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EFFECT OF GROWTH REGULATORS, ALAR OR TRICHLOROBENZOIC ACID AND THE HERBICIDE BASAGRAN ON THE GROWTH AND PROPAGATIVE CAPACITY OF PURPLE NUTSEDGE (*CYPERUS ROTUNDUS* L)

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ABSTRACT

Two Pot experiments were conducted during two successive summer seasons of 2006 and 2007 to study the effect of growth regulators, alar (B-nine) or trichlorobenzoic acid (TCBA) and the herbicide basagran on the growth and propagative capacity of purple nutsedge. Spraying treatments of purple nutsedge with alar or TCBA at three concentrations (100, 200 and 400 ppm) after 15 days from sowing, followed by foliar application of basagran at 2800 and 3700 ppm after 30 days from sowing were studied. The statistical analysis indicated that alar or TCBA alone increased significantly the growth of foliage of purple nutsedge, while, reduced the growth of underground organs. Basagran reduced the growth of both foliage and underground organs. The combined treatments of either alar or TCBA and basagran caused severe reduction in the growth of foliage as well as the propagative capacity of purple nutsedge after 65 days from sowing. Growth inhibition of the underground organs was higher with alar and basagran and reached (91.6%) as compared with single application of alar.

INTRODUCTION

Purple nutsedge is the world's worst weed (**Horowitz, 1992**). This perennial weed has a remarkable ability to survive adverse conditions and grow explosively when the land is planted to irrigated crops (**Williams, 1982 and Kim *et al* 1994**). The principal method of propagation in this weed is through the basal bulbs and tubers (**Nishimoto, 2001**).

In fact, a large percentage of tubers are often killed during dormancy, but even only one percent of the tubers from previous infestation are more than enough to bring back the population of this weed (**Kim *et al* 1994**). So, purple nutsedge has become a major weed problem in cultivated fields, since it belongs to the C4 groups which possess a high competitive ability with other C3 plants (**Wills, 1987**). Losses can result when nutsedges compete with crops (**El-Masry *et al* 1980; Messiha *et al* 1993; Bryson *et al* 2003; William and Hirase, 2004 and 2005**).

Control programs should be aimed at preventing the formation of tubers through prevention of growth, prevents tuber production, and hence eliminates the weed. However, the tubers can remain dormant and impervious to pesticides for years. So, understanding nutsedge control begins with the realization that tubers are the key to the weed's survival.

Very few herbicides can be used for purple nutsedge control and will never completely eradicate the weed from a field, from these herbicides, basagran (**Altland *et al* 2003; Ferell *et al* 2004; and El-Rokiek *et al* 2007**) and glyphosate (**Durigan *et al* 2006** and **El-Rokiek *et al* 2006**).

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One approach to control this perennial weed is activating dormant buds to form shoots by some growth regulators e. g. benzyle adenine (cytokinin) (**Bendixen *et al* 1989 a; Yogev *et al* 1996; Kim *et al* 1998;** and **El-Rokiek *et al* 2006**); morphactin (**El-Masry** and **Rehm, 1977a&b; Bendixen *et al* 1989 b** and **Saad El-Din *et al*** 1996); alar (**Horowitz**, 1972 and **Saad El-Din, 1985**). Thus, the problem of dormant underground buds would be eliminated and then an effective herbicide could be used.

The objective of this work was to evaluate the efficiency of growth regulators alar or trichlorobenzoic acid prior to the herbicide basagran treatment.

MATERIALS AND METHODS

Pot experiments were conducted under greenhouse conditions at the National Research Centre, during two successive summer seasons in August of 2006 and 2007. The stock of purple nutsedge (*Cyperus rotundus* L.) used as a source of tubers was collected from a dense stand at the National Research Centre Experimental Station at Shalakan, Kalubia Governorate. The collected tubers were planted in pots 30 cm diameter filled with nile suspended matter and sand, one tuber was planted in each pot.

Purple nutsedge plants, 15 days old, were sprayed with alar (B9- succinamic 2, 2-dimethylhydrazine) or trichlorobenzoic acid at the rate of 100, 200 and 400ppm. After 15 days from spraying (B9) or trichlorobenzoic acid (30days after sowing), the herbicide basagran (bentazon), 48% (3-isopropyl 1 H-2, 1, 3-benzathiadiazin-4-(3 11) one, 2, 2-dioxide) was applied foliarly at the rate of 2800 or 3700 ppm to study its interaction with these two growth regulators on the propagative capacity of purple nutsedge. The experiment included 24 treatments as follow:

Alar at 1-Zero, 2-100 ppm 3- 200 ppm and 4- 400 ppm.

Basagran at

5-2800 ppm and 6- 3700ppm. 7-Basagran at 2800 ppm + alar at 100ppm.

8- Basagran at 2800ppm + alar at 200 ppm and 9- Basagran at 2800ppm +alar at 400ppm.

10- Basagran at 3700 ppm + alar at 100 ppm 11- Basagran at 3700ppm + alar at 200ppm and 12- Basagran at 3700ppm + alar at 400ppm

Trichlorobenzoic acid at 13-Zero, 14-100ppm, 15-200ppm and 16-400ppm.

