.43	1.58	2.17
	60.00	0.99	0.76	0.45	0.61	1.77	1.97	1.39	1.40
Mean		1.18	1.02	0.14	0.78	2.20	2.35	1.40	1.85
Ammonium	20.00	1.09	1.64	0.64	0.56	2.03	2.37	1.63	2.20
nitrate	40.00	1.16	2.10	0.95	0.84	2.33	3.01	1.78	2.10
N (unit)	60.00	1.62	2.41	0.99	1.30	2.73	3.25	1.37	1.93
Mean		1.29	2.05	0.86	0.90	2.36	2.87	1.59	2.08
Ammonium sulfate	20.00	1.10	1.08	0.86	0.79	1.89	2.79	2.21	1.92
N	40.00	1.45	1.69	0.94	0.93	2.19	2.91	2.40	2.42
(unit)	60.00	1.06	1.37	0.61	0.58	1.81	2.53	0.98	1.54
Mean		1.20	1.38	0.80	0.77	1.96	2.14	1.53	1.96
Mean of	Control	0.52	0.77	0.39	0.46	1.28	1.50	1.08	1.30
concentrations	20.00	1.19	1.33	0.83	0.75	1.99	2.60	1.35	21.03
(N unit)	40.00	1.26	1.60	0.89	0.87	2.44	2.78	1.92	2.23
	60.00	1.22	1.51	0.68	0.83	2.10	2.58	1.25	1.62
LSD at (0.05) - N.S.		2.16	0.19	0.11	0.11	0.13	0.14	0.12	0.11
LSD (0.05) of N.D.		0.17	0.17	0.14	0.08	0.12	0.12	0.11	0.09
LSD (0.05) of N.S.xN.D		0.14	0.14	0.12	0.10	0.10	0.11	0.09	0.07

Note: S_1: First season, S_2: Second season, N.S.: Nitrogen source, N: Nitrogen N.D.: Nitrogen Doses

Table 7. Effect of different nitrogen sources and doses on total lipid content of *Urtica pilulifera* plants during 2009 and 2010 seasons.

Treatments		Total lipid%							
		Rotts		Herb		Flower		Seeds	
		S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2
Control		0.32	0.38	0.89	0.92	2.87	3.35	14.28	16.26
	20.00	0.77	0.57	1.40	1.48	4.61	4.42	20.48	20.31
Urea N (unit)	40.00	1.03	1.04	1.78	1.80	6.54	6.51	20.03	19.86
	60.00	0.98	0.95	1.60	1.57	5.83	6.07	19.64	19.84
Mean		0.93	0.85	1.59	1.62	5.66	5.67	20.33	20.29
Ammonium nitrate N (unit)	20.00	0.64	0.57	1.11	1.11	5.00	5.42	20.84	20.92
	40.00	1.21	1.24	1.94	2.13	6.58	6.92	20.88	20.72
	60.00	0.921	1.10	1.84	1.73	6.47	6.63	21.00	21.17
Mean		0.93	0.97	1.63	1.66	6.02	6.32	20.62	20.65
Ammonium sulfate N (unit)	20.00	0.40	0.48	1.00	1.06	5.40	5.19	19.09	18.90
	40.00	0.54	0.63	1.55	1.34	6.16	6.14	19.98	19.56
	60.00	0.51	0.60	1.42	1.19	5.99	5.34	20.63	20.80
Mean		0.48	0.57	1.32	1.20	5.85	5.56	19.90	19.75
Mean of concentrations (N unit)	Control	0.32	0.38	0.89	0.92	2.87	3.35	14.28	16.26
	20.00	0.60	0.54	1.17	1.22	5.00	5.01	20.17	20.01
	40.00	093	0.97	1.76	1.76	6.43	6.52	20.30	20.05
	60.00	0.80	0.88	1.62	1.49	6.10	6.01	20.42	20.60
LSD at (0.05)- N.S.		0.08	0.10	0.07	0.14	0.85	0.89	0.68	0.55
LSD (0.05) of N.D.		0.07	0.11	0.05	0.12	0.75	0.74	0.62	0.42
LSD (0.05) of N.S.xN.D.		0.06	0.08	0.04	0.11	0.77	0.72	0.65	0.46

Note: S_1: First season, S_2: Second season, N.S.: Nitrogen source, N: Nitrogen N.D.: Nitrogen Doses

roots contained the lowest values (Table 6). This was the case in both seasons, regardless of the applied treatments. The total caffeic acid derivatives showed a statistically significant increment due to different sources and doses of nitrogen in both seasons as compared to untreated plants. As for nitrogen sources, ammonium nitrate has more promising effects on increasing the total caffeic acid derivatives in all parts of *Urtica* plants. On the contrary, urea treatment showed the least effect on increasing total caffeic acid derivatives in all plant parts. Concerning the nitrogen doses, data in Table 6 showed that the maximum values of the total caffeic acid derivatives in all parts were recorded with medium dose (40 N units/fed) in both seasons while the interaction effect of different sources and doses of nitrogen on the TCAD indicated that ammonium nitrate at high dose (60 N units/fed) produced the maximum values in roots and herb although ammonium sulfate at the medium dose (40 N units/fed) magnified TCAD in seed than the other treatments. These results are in accordance with Mao et al (2001) who noticed that nitrogen levels significantly affected the concentrations of caffeic acid on sweet potato weevil (Coleoptera: Curculionidae). El-Sayed et al. (2012) recorded results showed that the highest level of Nitrogen (300kg/fed) was improving the content of polysaccharide, caffeic acid and alkamides of *Echinacea paradoxa* L. plants.

Total lipid content

It is evident that the lipid content is the highest in the seed (14.28 and 16.26%) followed by flowers (2.87 and 3.35%) while the roots contained the lowest lipid content as compared to flowers and seed (Table 7). All the used sources and doses of nitrogen significantly increased the lipid content in different plant parts in both seasons. Application of ammonium nitrate produced the highest effect on the lipid accumulation in roots, herb, flowers, and seed as compared to other sources.

Although all the used doses of nitrogen resulted in considerable increases in the lipid content in the plant parts, the medium dose (40 units/fed) was the most effective in increases the lipid in roots, herb and flowers, while the high dose (60 units/fed) was the most effective in increasing the total lipid in seed, these trends have been followed in both two seasons. The maximum values of total lipid content in root, herb and flowers have resulted from ammonium nitrate at 40 units/fed while ammonium nitrate at high dose (60 N units/fed) produced the highest values in seed.

Our results are in harmony with Khalil et al (2001) who reported that application of nitrogen fertilizer on *Nigella sativa* increased total lipid content of the seed. It is clear from the mentioned results that the best treatment to enhance total carbohydrate content in all plant parts is ammonium sulfate at 60 units/fed except herb which induced by urea at 60 units/fed while the most effective treatment to augment total caffeic acid derivatives in all parts is ammonium nitrate at 60 units/fed. On the other hand, the best treatment to increase the total lipid content in all plant parts was ammonium nitrate at 40 units/fed.

CONCLUSION

Urtica pilulifera plants positively responded to nitrogen application. All nitrogen treatments produced significant increments in growth and determined chemical constituents as compared to untreated plants and the best source was ammonium sulfate for all parameters at the high level (60 N units/fed).

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