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The effect of sowing dates and LiQ-humus and their interactions on growth, yield and chemical compositions of *Withania somnifera* L. Dunal (Ashwagandha)

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ABSTRACT

The experiment was conducted to study the effect of sowing dates and LiQ-Humus on growth, yield and chemical composition of Ashwagandha (Withania somnifera L.) sown at Medicinal and Aromatic Plants fields of the College of Agriculture , Basra University, Iraq, during the growing season of 2013/2014 and 2014/2015. The experiment was laid out in Randomized Complete Block Design in a factorial experiment having three replications. The experiment involved two factors: sowing dates at three levels of1or20 September and 10 October and LiQ-Humus(0 and 0.75) ml.l^{-1}The results showed that the all growth characters and chemical composition and nutrient contain of Ashwagandha plants as affected by different sowing dates. LiQ-Humus had no significant effects on all growth characters during both growing seasons except for dry weigh of leaves and roots. and increase of nutritional components. The interactions between sowing dates and LiQ-Humus gave a significant increase in most studied parameters during both seasons.

Key words: Ashwagandha (*Withania somnifera* L.) , sowing dates , LiQ-Humus.

INTRODUCTION

Withania somnifera L. related to Solanaceae Family, spread around the dry parts of South East Asia mentioned Ayurveda [1] *W. Somnifera L.* is an annual or perennial plant which has erect grayish, stellate-tomentose undershrub features (30-75 cm high) with long tuberous roots. Leaves are alternate or subopposite , broadly ovate to oblong, petiolate, sub-acute, entire, with lamina .Flowers are small, greenish ,axillary, solitary or in few-flowered cymes and bisexual The calyx is gamosepalous with five 3-5 mm lobes, accrescent and inflated in a fruit. The corolla is campanulate, greenish-yellow with five 5-8 mm lobes. There are five included stamens. The ovary is ovoid/globose, glabrous, and many ovuled. The style is filiform and stigma is 2-lobed. Fruit is a globose berry, orange-red when ripe and enclosed in the enlarged calyx. Seeds are many, discoid, yellow and reniform [2,3,4]. The chemistry of this plant has been extensively studied and several groups of chemical constituents such as steroidal lactones, alkaloids, flavonoids, tannin etc. have been identified, extracted, and isolated [5,6]**.** The pharmacological activity of W. somnifera extracts has been summarized recently by Gupta and Rana [3]. Historically, W.somnifera has been used as an antioxidant, adaptogen, aphrodisiac, livertonic, antiinflamatory agent and astringent and more recently as an antibacterial, antihyperplycemic and antitumor , as well as to treat ulcers and senile dementia .In recent years, numerous pharmacological studies were also carried out to explore other beneficial effects of *W. somnifera*. Further research with withaferin-A shows that having antiplatelet, anticoagulant, and profibrinolytic properties (7), cardioprotective activity, nephroprotective activity, immunomodulatory activity and antileishmanial activities. Proper and timely tillage, sowing method, sowing time, planting geometry, new crop varieties, use of fertilizers, pesticides and herbicides in suitable crop rotations are some of the practices that contribute to the increase and stabilization of agricultural production. In this experiment an attempt was made to study the influence of sowing date and LiQ-Humus on vegetative growth , fresh and dry weight of leaves and roots and chemical components of *Withania Somnifera (L.).*

MATERIALS AND METHODS

Experimental Design

The study on the effect of sowing dates and LiQ-humus on growth, yield and chemical composition of Ashwagandha (*Withania somnifera* L.) was conducted at Medicinal and Aromatic Plants fields of the College of Agriculture, Basra University, Iraq, during the growing seasons of 2013/2014 and 2014/2015.

The experiment was laid out in RCBD (Factorial) design with three replications. There were six treatment combinations comprised of three dates of sowing (Sep.1st, Sep. 20th and Oct.10th) and two levels of LiQ-humus(0 and 0.75) ml.l^{-1}.The seeds were sown in small pots with the size (180cm^{3}) and then transplanted in large size pots (900 cm$^{3)}$ when Seedlings aged 5 month. The plants were treated with LiQ-humus (produced by Humin Tech, Germany)after 14 days of transplanting. Treatments were repeated three times. Each treatment was about 20 days after the other treatment took place. Tables (1& 2) explains the chemical, physical, soil mixture, LiQ-humus and irrigational water used in this experiment.