17- Basagran at 2800ppm.

18- Basagran at 3700ppm.

19- Basagran at 2800ppm +T CBA at 100 ppm.

20-Basagran at 2800ppm +TCBA at200 ppm.

21- Basagran at 2800ppm +TCBA at 400 ppm.

22- Basagran at 3700ppm +TCBA at 100 ppm.

23- Basagran at 3700ppm + TCBA at 200ppm.

24- Basagran at 3700ppm + TCBA at 400ppm

All sprays were performed by a glass atomizer fixed to a graduated tube at a rate of 15ml / plant.

Each treatment was represented by six replicates; all pots were arranged at complete randomized design. Three plants were collected from each treatment and the following growth characters were taken after 15days from spraying the two growth regulators (30 days after sowing) and after 35 days from spraying basagran (65 days from sowing).

1- Number of mother shoots / tuber.
2- Number of leaves of mother shoots / tuber.
3- Length of mother leaves (cm).
4- Number of daughter shoots / tuber.
5- Number of leaves of daughter shoots / tuber.
6- Number of rhizomes / tuber.
7- Length of rhizomes / tuber.
8- Number of propagative organs / tuber (basal bulb and tubers) / plant.
9- Dry weight of foliage (g / plant).
10- Dry weight of underground organs (g / plant).
11- Total dry weight (g / plant).

The data were statistically analyzed according to **Snedecor and Cochran (1980).**

RESULTS

I- Effect of alar (B-nine)

Growth characters of mother shoots

Number of mother shoots /tuber

As indicated in **Table (1)** the statistical analysis of the data, shows that application of alar at 100, 200&400ppm induced significant increase in the number of mother shoots / tuber of purple nutsedge plants as compared with the control. In contrast, basagran resulted in significant reduction in the number of mother shoots / tuber (65 days) as indicated from the grand average. Combined treatments of alar and basagran induced additive significant decrease in comparison to the highest concentration of alar alone. The reduction reached 83.5% (0.66/4) as compared with alar alone (65days).

Table 1. Effect of foliar application of Alar and the herbicide Basagran on the number of mother shoots / tuber, number of leaves of mother shoots and length of the mother leaves (cm) of purple nutsedge (*Cyperus rotundus* L.) after 65 days from sowing. (Average of the two seasons)

Number of mother shoots /tuber				
Alar (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	2.00	2.00	1.66	1.88
100	3.00	2.00	1.33	2.11
200	3.66	2.00	1.00	2.22
400	4.00	2.00	0.66	2.22
Mean	3.08	1.79	1.52	
L.S.D. at 5 % level	a= 0.23	b= 0.61	axb= 0.97	

Number of leaves of mother shoots /tuber				
Alar (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	10.00	6.00	6.00	7.30
100	19.66	3.00	4.00	8.88
200	24.00	3.00	1.00	9.33
400	30.30	4.00	3.00	12.40
Mean	20.99	3.75	3.50	
L.S.D. at 5 % level	a= 0.64	b= 0.61	axb= 1.11	

Length of the mother leaves (cm)				
Alar (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	54.00	37.50	22.50	38.00
100	74.00	21.00	20.00	38.33
200	87.00	16.00	15.00	40.33
400	92.00	14.00	15.00	40.33
Mean	76.75	37.50	13.65	
L.S.D. at 5 % level	a= 2.32	b= 2.86	axb= 4.95	

a= Alar b= Basagran axb= Interaction between alar and basagran

Number of leaves of mother shoots/tuber

The statistical analysis of the data in **Table (1)** shows that foliar application of all concentrations of alar (from 100 to 400ppm) caused significant increase in number of leaves of mother shoots / tuber. In contrast, foliar application of basagran at the two concentrations caused significant reduction especially with the highest concentration (3700 ppm) as shown in **Table (1)** after 65days. Moreover, the number of leaves of mother shoots/tuber showed significant reduction in response to combined treatments of alar and basagran as compared to alar alone. Significant reduction was recorded with alar at 200 ppm and basagran at 3700ppm (1/24, 95.8%) when compared to alar alone.

Length of mother leaves (cm)

The length of mother leaves indicates significant responses with foliar application of alar at concentrations of 200 and 400 ppm as indicated from the statistical analysis of the data after 65days (**Table 1**). However, significant reduction was recorded by using basagran treatments. Maximum inhibition resulted from combination of alar at 200 or 400 ppm and basagran at 280 or 3700 ppm in comparison to alar alone (15/92, It reached to 83.6%).

Growth characters of daughter shoots

Number of daughter shoots / tuber

The statistical analysis shows significant increase in the number of daughter shoots with foliar application of alar at 200 & 400 ppm. In contrast to this effect, basagran at the two concentrations caused great reduction in the number of daughter shoots / tuber. The interaction of alar and basagran at the two concentrations caused additive reductions when compared to the highest concentration of alar alone (**Table 2**).

Number of leaves of daughter shoots / tuber

Significant increase in the number of leaves of daughter shoots was recorded with alar treatments at 400 ppm (**Table 2**). Moreover, basagran caused significant reduction. The interaction of combined treatments of alar (200 ppm) and basagran (2800 or 3700 ppm) induced remarkable reduction (9/131) which reached to 92.9% (65 days old) as compared with the highest concentration of alar alone.

