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EFFECT OF POTASSIUM SULPHATE AND SINGRAL ON VEGETATIVE GROWTH AND ACTIVE INGREDIENT OF *AMBROSIA MARITIMA* L.

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ABSTRACT

Field experiment was conducted during two seasons 2008 – 2009 in the Farm of Mallaway Agricultural Research Station El-Minia Governorate, Egypt; to study the effect of potassium fertilization and singral as foliar spray on the vegetative growth and active ingredient of *Ambrosia maritima* L.

Potassium sulphate treatments are used in three levels control, 50 and 100 kg/fed., while, singral is used as three treatments control, 1 and 2 g/l.

The data showed that, both potassium sulphate and singral treatments had significant effect on vegetative growth as well as ambrosin and damssin percentage compared with control.

Treating plant with 100 kg/fed. potassium sulphate and 2 g/L singral gave the highest values at all parameters of damsissa plant.

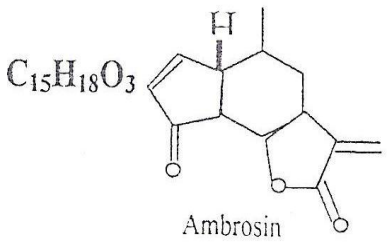
INTRODUCTION

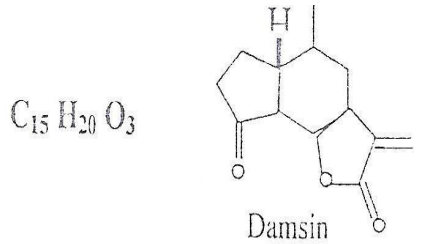
Medicinal and aromatic plants occupy a prominent economic position because of the continuous increasing demand which represent significant sources of economic revenue and foreign exchange.

Ambrosia maritima L., (damsissa), family; Compositae is perennial plant widely distributed throughout the Mediterranean region used in folk medicine for treatment of renal colic and cacui. Recently, the plant has reached the stage at large scale trials for control of Bilharziasis, El-Sway *et al.* (1984).

Sesquiterpene lactone extracted and isolated from whole plant, were shown to be toxic to the snails representing to the snails the intermediate host of the schistomasis and fasciolliasis found in canals

Picman *et al.* (1986). Many of these compounds were isolated from the crude herb, including damsin, ambrosin, neoambrosin hymenin and other fifteen pseudoguainolids Picman *et al*. (1986) and Jokupovic *et al.* (1987).





Under intensive cropping system that following in Egyptian farming, so, there is soil degradation in its fertility in both macro and microelements which in more cases must be applied to the soil or by foliar on plants like singral to avoid the symptoms of shortage of these elements.

Many investigators studied the effect of both potassium fertilization and foliar spray on some medicinal and aromatic plants as follows:

Mengel (1978) revealed that, Potassium is considered one of the major nutrients and it is very important element in growth and development of plants. It is very necessary in young growing tissues for cell elongation and possibly for cell division. It is very mobile in plants and therefore circulates freely. It helps in several physiological processes and uptake of other nutrient elements. It also plays an important role in activation of more than 60 enzyme systems in plants. It has a role in stomatal respiration, photosynthetic transfer, crop development. In addition to, its role in nutrition it also plays an important role in irrigation where at helps plants to be tolerant for water stress.

Haikal (1973) on geranium concluded that K fertilizer at the rate from 2 to 4 gm potassium sulphate, per plant produced higher foliage.

Shadia (1988) on *Pelargonium graveolens* found that using potassium sulphate 55 kg / fed. and calcium supper phosphate (130 k/fed.) significantly increased plant height and fresh and dry weight in the first cut during two seasons.

Khater *et al.* (1996) on *Jasminum officinale* found that, foliatrin treatment (foliar spray) 4 ml/L. significantly increased plant height, fresh and dry weight of aerial parts of plant, number of flowers, percentage and yield of concrete.

Shadia and El-Gamal (1996) on Pyrethrum found that, the different concentrations of foliar spray; significantly increased number of flowers, fresh and dry weights of flowers per plant and per plot compared with the control up to 3 m /l, pyrethrin content significantly increased by using different concentration.