Tables (1 & 2) explains the chemical, physical, soil mixture, LiQ-Humus and irrigation water used in this experiment

Table 1 soil mixture& Irrigation water		
Characterize	Season1	Season2
(E.C)	5.03	5.04
(pH)	7.32	7.30
Total nitrogen(ml.l^{-1})	0.85	0.90
Phosphorus(ml.l^{-1})	17.76	20.85
Potassium(ml.l^{-1})	22.18	30.04
Organic matter%	0.38	0.40
Separates of soil		
Sand%	46.90	46.51
Silt%	18.00	20.04
Clay%	14.00	13.11
Soil texture	Sandy silt	
Irrigation water		
(E.C)	40.2	40.3
(pH)	7.90	7.92

Table2	
LiQ-Humus Composition & Properties	
Density	1.12kg/L
(pH)	9-10.5
(E.C)	400-600 meq/100g
Particle size	<100 Microns
Solubility in water	100%
Potassium Humates	>18%
Potassium(K_2O)	%3
Iron (Fe)	0.3
Organic matter%	16.5

Table (3) maximum and minimum temperature grades and relative humidity for two seasons

Month	2013/2014		
	Temperature		Humidity%
	Max.	Min.	
September	42.23	24.79	19.26
October	33.41	17.33	26.84
2014/2015			
September	41.48	27.45	19.87
October	30.88	18.86	22.47

Measurements

Immediately after harvest, three plants in each replication were used for measurement of factors. Measured factors consisted of:-

1. Plant Growth Characteristics

plant's height, branch number.plant^{-1}, Leaf number.plant^{-1},leaf area, fresh and dry weight of leaves and roots.

2. Chemical Compositions

A. Total chlorophyll content was measured by Spectrophotometer, according to Good(8).
B. Total carbohydrate in leaf and root was measured by Spectrophotometer, according to Dubois *et al.*(9).
C. vitamin C was measured as described by A. O. A. C. (10).

3. Nutritional Components

A. Total nitrogen percentage (N %) by micro-Kjeldahl according to Page *et al.*(11).
B. Phosphorus content (P %) according to Olsen and Dean (12).
C. Potassium (K) and calcium (CA)content was measured by using Flame photometer according to Page *et al.*(11).

Statistical procedure

The data recorded from three plants were subjected to statistical analysis, using analysis of variance (ANOVA) using Gen Stat Release 10 statistical software. The differences among various treatments were analyzed through Least Significant Difference test at probability of 0.05.(13).

RESULTS AND DISCUSSION

A. Growth Characteristics

The growth characters of Ashwagandha plants as affected by different sowing dates and treated with LiQ-humus and their interactions are shown in tables (4,5,6). Regarding plant high, it could be easily noticed that10th Oct., had increased plant high significantly comparing with other dates in both growing seasons. The maximum increment for branches number was recorded on 20th Sep., more than the other sowing dates during both growing seasons. Number of leaves per plant had the highest values when plant sown on 20th Sep., for the first growing season, and plant sown on 10th Oct., for the second growing season.

However plants sown on 1stSep.,for the first season and 10th Oct., for the second season produced a significant maximum leaf area. Meanwhile, the variation in the average values of fresh and dry weight for leaves and root for different sowing dates was significantly increased. The maximum fresh and dry weight of leaves and fresh weight of roots during the first season, was obtained of plants sown on 1stSep., and during the second season was obtained of plants sown on 10th Oct. and 20th Sep.

Table (5) shows that LiQ-humus had no effects on all growth characters during both growing seasons except for dry weigh of leaves and roots.

Table 4: Effect of sowing dates on Growth Characteristics of *W. somnifera*(L.) during both growing seasons

Sowing dates	Season (2013/2014)							
	Plant high	No. of branches	No. of leaves	Leaf area (m^2)	Fresh weight(g/plant)		Dry weight(g/plant)	
					Leaves	Roots	Leaves	Roots
D1	39.6	22.83	188.02	0.65	47.30	8.59	8.94	1.73
D2	47.1	25.00	199.20	0.39	38.61	5.94	7.33	1.52
D3	43.6	24.44	125.95	0.22	20.80	6.78	4.67	1.74
L.S.D.	**5.21**	**1.49**	**7.38**	**0.09**	**2.87**	**0.88**	**0.92**	**N.S**
Season (2014/2015)								
D1	29.6	9.23	59.94	0.13	16.01	1.78	2.54	0.24
D2	35.1	12.75	67.83	0.17	19.10	2.99	4.01	0.31
D3	38.5	10.25	79.79	0.25	21.44	2.94	4.46	0.57
L.S.D.	**3.34**	**1.86**	**5.93**	**0.03**	**2.29**	**0.63**	**1.03**	**0.12**