Growth characters of underground organs

The statistical analysis of the data shows (**Table 3**) significant reduction in the underground organs (basal bulb and tubers) of purple nutsedge in response to all concentrations of alar when compared with control. This reduction was accompanied by significant reduction in the number of rhizomes as well as their lengths. Similar reduction in the number of underground organs was observed with basagran. Combined treatments of alar and basagran caused additional reduction in these organs. The most detectable reduction was recorded by the combination of alar at 200 and / or 400ppm with basagran at 3700 ppm (65 days old). The number of propagated organs decreased to 5/38, 86.8% as compared to alar alone. The inhibition in number of rhizomes reached to 80.4%.

Dry weight of foliage (g /plant)

The statistical analysis of the data in **Table (4)** shows significant responses in the dry weight of foliage of purple nutsedge due to alar treatment at 400ppm. The herbicide basagran exerted significant inhibition. It is worthy to mention that the enhancement effect of alar on the dry weight of foliage of purple nutsedge was antagonized with the herbicide basagran. The greatest reduction was recorded with the combined application of alar at 400ppm and basagran at 3700ppm compared with single application of alar. The inhibition reached 1/15, 93.3%.

Dry weight of underground organs (g / plant)

The statistical analysis reveals significant reduction in dry weight of underground organs (65 days old) due to foliar application of alar with the different concentrations. In addition, the herbicide basagran reduced the dry weight of underground organs. The higher concentration of basagran induced the highest reduction in dry weight (65 days old). The same **Table (4)** indicates that dry weight of underground organs was adversely affected by combination of alar with basagran when compared with alar alone. Maximum inhibition (0.75/9, 91.6 %) was recorded with 400 ppm alar and basagran at 3700 ppm.

Total dry weight

Total dry weight (dry weight of foliage + dry weight of underground organs) showed similar trend to that recorded in the dry weight of underground organs (**Table 4**).

II-Effect of trichlorobenzoic acid (TCBA)

Growth characters of mother shoots

Number of mother shoots /tuber

Table (5) indicates that trichlorobenzoic acid (TCBA) at all concentrations increased significantly the number of mother shoots / tuber of purple nutsedge plants. However, basagran has adverse effect on the number of mother shoots / tuber (65 days old). Combined treatments of TCBA and basagran induced higher adverse effect in comparison to TCBA alone. The inhibition reached, 64.3% (1.66/4.66) when compared with the highest concentration of TCBA alone at (65days old).

Number of leaves of mother shoots/tuber

The statistical analysis of the data in **Table (5)** reveals that foliar application of all concentrations of TCBA (from 100 to 400ppm) resulted in significant increase in number of leaves of mother shoots / tuber, while, basagran caused significant reduction especially at the highest concentration (3700 ppm. Moreover, the combined treatments of basagran with TCBA caused additive maximum

Table 2. Effect of foliar application of Alar and the herbicide Basagran on the number of daughter shoots / tuber and number of leaves of daughter shoots of purple nutsedge (*Cyperus rotundus* L.) after 65 days from sowing. (Average of the two seasons)

Number of daughter shoots /tuber				
Alar (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	22.00	8.00	4.30	11.40
100	30.00	4.30	2.00	12.01
200	34.00	8.00	5.00	15.66
400	38.00	7.00	5.00	16.66
Mean	31.00	6.82	4.07	
L.S.D. at 5 % level	a= 1.11	b= 0.1.14	axb= 1.91	

Number of leaves of daughter shoots /tuber				
Alar (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	111.60	18.00	16.00	48.50
100	125.00	13.00	10.00	49.33
200	131.60	9.30	9.30	50.06
400	135.30	11.00	10.00	52.20
Mean	125.88	12.83	11.33	
L.S.D. at 5 % level	a= 1.76	b= 2.75	axb= 4.76	

a= Alar, b= Basagran axb= Interaction between alar and basagran

significant reduction in the number of leaves of mother shoots / tuber as compared to TCBA alone. High adverse effect was detected with 400 ppm TCBA and 2800 or 3700 ppm basagran (95% reduction, 2/40.50) as compared with the highest concentration of TCBA alone.

Length of mother leaves (cm)

The length of mother leaves indicates no significant responses with foliar application of TCBA with concentrations, 100 and 200 ppm **(Table 5)** after 65days old. However, significant reduction was recorded by using basagran treatments. Maximum inhibition resulted from combination of alar at 400 ppm and basagran at 3700ppm in comparison to TCBA alone. It reached (80.5%, 16.2/82.60).

Growth characters of daughter shoots

Number of daughter shoots / tuber

The number of daughter shoots increased over the control by applying TCBA at 200 & 400 ppm **(Table 6)**. Basagran caused great reduction in the number of daughter shoots / tuber. The reduction was greater with the highest concentration (3700ppm). The inhibition of TCBA with basagran was the highest (1/36.30, 97.2%) especially with TCBA and basagran at 200 & 3700 ppm as compared with TCBA alone.