Shadia and El-Mogi (2003) on *Castor bean* found that potassin (as foliar spraying) gave the highest values of vegetative growth, seed yields as well as fixed oil yield.

El-Mogy and Abd El-Salam (2006) on *Carthamus tinctorus* L. found that, application of Irral as foliar spray (4 g/L) significantly increased the vegetative growth and active ingredient.

Meawad *et al.* (2006) concluded that, treating *Ambrosia maritima* with 4500 ppm singral for four times significant increased fresh herb, seed yield ambrosin and damsin as well as total carbohydrates and macro elements.

The main targets of this present work are to:

1. Study the effect of potassium fertilization (soil application) on yield, its components and quality in the studied region.
2. Investigate the effect of singral foliar application on yield, its components and quality.
3. Study the effect the interaction between potassium fertilization and foliar application of singral.

MATERIALS AND METHODS

A field trial was conducted at Mallaway Agricultural Research Station El-Minia Governorate, Egypt during the two successive growing seasons 2008 and 2009 to study the impact of potassium fertilization and foliar application of singral on yield, its components and quality of damsissa plants in the studied area.

Seeds of damsissa plant (*Ambrosia maritima* L.) were obtained from Medicinal and Aromatic Dep. Doki, Egypt and sown in the nursery bed on February 21th and after 45 days seedlings were transplanted in the permanent field through the two growing seasons.

The experimental unit area (plot) was 3x3.5 m^2 containing five rows. The distance between rows was 60 cm and the distances between plants were 50 cm.

The experimental design was in complete randomized blocks with two factors (potassium and singral fertilization) and three replicates, where potassium fertilization was used with three levels 0, 50 and 100 kg/fed potassium sulphate, while, singral was sprayed with (0, 1 and 2 g/l).

Potassium treatments were added into two doses the first was on 8th May and the second one was added on 8th June with the same amount.

Singral as foliar spray was used after one month from transplanting and the second spray was one month interval. The chemical composition of singral was as follows; Macro elements (%); N (20%), P_2O_5 (20%), K_2O (20%), Mg (120 ppm) and S (0.4%). In addition of micro elements (ppm), Fe (70), Zn (14), Cu (16), Mn (42), B (22) and Mo (14), Meawad, (2006).

The herb was cut twice the first was on 20th July, while, the second on 25th September. All the agricultural practices were done in the two cuts. These data was recorded plant height, number of branches, fresh and dry herb and active substances (Ambrosin and Damsin).

Ambrosin and Damsin percentage were estimated according to the method described by Amin (1980).

The data were statistical analysis according to Steel and Torrie (1980) using new L.S.D.

RESULTS AND DISCUSSION

I-Effect of potassium sulphate and singral on vegetative growth

I-1- Plant height

Data in Table (1) show that, potassium treatments significantly increased plant height compared to control; the highest values were obtained at 100 kg potassium sulphate.

As for singral treatments the data in the same table indicate that there are significant increases in plant height compared with control and plant height significantly increased by increasing treatments.

The data also indicate that the treatment 100kg/ fed. potassium sulphate and 2g/L singral gave significant values of these parameters. These results were shown during two cuts in the two seasons.

Table (1). Effect of potassium sulphate and foliar application of singral on plant height (cm.) of *Ambrosia maritima* during 2008 and 2009.

Treatments	1st season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	33.67	41.67	43.00	39.44	35.67	40.33	42.67	39.56
S2	39.67	44.67	46.00	43.44	38.33	43.33	44.00	41.86
S3	43.33	52.33	46.67	47.44	41.67	51.33	45.00	46.00
Mean	38.89	46.22	45.22		35.56	45.00	43.89	
L.S.D at (0.05) for	K = 1.739 S = 1.739 K × S = 3.012				K = 1.456 S = 1.456 K × S = 2.521			
Treatments	2nd season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	30.00	31.00	35.33	32.11	31.67	33.00	36.33	33.67
S2	36.00	33.00	34.67	34.67	38.67	35.67	38.67	37.67
S3	36.67	37.67	41.00	38.44	38.33	38.67	41.23	39.44
Mean	34.22	34.00	37.00		36.22	35.78	38.78	
L.S.D at (0.05) for	K = 1.98 S = 1.98 K × S = N.S				K = 1.199 S = 1.199 K × S = 2.077			

I-2- Number of branches

Data presented in Table (2) clear that, number of branches per plant significantly increased by increasing both potassium and singral treatments.