** D1:-1 September, D2 :- 20 September, D3 :-10 October.*

Table 5: Effect of LiQ-Humus on growth characteristics of *W. somnifera*(L.) during both growing seasons

LIQ-Humus $ml.l^{-1}$	Season (2013/2014)							
	Plant high	No. of branches	No. of leaves	Leaf area m^2	Fresh weight(g/plant)		Dry weight(g/plant)	
					Leaves	Roots	Leaves	Roots
H0	42.2	25.58	173.59	0.45	38.31	7.80	7.53	1.80
H1	44.6	22.60	168.52	0.39	32.84	6.41	6.43	1.53
L.S.D.	**N.S**	**1.22**	**N.S**	**N.S**	**2.34**	**0.72**	**0.75**	**0.20**
Season (2014/2015)								
H0	33.9	10.57	68.53	0.18	19.22	2.68	4.43	0.45
H1	34.9	10.92	69.85	0.18	18.48	2.46	2.90	0.29
L.S.D.	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**0.84**	**0.09**

** H0 :- without LIQ-Humus , H1:- with LIQ-Humus (0.75 $ml.l^{-1}$).*

Table 6: Effect of interactions between sowing dates and LiQ-Humus on growth characteristics during both growing seasons

sowing dates & LiQ-Humus	Season (2013/2014)							
	Plant high	No. of branches	No. of leaves	Leaf area m^2	Fresh weight(g/plant)		Dry Weight (g/plant)	
					Leaves	Roots	Leaves	Roots
D1H0	40.3	25.42	161.88	0.61	49.19	9.57	9.60	1.89
D2H0	47.2	28.31	219.39	0.43	43.62	6.47	7.99	1.60
D3H0	39.2	23.00	139.50	0.30	22.10	7.35	4.99	1.91
D1H1	38.8	20.25	214.17	0.69	45.42	7.60	8.29	1.57
D2H1	47.1	21.69	179.00	0.35	33.59	5.42	6.67	1.45
D3H1	48.0	25.88	112.40	0.14	19.51	6.20	4.35	1.58
L.S.D.	**7.37**	**2.11**	**10.44**	**0.13**	**4.06**	**1.24**	**1.30**	**0.35**
Season (2014/2015)								
D1H0	29.5	11.38	66.00	0.13	15.22	2.10	2.45	0.29
D2H0	35.3	10.67	63.75	0.18	18.25	2.80	5.34	0.30
D3H0	36.8	9.67	75.83	0.22	24.20	3.14	5.52	0.76
D1H1	29.6	7.08	53.88	0.13	16.80	1.45	2.62	0.19
D2H1	34.8	14.83	71.92	0.15	19.95	3.18	2.68	0.32
D3H1	40.2	10.83	83.75	0.27	18.69	2.74	3.39	0.38
L.S.D.	**4.73**	**2.64**	**8.39**	**0.05**	**3.24**	**0.89**	**1.45**	**0.16**

** D1H0:-1 September without LIQ-Humus ; D2H0 :- 20 September without LIQ-Humus ; D3H0 :-10 October without LIQ-Humus ; D1H1:-1 September with LIQ-Humus ; D2H1 :- 20 September with LIQ-Humus ; D3H1 :-10 October with LIQ-Humus .*

The interaction of sowing date and LiQ-humus was significantly affected all growth characters during both growing seasons, table (6). The treatment of sowing date of 10th Oct., with LiQ-humus produced the highest plant height in both seasons (48.0 and 40.2 cm) and maximum number of leaves (83.75) and leaf area(0.27m^2) during the second season only followed by other treatments. Also, the highest fresh and dry weight of leaves (49.19g) and (9.60g) and fresh weight of roots (9.57g) was obtained under the treatment of sowing date on1st Sep. without LiQ-humus followed by other treatment during the first season. Treatment of sowing date of1stSep. with LiQ-humus produced the maximum leaf area(0.69m^2) during the first season only, followed by other treatments. Also the plants which were sown on 20th Sep. without LiQ-Humus gave a significant increase number of branches and leaves (28.31) and (219.39) during the first season, and increase dry weight of leaves (5.34g) during the second season followed by another treatment. And plants sown on 20th Sep. with LiQ-Humus gave a significant increase in number of branches (14.83) and fresh weight of roots (3.18) during the second season. However the plants which was sown in 10th Oct.. Maximum fresh weight of leaves (24.20g)during the second season and dry weight of roots during both seasons (1.91g and 0.76g) obtained of plants sown on 10th Oct., without LiQ-humus.