Number of leaves of daughter shoots / tuber

Table (6) reveals significant increase in the number of leaves of daughter shoots with application of TCBA. On the other hand, the number of leaves of daughter shoots was greatly reduced by application of the herbicide basagran. Additional reductions with treatments of TCBA and associated herbicide were obtained, particularly with 200ppm TCBA and 3700 basagran (8.3/139, 94.02 %).

Growth characters of underground organs

The statistical analysis of the data indicates **(Table 7)** significant reduction in the underground organs (basal bulb and tubers) of purple nutsedge

Table 3. Effect of foliar application of Alar and the herbicide Basagran on the number of propagative organs (basal bulbs and tubers), number of rhizomes / tuber and length of rhizomes / tuber (cm) of purple nutsedge (*Cyperus rotundus* L.) after 65 days from sowing. (Average of the two seasons)

Number of propagative organs (basal bulbs and tubers) (basal bulbs and tubers)				
Alar (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	72.3	34.0	25.00	43.80
100	57.0	22.0	22.00	33.56
200	52.0	9.0	7.60	22.80
400	38.0	8.3	5.00	17.10
Mean	54.8	18.3	14.88	
L.S.D. at 5 % level	a= 1.93	b= 3.0	axb= 3.35	

Number of rhizomes / tuber				
Alar (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	34.0	21.6	16.3	23.96
100	30.0	15.3	13.0	19.43
200	28.0	13.3	4.3	15.20
400	25.6	6.0	5.0	12.20
Mean	29.4	14.05	9.65	
L.S.D. at 5 % level	a= 1.68	b= 1.11	axb= 2.92	

Length of rhizomes / tuber (cm)				
Alar (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	418.0	295.0	224.5	312.60
100	245.0	152.0	138.0	180.30
200	210.0	200.0	36.0	148.60
400	190.6	149.0	50.0	129.66
Mean	265.9	199.0	112.13	
L.S.D. at 5 % level	a= 28.4	b= 21.56	axb= 49.19	

a= Alar b= Basagran axb= Interaction between alar and basagran

Table 4. Effect of foliar application of Alar and the herbicide Basagran on the dry weight of foliage (g / plant), dry weight of underground organs (g / plant) and total dry weight of purple nutsedge (*Cyperus rotundus* L.) after 65 days from sowing. (Average of the two seasons)

Dry weight of foliage (g / plant)				
Alar (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	10.50	4.80	3.40	6.23
100	12.10	3.75	2.90	6.25
200	12.66	4.80	1.60	6.35
400	15.00	3.70	1.00	6.56
Mean	12.34	4.26	1.75	
L.S.D. at 5 % level	a= 0.21	b= 0.23	axb= 0.39	

Dry weight of underground organs (g / plant)				
Alar (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	17.50	10.70	2.75	10.31
100	15.50	4.60	2.05	7.38
200	13.50	3.00	1.50	6.00
400	9.00	3.00	0.75	4.25
Mean	13.87	4.07	2.10	
L.S.D. at 5 % level	a= 0.75	b= 0.90	axb= 1.30	

Total dry weight (g / plant)				
Alar (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	28.00	15.500	6.15	16.55
100	27.60	8.35	4.95	13.63
200	26.16	7.80	3.10	12.35
400	24.00	6.70	1.75	10.81
Mean	26.44	9.58	3.98	
L.S.D. at 5 % level	a= 1.07	b= 0.75	axb= 1.86	

a= Alar b= Basagran axb= Interaction between alar and basagran

Table 5. Effect of foliar application of trichlorobenzoic acid (TCBA) and the herbicide Basagran on the number of mother shoots /tuber, number of leaves of mother shoots and length of the mother leaves (cm) of purple nutsedge (*Cyperus rotundus* L.) after 65 days from sowing. (Average of the two seasons)

Number of mother shoots /tuber				
TCBA (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	2.00	2.00	1.66	1.88
100	3.66	2.00	2.00	2.55
200	4.33	2.00	1.66	2.66
400	4.66	1.66	1.66	2.66
Mean	3.58	2.00	1.60	
L.S.D. at 5 % level	a= 0.48	b= 0.27	axb= 0.83	

Number of leaves of mother shoots /tuber				
TCBA (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	10.00	6.00	6.00	7.30
100	29.50	2.00	2.00	11.16
200	35.00	3.00	2.50	13.50
400	40.50	2.00	2.00	14.83
Mean	28.75	3.25	3.12	
L.S.D. at 5 % level	a= 1.46	b= 1.27	axb= 1.52	

Length of the mother leaves (cm)				
TCBA (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	54.00	37.50	22.50	38.00
100	70.50	25.50	21.00	39.00
200	77.60	23.20	17.50	39.43
400	82.60	21.30	16.20	40.03
Mean	71.17	26.88	19.32	
L.S.D. at 5 % level	a= 2.03	b= 2.84	axb= 4.39	

a= TCBA b= Basagran axb= Interaction between TCBA and basagran

Table 6. **Effect of foliar application of trichlorobenzoic acid (TCBA) and the herbicide Basagran on the number of daughter shoots /tuber and the number of leaves of daughter shoots of purple nutsedge (*Cyperus rotundus* L.) after 65 days from sowing. (Average of the two seasons)**