As for interaction the data in the same table revealed that, 100 kg/ fed. potassium sulphate and 2g/L singral gave the highest values. These results were obtained during two cuts in the two seasons.

Table (2).Effect of potassium sulphate and foliar application of singral on number of branches of *Ambrosia maritima* during 2008 and 2009.

Treatments	1st season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	6.67	10.33	10.67	9.56	8.67	12.00	11.67	10.78
S2	9.00	8.33	9.33	8.89	10.00	10.00	10.33	10.11
S3	10.67	10.33	10.33	10.44	11.67	11.67	11.33	11.56
Mean	9.11	9.67	10.11		10.11	11.22	11.11	
L.S.D at (0.05) for	K = 0.65 S = 0.65 K × S = 1.13				K = 0.713 S = 0.713 K × S = 1.235			
Treatments	2nd season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	7.00	10.00	12.33	9.78	8.00	11.00	12.67	10.56
S2	8.67	13.00	11.33	11.00	9.33	13.00	11.67	11.33
S3	9.67	13.67	14.33	12.56	10.67	13.67	14.00	12.78
Mean	8.44	12.22	12.67		9.33	12.56	12.78	
L.S.D at (0.05) for	K = 0.726 S = 0.726 K × S = 1.256				K = 0.904 S = 0.904 K × S = N.S			

I-3- Fresh and dry herb per plant and per plot

In Table (3), (4), (5) and (6) the data clear that, treating plants with potassium fertilization significantly increased fresh and dry herb of plant compared with control.

Treating plants with singral as foliar spray took the same trend.

As for interaction the data cleared that, 100 kg/ fed. potassium sulphate and 2 g/L singral gave the highest values of fresh and dry weights.

These result of the vegetative growth of damsissa plant in this study were in harmony with those obtained by Shadia and Zayed (1994) on Fenugreek plant found that, 200 kg/fed. Calcium super phosphate and 100 kg/fed. potassium sulphate gave the highest values

of plant height, number of pods, fresh and dry weight of plant in both locations.

Khater (1994) on *plantago psyllnium* found that treating plants with 100 kg/fed. potassium sulphate significantly increased plant height, number of branches and fresh and dry weight of plant.

The role of potassium as macro element was mentioned by Sasha *et al.* (2007) found that, potassium is required among other functions for the translocation of carbohydrates from the leaves to the root system.

Chouretah and Bunemann (1970) on strawberry; they demonstrated that potassium increasing the content of glucose, fructose, sucrose, xylose and maltose increased. Whereas, the latter concluded that raising level of potassium, the content of reducing sugars increased.

Table (3).Effect of potassium sulphate and foliar application of singral on fresh weight (g/plant) of *Ambrosia maritima* during 2008 and 2009.

Treatments	1st season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	245.00	483.33	481.67	403.33	280.00	496.67	493.33	423.33
S2	525.00	791.67	586.67	634.44	566.67	800.00	600.00	647.78
S3	476.67	550.00	748.33	591.67	466.67	563.33	746.67	592.22
Mean	415.56	608.33	605.56		430.00	620.00	613.33	
L.S.D at (0.05) for	K = 22.90 S = 22.90 K × S = 39.67				K = 24.87 S = 24.87 K × S = 43.08			
Treatments	2nd season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	267.33	500.00	500.00	422.44	283.33	526.67	530.00	446.67
S2	493.33	716.67	596.67	602.22	493.33	726.67	630.00	616.67
S3	453.33	516.67	713.33	561.11	443.33	530.00	733.33	568.89
Mean	404.67	577.78	603.33		406.67	594.44	631.11	
L.S.D at (0.05) for	K = 14.4 S = 14.4 K × S = 24.48				K = 24.30 S = 24.30 K × S = 42.09			

Table (4). Effect of potassium sulphate and foliar application of singral on dry weight (g/plant) of *Ambrosia maritima* during 2008 and 2009.