Planting dates is of the most important factors to be taken into account when the cultivation of any plant, as the different planting dates regularly mean a difference in environment such as temperature, light, humidity and other factors that reflect plant growth and development and the quality and quantity of production factors (14). The vegetative growth shown of high plant and number of branches, leaves and leafy area of strength and signs of growth, which in turn influenced by the quantity and quality of nutrients absorbed and environmental conditions surrounding the plant also affect the dates of the various agriculture. The early sown plants may be due to the growth in the availability of the appropriate environmental conditions for vegetative growth which has worked to increase the efficiency of photosynthesis that reflected positively in the strength of plant growth such as number of branches and leaves ,fresh and dry weight of leaves and roots (15). This result agrees with Ayub, *et al* (16) and Omidbaigi *et al*. (17) to *Foeniculum vulgare* Mill. The increased branches may be due to the availability of food manufacturers needed to stimulate the buds on plant growth and compared to plants cultivated late deadlines amount (18). This result agrees with El-Khayat and Gouda (19) and Tunio *et al*. (20) to fennel plants ,Or increase the efficiency of photosynthesis and the accumulation of metabolites that stimulate cell division and the emergence of new vegetative growth of total heavy vegetative growth represented by the number of branches , number of leaves. This result agrees with Sarkis *et al*. (21) and Altuhafy *et al*. (22) and Kazem (23) to *Pimpinell anisum* L . Plants growing in the early dates led to increased leaf area compared to those cultivated in the late dates due to different environmental conditions of temperature, humidity and lighting in the different planting dates. This result is similar too Sarkis *et al*. (21) and Ayub *et al*. (16) to fennel plant and Pesti *et al.* (24).

The beneficial effect of interaction of sowing date and LiQ-humus on growth characters may be difference in the environment of temperature, light, humidity and other factors that are reflected on plant growth and development and the quality and quantity of production factors. The beneficial stimulation effect of LiQ-humus explained by several hypotheses, including the formation of complex between the humus and mineral ions, catalysis of humic acid to enzymes in plant, influence of humic on respiration and photosynthesis, stimulation of nucleic acid metabolism and hormone activity .In addition to its capacity to improve the hydro physical properties of the soil.

B .Chemical compositions

The chemical compositions of Ashwagandha plant as affected by different sowing dates and treated with LiQ-humus and their interactions are shown in tables (7,8,9).The delay in sowing from 1stSep., to 10th Oct., increase the total chlorophyll and vitamin C during the first growing season only, table (7). Highly total chlorophyll during the second season, produced by plants sown on 1st Sep. The maximum carbohydrate of leaves during the first and second growing seasons was obtained by plants sown on 1stSep., and 20th Sep. Also plants sown on 20th Sep produced significantly maximum levels of carbohydrate of roots during the first growing season.

Table (8) Analysis of variance showed that the effect of LiQ-humus had no significant effects on all chemical composition during both growing seasons, except for total chlorophyll and vitamin c during the first season only.

On the other hand data presented in Table (9)) showed the interactions between sowing date and LiQ-humus were significantly affected all chemical compositions. The highest rates of total chlorophyll (75.15ml) and (41.39ml) were found at treatment 10thOct. with LiQ-humus during season one and 1stSep. with LiQ-humus during season two, followed by other treatments. The maximum rates of vitamin C (4.67 ml) were obtained at treatment 10th Oct. with and without LiQ-humus during season one only . The highest carbohydrate of leaves (27.16ml) during season one and (25.49ml) during season two, was obtained at1 and 20thSep.with LiQ-humus followed by other treatments. Whereas, plants sown on 20th Sep. with LiQ-humus gave high rate of total carbohydrate of root (26.37 ml) during the first season only, followed by other treatments.