Number of daughter shoots /tuber				
TCBA (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	22.00	8.00	4.30	11.40
100	28.83	5.50	3.00	12.44
200	36.30	4.00	1.00	13.76
400	42.00	7.00	5.00	18.00
Mean	60.18	6.12	2.57	
L.S.D. at 5 % level	a= 1.32	b= 1.20	axb= 2.24	

Number of leaves of daughter shoots /tuber				
TCBA (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	111.60	18.00	16.00	48.50
100	129.60	14.16	10.30	51.15
200	139.00	12.00	8.30	53.10
400	140.30	10.00	9.50	53.26
Mean	130.12	13.54	11.02	
L.S.D. at 5 % level	a= 2.19	b= 1.17	axb= 3.79	

a= TCBA b= Basagran axb= Interaction between TCBA and basagran

in response to all concentrations of TCBA when compared with control. This effect was concomitant by significant reduction in the number of rhizomes as well as their lengths. Similar trend in the number of underground organs were recorded with basagran. Greater reduction was severely measured due to combination of TCBA and basagran as compared to TCBA alone. The number of basal bulb and tubers reached the maximum reduction with TCBA at 400 ppm and basagran at 3700 ppm (9.60/20, 52%). The inhibition in number of rhizomes reached to 61.5% (6/15.60) with the same treatment. The inhibition in length of rhizomes reached 28.6% with 200ppm TCBA and 3700ppm basagran.

Dry weight of foliage (g /plant)

The statistical analysis of the data **(Table 8)** reveals that TCBA at 200 & 400 ppm resulted in significant increase in dry weight of foliage of purple nutsedge as compared to the untreated control. The herbicide basagran induced significant inhibition. The results show that the promotive effect of TCBA on the dry weight of foliage of purple nutsedge was suppressed by the herbicide basagran. The greatest significant reduction was recorded with the combined application of TCBA at 400 ppm and basagran at 3700 ppm as compared with single application of TCBA (1.3/18.8, 93.1%).

Table 7. Effect of foliar application of trichlorobenzoic acid (TCBA) and the herbicide Basagran on the number of propagative organs (basal bulbs and tubers), number of rhizomes / tuber and length of rhizomes/tuber (cm) of purple nutsedge (*Cyperus rotundus* L.) after 65 days from sowing. (Average of the two seasons)

Number of propagative organs (basal bulbs and tubers)				
TCBA (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	72.30	34.00	25.00	43.80
100	35.00	26.60	24.60	28.73
200	26.00	18.60	22.00	22.20
400	20.00	15.60	9.60	15.06
Mean	37.80	23.70	20.30	
L.S.D. at 5 % level	a= 1.42	b= 1.74	axb= 2.46	

Number of rhizomes / tuber				
TCBA (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	34.00	21.60	16.30	23.96
100	26.60	18.60	15.60	20.26
200	22.00	10.00	14.00	15.53
400	15.60	9.60	6.00	10.40
Mean	24.70	14.95	12.97	
L.S.D. at 5 % level	a= 1.97	b= 0.44	axb= 3.41	

Length of rhizomes / tuber (cm)				
TCBA (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	418.0	295.0	224.5	312.60
100	252.00	132.0	92.00	158.00
200	116.30	103.00	83.00	100.76
400	110.00	96.50	89.60	98.70
Mean	224.07	156.60	122.27	
L.S.D. at 5 % level	a= 26.98	b= 20.47	axb= 47.93	

a= TCBA b= Basagran axb= Interaction between TCBA and basagran

Table 8. Effect of foliar application of trichlorobenzoic acid (TCBA) and the herbicide Basagran on the dry weight of foliage (g / plant), dry weight of underground organs (g / plant) and total dry weight of purple nutsedge (*Cyperus rotundus* L.) after 65 days from sowing. (Average of the two seasons)

Dry weight of foliage (g / plant)				
TCBA (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	10.50	4.80	3.40	6.23
100	15.20	3.13	2.40	6.91
200	18.00	3.03	1.80	7.61
400	18.80	3.03	1.30	7.71
Mean	15.62	4.66	2.22	
L.S.D. at 5 % level	a= 0.76	b= 0.63	axb= 0.99	

Dry weight of underground organs (g / plant)				
TCBA (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	17.50	10.70	2.75	10.31
100	7.30	3.50	2.60	4.46
200	6.60	2.90	2.50	4.00
400	6.35	2.46	2.40	3.73
Mean	9.43	4.89	2.56	
L.S.D. at 5 % level	a= 0.68	b= 0.42	axb= 1.03	

Total dry weight (g)				
TCBA (ppm)	Basagran (ppm)			Mean
	0	2800	3700	
0	28.00	15.500	6.15	16.55
100	22.50	6.63	5.00	11.37
200	24.60	5.93	4.30	11.61
400	25.15	5.49	3.70	11.44
Mean	25.06	8.38	4.78	
L.S.D. at 5 % level	a= 0.78	b= 1.05	axb= 1.81	

a= TCBA b= Basagran axb= Interaction between TCBA and basagran

Dry weight of underground organs (g / plant)

The statistical analysis indicates significant reduction (**Table 8**) due to foliar application of TCBA at different concentrations in dry weight of underground organs (65days old). The reduction increase with increasing TCBA concentration in comparison to the control. Moreover, the herbicide basagran reduced the dry weight of underground organs as indicated by the grand average. The reduction was higher with the elevated level (3700 ppm). The same **Table (8)** indicates that combined treatments of TCBA at 100ppm and basagran at 3700ppm reduced weed growth up to 64.4% (2.6 / 7.3) as compared to single application of TCBA alone.