Treatments	1st season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	147.00	290.00	274.67	237.22	168.33	292.00	298.00	252.78
S2	255.00	475.67	353.67	361.44	318.67	480.00	356.00	384.89
S3	286.33	346.67	451.33	361.44	283.33	339.33	456.00	359.5
Mean	329.44	370.78	359.84		256.78	370.44	370.00	
L.S.D at (0.05) for	K = 41.90 S = 41.90 K × S = 72.60				K = 15.15 S = 15.15 K × S = 26.58			
Treatments	2nd season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	148.00	295.00	301.00	248.00	165.00	307.00	318.00	263.33
S2	281.33	430.67	364.67	358.89	287.67	436.00	384.33	369.33
S3	267.00	310.00	435.00	337.33	258.67	319.67	445.67	341.33
Mean	232.11	345.22	366.89		237.11	354.22	382.67	
L.S.D at (0.05) for	K = 13.18 S = 13.18 K × S = 22.82				K = 14.90 S = 14.90 K × S = 25.80			

Table (5). Effect of potassium sulphate and foliar application of singral on fresh weight (g/plot) of *Ambrosia maritima* during 2008 and 2009.

Treatments	1st season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	8575	16916	16858	14116	10033	17383	17266	14894
S2	18375	27708	14520	20201	15516	28000	21000	21505
S3	16683	13463	26191	18779	16916	19716	26133	20922
Mean	14544	19362	19190		14155	21700	21466	
L.S.D at (0.05) for	K = NS S = 4534 K × S = 7853				K = 1897 S = 1897 K × S = 3285			
Treatments	2nd season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	9356	23333	17500	16730	9916	18433	18550	15633
S2	17266	25083	20883	21077	17266	25433	22050	21583
S3	15866	18083	24966	19638	15750	18550	25666	19988
Mean	14163	22166	21116		14311	20805	22088	
L.S.D at (0.05) for	K = 3315 S = 3315 K × S = 5739				K = 848 S = 848 K × S = 1470			

Table (6). Effect of potassium sulphate and foliar application of singral on dry weight (g/plot) of *Ambrosia maritima* during 2008 and 2009.

Treatments	1st season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	5145	10150	9613	8302	5891	10220	10430	8847
S2	8925	16625	12378	12642	11153	16800	12460	13471
S3	10021	10460	15796	12092	9916	11876	15960	12584
Mean	8030	12411	12596		8987	12965	12950	
L.S.D at (0.05) for	K = 1345 S = 1345 K × S = 2329				K = 537 S = 537 K × S = 930			
Treatments	2nd season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	5180	11876	10535	9197	5775	10745	11130	9216
S2	9846	13790	12751	12129	10068	15260	13451	12926
S3	9345	10581	15225	11717	9053	11187	15598	11946
Mean	8123	12082	12837		8298	12397	13393	
L.S.D at (0.05) for	K = 1333 S = 1333 K × S = 2308				K = 521 S = 521 K × S = 903			

II-Effect of potassium sulphate and singral on active ingredients

II-1-Damsin %

Data presented in Table (7) indicate that, both treatments of potassium sulphate and singral significantly increased damsin percent and by increasing treatments levels the percentage significantly increased.

Dealing with interaction the data in the same Table showed that the highest values were obtained at 100 kg/ fed. potassium sulphate and 2g/L singral. These results were observed during two seasons in two cuts.

Table (7). Effect of potassium fertilization and foliar application of singral on Damsin percent of *Ambrosia maritima* herb during 2008 and 2009.

Treatments	1st season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	1.833	3.000	1.900	2.244	2.833	3.667	2.667	3.056
S2	2.333	3.000	4.333	3.222	3.000	4.333	4.667	4.000
S3	3.667	3.333	4.500	3.833	4.667	4.333	5.067	4.689
Mean	2.611	3.111	3.578		3.500	4.111	4.133	
L.S.D at (0.05) for	K = 0.58 S = 0.58 K × S = 1.00				K = 0.48 S = 0.48 K × S = 0.83			
Treatments	2nd season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	1.667	2.500	1.833	2.000	2.833	3.667	3.667	3.389
S2	2.067	3.000	3.667	2.911	4.067	3.667	4.933	4.222
S3	3.667	3.333	3.667	3.556	4.133	4.067	5.000	4.400
Mean	2.467	2.944	3.056		3.678	3.800	4.533	
L.S.D at (0.05) for	K = 0.45 S = 0.45 K × S = 0.78				K = 0.36 S = 0.36 K × S = 0.63			

II-2- Ambrosin%

Data in Table (8) show that, potassium fertilization treatments increased ambrosin percentage by increasing the level up to 100 kg / fed., but these increases was insignificant in the first season. While, it were significant in the second one during two cuts.