The exceed of early plants in the content of carbohydrates may be due the reason that plants growth under favorable weather conditions led to the length of the vegetative growth period and abundance represented by increasing the number of branches and vegetative number of leaves and leaf area which led to increase the efficiency of photosynthesis, which reflected significant increase in processed food in stock accumulation and delayed transmission of those manufactured materials to the centers polarization (flowers and fruits) which provided carbonate needed to build the amino acid structures led to increase the total chlorophyll and vitamin contents(25). This is consistent with Abd *et al*. (26) to *Ocimum basilicum* var. basilicum L.

Humus isa complex installation organic material produced from the decomposition of plant and animal material (27). The use of humic fertilizer which contains a large number of organic acids which humic acid and humin acid and fulivc acid, which have effective roles in the readiness of nutrients for plants and thus its impact on improving the growth and production indicators, many of the studies and research reported that the addition of humic acid characterized by improving plant growth directly or indirectly it act as bio-stimulant induced hormonal activity of plant releasing different auxin types which in regulating plant growth and environmental responses. Humic acid improve plant growth by improving soil texture and act to increase water, plants roots ability to enter soil and penetrate, Humic acid is very important as transfer media for nutrition's from soil to plant and increase soil water holding ability and stimulate soil microorganisms activity. In addition the LiQ-humus contain potassium (Table2) that goes into the physiological operations such as cell division and activate enzymes and representation of carbohydrates, which is reflected positively in increased plant height and the percentage of dry matter in it and thus its impact on improving growth indicators and production (28,29).

Table 7: Effect of sowing date on chemical compositions of *W. somnifera*(L.) during both seasons

Sowing dates	Season (2013/2014)			
	total chlorophyll content (ml.100 gm^{-1})	vitamin c (ml.100 gm^{-1})	total carbohydrates (ml. gm^{-1})	
			Leaves	Roots
D1	47.98	3.33	27.09	25.91
D2	53.96	3.46	26.53	26.15
D3	63.96	4.67	25.63	25.48
L.S.D.	**4.13**	**0.83**	**0.33**	**0.61**
Season (2014/2015)				
D1	38.67	2.45	24.70	25.65
D2	23.72	2.62	25.24	26.12
D3	28.47	2.42	24.84	26.17
L.S.D.	**3.51**	**N.S**	**0.36**	**N.S**
* *D1:-1 September, D2 :- 20 September, D3 :-10 October.*				

Table 8: Effect of LiQ-Humus on chemical compositions of *W. somnifera*(L.) during both seasons

LIQ-Humus ml.l^{-1}	Season (2013/2014)			
	total chlorophyll index (ml.100 gm^{-1})	vitamin c (ml.100 gm^{-1})	total carbohydrates (ml. gm^{-1})	
			Leaves	Roots
H0	59.83	4.22	24.82	25.71
H1	50.77	3.42	25.03	25.98
L.S.D.	**3.37**	**0.68**	**N.S**	**N.S**
Season (2014/2015)				
H0	29.37	2.66	26.38	26.02
H1	31.20	2.32	26.45	25.95
L.S.D.	**N.S**	**N.S**	**N.S**	**N.S**
*** H0 :- without LIQ-Humus , H1:- with LIQ-Humus (0.75 ml.l^{-1}).**				

Table 9: Effect of interactions between sowing dates and LiQ-Humus on chemical compositions of *W. somnifera*(L.) during both seasons

sowing dates & LiQ-Humus	Season (2013/2014)			
	total chlorophyll index. (ml.100 gm^{-1})	vitamin c (ml.100 gm^{-1})	total carbohydrates (ml.100 gm^{-1})	
			Leaves	Roots
D1H0	57.74	3.75	27.02	25.82
D2H0	68.98	4.25	26.50	25.92
D3H0	52.78	4.67	25.64	25.38
D1H1	38.22	2.92	27.16	26.00
D2H1	38.94	2.67	26.56	26.37
D3H1	75.15	4.67	25.63	25.58
L.S.D.	**5.84**	**1.18**	**0.46**	**0.86**
Season (2014/2015)				
D1H0	35.95	2.54	24.68	25.66
D2H0	24.01	2.79	24.98	26.18
D3H0	28.15	2.66	24.80	26.21
D1H1	41.39	2.36	24.72	25.63
D2H1	23.42	2.44	25.49	26.07
D3H1	28.79	2.17	24.88	26.13
L.S.D.	**4.97**	**N.S**	**0.51**	**N.S**
** D1H0:-1 September without LIQ-Humus ; D2H0 :- 20 September without LIQ-Humus ; D3H0 :-10 October without LIQ-Humus ; D1H1:-1 September with LIQ-Humus ; D2H1 :- 20 September with LIQ-Humus ; D3H1 :-10 October with LIQ-Humus .*				