Total dry weight

Total dry weight (dry weight of foliage + dry weight of underground organs) showed similar trend to that recorded in the dry weight of underground organs **(Table 8).**

DISCUSSION

Purple nutsedge tubers remain viable for several years and serve as the principal mean of survival (**El-Masry and Rehm, 1977a**). Apical dominance influences the sprouting of buds within a tuber and also in the chain of tubers. Dormancy increases with tuber age **(Horowitz, 1992 and Nishimoto, 2001).**

The results presented in this investigation revealed that either alar or TCBA especially at the highest concentration (400ppm) induced significant increase in the number of mother shoots / tuber, **(Tables 1 & 5)**. Therefore, this pretreatment released the dormant buds from apical dominance to develop leafy shoots. These results came in accordance with **Saad-El-Din (1985)** at which alar increase the number of sprouting buds, while were not in accordance with that obtained by **Horowitz (1972)**. The effect of TCBA also was similar to other growth regulators that break bud dormancy, in this connection, **Pan (2006)** found that TCBA which is auxin-like in its action produce developmental effects similar to those produced by 2, 4-D.

Basagran reduced significantly the growth and propagative capacity of purple nutsedge (**Tables 1-4** and 5-8), but did not inhibit these organs completely. These results indicated that basagran is insufficient herbicide for controlling the vegetative growth of purple nutsedge. Similar results were reported by many investigators in which about 44% regrowth of purple nutsedge was obtained (**Akin and Shaw, 2001; Altland *et al* 2003; Ferell *et al* 2004** and **Butler *et al* 2006** and **Durigan *et al* 2006**). **El-Rokiek *et al* 2007** supported also these results. Therefore, complete elimination of all viable buds of the tubers was not achieved by post emergence treatment of basagran (**Ferell *et al* 2004 and El-Rokiek *et al* 2007**). Consequently, reproduction was still possible from surviving buds on the tubers.

The results showed that application of alar or TCBA treatments with basagran caused additive reduction in the propagative capacity of purple nutsedge (**Tables 3, 4 and 7, 8**). The most effective action was realized with the combination of highest concentrations of alar or TCBA (400ppm) with high concentration of basagran (3700 ppm), it reached 93 % (**Figure 1**).

It must be mentioned that these results obtained by the two growth regulators, alar or TCBA (**Figure 2**) are different from that previously obtained by benzyl adenine (**El-Rokiek *et al* 2006**). In those results benzyl adenine led to breaking apical dominance which was accompanied by increase in the propagative capacity of purple nut - sedge.

Many investigators suggested that the effective method for controlling purple nutsedge must depend on releasing all dormant buds of the tubers before using herbicide (**El-Masry and Rehm, 1977 a&b; Saad El-Din, 1985; Bendixin *et al* 1989a & b; Yogev *et al* 1996 and El-Rokiek *et al* 2006**).

As have been reported by **Holm *et al* 1991; Horowitz, 1992**, and **Nishimoto, 2001**, this perennial weed is very difficult to control due to the apical dominance present in the buds of the tubers. So, growth regulators were tested by many researchers on the basis of breaking bud dormancy (**El-Masry & Rehm, 1977a & b; Bendixin *et al* 1989a & b; Yogev *et al* 1996; Messiha, 2005 and El-Rokiek *et al* 2006**).

The results of the present work added more support to the earlier findings of **El-Masry & Rehm, 1977 a&b; Kim & Nakayama, 1984; Bendixin *et al* 1989 a&b; Saad El-Din *et al* 1996; Yogev *et al* 1996; Kim *et al* 1998; Messiha, 2005 and El-Rokiek *et al* 2006**).

CONCLUSION

The results of the present investigation showed clearly that alar induced significant decrease in the dry weight of the underground organs of purple nutsedge after 30days from sowing, this result gives a chance for partial controlling of *Cyperus rotundus* at that time with alar alone. The results of this work revealed also that alar or TCBA increased the number of mother shoots / tuber of purple nutsedge. The increase in foliage was concomitant with a decrease in the propagative capacity of purple nutsedge. Moreover, basagran alone could decrease also the propagative capacity of purple nutsedge. These effects add more support to the idea that combined treatments of growth regulators and herbicides could have beneficial effects to control purple nutsedge.