In the same Table the data revealed that treating plants with singral as foliar spray significantly increased ambrosin percent and by increasing the singral treatments the percentage significantly increased up to 2g/L.

These results were shown in the two cuts during two seasons.

The percentage of ambrosin and damssin were in the same obtained by Shadia *et al.* (2009).

It could be recommended to treating damsissa plants with 100 kg / fed. Potassium sulfate and 2 g / l. singral as foliar spray in order to obtain highest values of vegetative growth and active ingredients.

Table (8). Effect of potassium fertilization and foliar application of singral on Ambrosin percent of *Ambrosia maritime* during 2008 and 2009.

Treatments	1st season							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	1.833	3.000	1.667	2.167	2.167	3.000	2.933	2.700
S2	2.000	2.667	2.667	2.444	2.667	3.333	3.000	3.000
S3	3.667	3.000	3.333	3.333	3.667	3.667	3.667	3.667
Mean	2.500	2.889	2.556		2.833	3.333	3.200	
L.S.D at (0.05) for	K = NS S = 0.44 K × S = 0.76				K = NS S = 0.39 K × S = NS			
Treatments	**2nd season**							
	1st cut				2nd cut			
	K1	K2	K3	Mean	K1	K2	K3	Mean
S1	1.900	2.933	1.933	2.256	2.600	3.667	3.500	3.256
S2	2.933	3.000	2.933	2.956	3.000	4.000	4.333	3.778
S3	4.067	4.067	4.100	4.078	4.067	3.667	4.667	4.133
Mean	2.967	3.333	2.989		3.222	3.778	4.167	
L.S.D at (0.05) for	K = 0.11 S = 0.11 K × S = 0.20				K = 0.48 S = 0.48 K × S = NS			

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تأثيرسلفات البوتاسيوم والسنجرال على النمو الخضرى والمواد الفعالة لنبات الدمسيسة

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مركز البحوث الزراعية - مصر

فى تجربة لدراسة تأثير سلفات البوتاسيم والسنجرال على النمو الخضرى والمواد الفعالة لنبات الدمسيسة فى موسمين 2008 / 2009 حيث:

- معاملات التسميد الارضى بسلفات البوتاسيوم 48 % بو$_2$ أ (كنترول، 50، 100 كجم / فدان) على دفعتين متساويتين.
- تم رش النباتات مرتان بمركب سنجرال سماد ورقى بالكميات (0، 1، 2 جم / لتر) الاولى بعد شهر من الزراعة والثانية بعد شهر من الاولى.

وكان من أهم النتائج المتحصل عليها ما يلى:

1- زيادة النمو الخضرى زيادة معنوية عند معاملة النباتات بالتركيزات المختلفة بسماد سلفات البوتاسيوم والرش بالسنجرال مقارنة بالكنترول

2- زيادة النسبة المئوية للدمسين والامبروزين زيادة معنوية فى المعاملات المختلفة لكلا العاملين تحت الدراسة مقارنة بالكنترول

3- معاملة نبات الدمسيسة ب 100كجم/فدان سلفات بوتاسيوم مع الرش2 جم/لتر السنجرال ادى الى الحصول على أعلى محصول للعشب والنسب المئوية للدمسين والامبروزين.

4- من النتائج المتحصل عليها من هذا البحث فانه يوصى باضافة 100 كجم/فدان سلفات البوتاسيوم لنبات الدمسيسة فى التربة ورش المجموع الخضرى مرتان بالسنجرال 2 جم / لتر، وذلك للحصول على اعلى محصول من العشب ذات نوعية جيدة لاحتوائه على أعلى نسبة من المادة الفعالة (الامبروزين والدمسين).