C. Nutritional contents

The nutritional contents of Ashwagandha affected by different sowing dates and treated with LiQ-humus and their interactions are shown in tables (10, 11,12).Data presented in Table (10) revealed that sowing dates were of a significant effect of macronutrients (N, P, K and Ca) in leaves and roots, except for the nitrogen and potassium of roots and phosphorus of leaves during both seasons. The maximum percentage of nitrogen in leaves and phosphorus in roots during the first season were obtained by plant sown on 1stSep**.** followed by other sowing dates. Also the highest percentage of phosphorus and calcium in roots was obtained by plant sown on 20th Sep. during the second season only. Furthermore plants sown on10th Oct. during the second season gave maximum percentage of calcium in leaves .

Table (11) showed that LiQ-humus causes significant differences in nutritional contents of Ashwagandha. Treatment with LiQ-Humus gave a significant increase of percentage of phosphorus in roots during the first season only, and also increase of percentage of nitrogen and calcium in roots and phosphorus ; potassium and calcium in leaves during the second season only. Whereas, plant without LiQ-Humus gave high percentage of potassium and calcium in roots during the first season only.

Analysis of variance showed that effect of interaction between sowing dates and LiQ-Humus on nutritional contents was significant (Table 12). High percentage of nitrogen in leaves(9.44%) during the second season, was obtained by treatment 1stSep. without LiQ-Humus. Whereas, high percentage of nitrogen in leaves (9.12%) and phosphorus in roots(5.24%).during thefirst season, was obtained by treatment 1stSep. with LiQ-humus. Also, the maximum percentage of potassium (3.13%) and calcium (1.86%) in roots during the first season, was obtained at treatment 20th Sep. without LiQ-Humus. Treatment 20thSep. with LiQ-Humus during the second season, produce maximum percentage of phosphorus (3.42%) and potassium (4.94%) in leaves and phosphorus (5.28%) and calcium (3.22%) in roots. The highest percentage of potassium in leaves(4.87%) during the first season, were obtained by treatment 10th Oct. without LiQ-Humus. 10th Oct. with LiQ-Humus gave the maximum percentage of phosphorus (3.66%) in leaves during the first season, and also gave the high percentage of nitrogen in roots (7.65%) and calcium (4.35%) in leaves during second season.

The exceed of early plants in the nutritional contents, may be due the plants growth under favorable weather conditions led to the length of the vegetative growth period and abundance represented by increasing the number of branches and vegetative number of leaves and leaf area which led to increase the efficiency of photosynthesis, which reflected significant increase in processed food in stock accumulation and delayed transmission of those manufactured materials to the centers polarization (flowers and fruits) which provided carbonate needed to build the amino acid structures led to increase the nutritional contents(25) . This is consistent with Abd *et al*. (26)to sweet basil.

Table 10: Effect of sowing dates on nutritional contents of *W. somnifera*(L.) during both seasons

Sowing dates	Season (2013/2014)							
	%N		%P		%K		%Ca	
	Leaves	roots	Leaves	roots	Leaves	roots	Leaves	roots
D1	8.81	5.14	3.25	4.95	3.42	2.80	2.73	1.31
D2	7.58	4.36	3.25	4.10	4.32	2.56	2.79	1.41
D3	4.89	3.91	3.16	4.64	4.40	2.30	2.78	1.37
L.S.D.	**2.20**	**N.S**	**N.S**	**0.33**	**0.90**	**N.S**	**N.S**	**N.S**
Season (2014/2015)								
D1	7.90	5.08	2.70	4.79	3.40	3.17	2.43	1.73
D2	7.47	4.41	2.91	5.20	4.16	3.05	3.09	2.55
D3	6.01	5.55	2.75	4.53	4.26	2.72	3.37	1.99
L.S.D.	**N.S**	**N.S**	**N.S**	**0.60**	**N.S**	**N.S**	**0.79**	**0.63**
** D1:-1 September, D2 :- 20 September, D3 :-10 October.*								

Table 11: Effect of LiQ-Humus on nutritional contentsof *W. somnifera*(L.) during both seasons