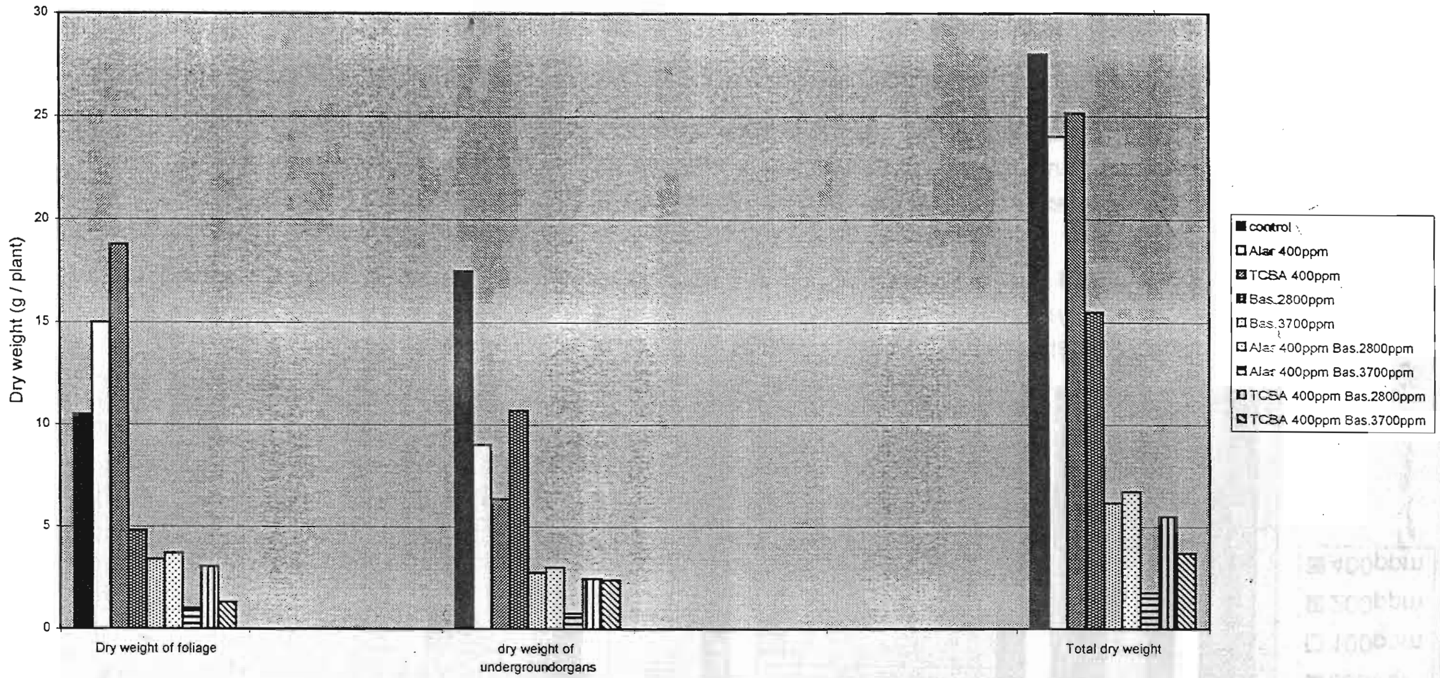

Figure 1. Effect of the growth regulators, alar or trichlorobenzoic acid (400 ppm) and the herbicide basagran (2800 & 3700 ppm) on dry weight of foliage, dry weight of underground organs and total dry weight (g /plant) of purple nutsedge at 65 days old.