LIQ-Humus	Season (2013/2014)							
	%N		%P		%K		%Ca	
	Leaves	roots	Leaves	roots	Leaves	roots	Leaves	roots
H0	7.76	4.72	3.10	4.61	3.91	2.88	2.56	1.60
H1	6.43	4.22	3.35	5.11	4.19	2.23	2.98	1.13
L.S.D.	**N.S**	**N.S**	**N.S**	**0.27**	**N.S**	**0.63**	**N.S**	**0.43**
Season (2014/2015)								
H0	7.47	3.82	2.46	4.71	3.32	2.61	2.38	1.38
H1	6.79	6.21	3.11	4.97	4.56	3.35	3.55	2.80
L.S.D.	**N.S**	**1.26**	**0.58**	**N.S**	**0.79**	**0.74**	**0.64**	**0.51**
** H0 :- without LIQ-Humus , H1:- with LIQ-Humus (0.75 ml.l^{-1}).*								

Table 12: Effect of interactions between sowing dates and LiQ-Humus on nutritional contentsof *W. somnifera*(L.) during both seasons

sowing dates & LiQ-Humus	Season (2013/2014)							
	%N		%P		%K		%Ca	
	Leaves	roots	Leaves	roots	Leaves	roots	Leaves	roots
D1H0	8.50	4.63	3.21	4.66	2.76	2.90	2.41	1.42
D2H0	8.73	4.95	3.41	4.82	4.09	3.13	2.34	1.86
D3H0	6.06	4.57	2.66	4.35	4.87	2.61	2.91	1.51
D1H1	9.12	5.65	3.29	5.24	4.09	2.71	3.05	1.19
D2H1	6.44	3.77	3.09	5.15	4.54	1.99	3.24	0.96
D3H1	3.73	3.25	3.66	4.94	3.93	1.98	2.66	1.24
L.S.D.	**3.11**	**N.S**	**0.53**	**0.46**	**1.28**	**1.09**	**N.S**	**0.75**
Season (2014/2015)								
D1H0	9.44	3.83	2.51	4.83	2.31	2.99	1.97	1.26
D2H0	7.76	4.19	2.39	5.12	3.37	2.45	2.78	1.87
D3H0	5.20	3.45	2.47	4.17	4.28	2.40	2.40	1.00
D1H1	6.36	6.34	2.88	4.75	4.49	3.35	2.89	2.20
D2H1	7.19	4.63	3.42	5.28	4.94	3.65	3.40	3.22
D3H1	6.83	7.65	3.04	4.88	4.25	3.04	4.35	2.98
L.S.D.	**2.80**	**2.18**	**0.58**	**0.85**	**1.38**	**N.S**	**1.11**	**0.89**
** D1H0:-1 September without LIQ-Humus ; D2H0 :- 20 September without LIQ-Humus ; D3H0 :-10 October without LIQ-Humus ; D1H1:-1 September with LIQ-Humus ; D2H1 :- 20 September with LIQ-Humus ; D3H1 :-10 October with LIQ-Humus .*								

The high percentage of nitrogen, phosphorus, potassium, calcium, may be caused by the effect of organic acid humic and fulvic in the LiQ-humus to increase metabolic processes activity such as construction photosynthesis and respiration and building materials carbohydrates in addition to increasing the permeability of cell membranes and absorption of nutrients, especially nitrogen and phosphorus , potassium, calcium, resulting in increased absorption of plants and accumulation of these elements in the leaves and roots, This results agree with Farhan (30) to *Solanum tuberosum* L. and Cimrin and Yilmas (31) to *Lactuca sativa* L.

Many researchers have reported promoted that the growth and nutrient uptake of plants is due to the addition of humus substances. The plants take more mineral elements due to better developed root systems. In additions, the stimulation of ions uptake in the applications of humus materials led many investigators to propose that materials affect membrane permeability . Therefore; the humic substances may interact with the phospholipid structures of the cell membranes and react as carriers of nutrients through them.(32).

CONCLUSION

The results showed that early sowing had the optimum yield the following traits revealed the largest quantities: "main branch number, leaves number per stem, plant height. And chemical composition of Ashwagandha . And can be concluded that LiQ-humus had safe of agricultural treatments to hazard undesirable impact of mineral fertilizers and had a favorable effect on growth and availability of chemical composition of *Withania somnifera* (L.) seedling.

(13) (14)

Photo (13&14) the experiment fields

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