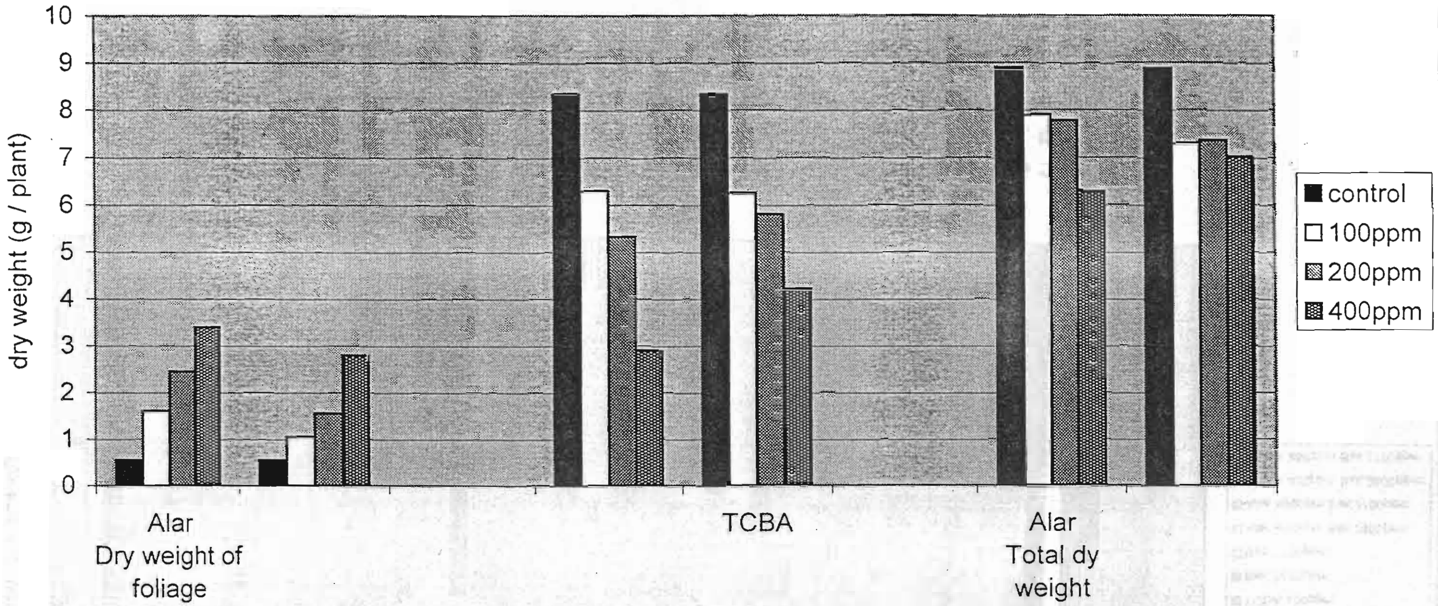

Figure 2. Effect of foliar application of the two growth regulators alar or trichlorobenzoic acid on dry weight of foliage, dry weight of underground organs and total dry weight (g / plant) of purple nutsedge after 30 days from sowing

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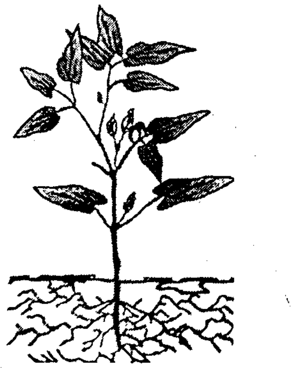
حوليــات العلــوم الزراعية
جامعة عين شمس ، القاهرة
مجلد(٥٤)، عدد (١)، ٥٩-٧٥، ٢٠٠٩



تأثير استخدام منظمى النمو الآلار أو تراىكلورو حامض البنزويك و كذا مبيد الحشائش البازاجران على نمو وتكاثر حشيشة السعد

[٥]

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الموجـــز

أجربت هذه التجربة بـصوبة المركـز القـومى للبحوث خلال موسمي الـصيف (٢٠٠٦ و ٢٠٠٧) لدراسة تاثير الآلار أو تراى كلورو حامض البنزويك ومبيد الحشائش البازاجران على النمـو الخـضرى وكـذلك أعـضاء التكـاثر الأرضـية (الكورمـات والدرنات) لحشيشة السعد . وفى هذه الدراسـة تـم رش نباتات السعد بمادتى الآلار أو تـراى كلـورو حامض البنزويك بتركيزات ١٠٠، ٢٠٠ و٤٠٠ جزء فى المليون بعد ١٥ يوم مـن الزراعـة تلاهـا رش النباتات بمبيد الحشائش البازاجران بتركيـزى ٢٨٠٠ و ٣٧٠٠ جزء في المليون وذلك بعد ٣٠ يـوم مـن الزراعة ، أى بعد ١٥ يوم من رش نباتـات الـسعد بمادتى الآلار أو تراى كلورو حامض البنزويك.

وقد أظهرت النتائج زيادة فـى إنبـات البـراعم الموجودة على الدرنة الأم باستخدام كلا المادتين بينما كان تأثيرهما مثـبط لأعـضاء التكـاثر الأرضـية وبالإضافة لذلك أظهرت النتائج أن للبازاجران تـأثير مثبط علي كل من المجموع الخضري وكذلك أعضاء التكاثر الأرضية وذلك بالمقارنة بـالكنترول. وممـا يجدر الإشارة اليه أن رش منظمى النمـو المـشار إليهما متبوعه برش المبيد فاقت فى التأثير كل معاملة على حدة، أى أدت المعاملات المزدوجـة لأى مـن المادتين والبازاجران إلي زيادة في تثبيط النمو وذلك بالمقارنة بكل معاملة على حدة . وكان أوضحها فـى التأثير المعاملة المزدوجة لكل مـن الآلار بـالتركيز العالى (٤٠٠ جزء في المليون) والتركيز العالي مـن البازاجران (٣٧٠٠ جزء في المليون) حيث أدى إلى تثبيط لأعضاء التكـاثر الأرضـية بنـسبة ٩١,٦%. والجدير بالذكر أن الآلار أدى إلـى نقـص معنـوى واضح فى الوزن الجاف لأعضاء التكاثر الأرضـية بعد ٣٠ يوم من الزراعة. وعلى ضوء هذه النتيجـة فإنه يمكن مقاومة السعد فى ذلك التوقيت بعـد الآلار بالطرق الميكانيكية (**شـكل ١**). **ويوضح هذا البحـث** أيضا أنه ربما يرجع هذا النقص فى اعضاء التكـاثر الأرضية نتيجة دفع البراعم الموجودة على الـدرنات للإنبات وعند إستخدام مبيد الحشائش يـتم مـوت او تثبيط النبات فى النمو و بذلك يعطى فرصة لعدم نمو اعضاء تكاثر جديدة وبذلك يسهل التخلص من تلـك الحشيشة.

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