

RESPONSE OF RICE AND ASSOCIATED WEEDS TO BIOREGULATOR (BIO HORM) SPRAY AND WEED MANAGEMENT IN SALINITY SOIL.

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ABSTRACT

Two field experiments were conducted during the two successive seasons of 2007 and 2008 at the Agricultural Experimental Station of Agricultural Research Center, at EL-Serw, Damietta Governorate Egypt, to study the effect of the bio horm and weed control treatments (Bentazon, Pyrazosulfuron, Fenoxaprop, Penoxsulam, Bentazon+Fenoxaprop, Bentazon+Penoxsulam, Pyrazosulfuron+Fenoxaprop, Pyrazosulfuron+Penoxsulam, twice hand weeding and un- weeded check) on growth, yield, its components and NPK percentage in grains of direct seeded rice as well as associated weeds in salinity soils.

Results illustrated that application of bio horm increased fresh and dry weight of total weeds. Spraying bio horm after 50 days from sowing (DFS) markedly increased rice growth characters (plant height, number of productive tillers, fresh and dry weight of rice plants), yield and yield components (panicle length, number of panicles / m², weight of 1000 grain, grain and straw yield) and N,P and K % of grain rice, compared with untreated treatment.

All weed control treatments caused significant reduction on number, of fresh and dry weight of total weeds/m² after 60 DFS in both seasons. Pyrazosulfuron treatment gave the highest decrease in total number of weeds followed by Pyrazosulfuron + Penoxsulam and Pyrazosulfuron+Fenoxaprop treatments. Pyrazosulfuron + Fenoxaprop treatment gave the highest decrease in total fresh weight of weeds followed by Bentazon + Penoxsulam, Pyrazosulfuron and Pyrazosulfuron + Penoxsulam, respectively in 2007 season. While, in the second season Pyrazosulfuron treatment gave the lowest values of total fresh weight of weeds. Mean while, Bentazon + Penoxsulam was more effective than other treatments in reducing the dry weight of total weeds in both seasons.

All herbicidal treatments and hand weeding increased significantly growth, yield, yield components and chemical composition of grain rice . Bentazon + Penoxsulam was superior treatment for increasing number of productive tillers, number of panicles / m², 1000- grain weight and grain yield as well as NPK percentage of rice grains in both seasons. Meanwhile, Bentazon + Penoxsulam was superior treatment in plant height, fresh and dry weight of whole plant, panical length and straw yield in the first season. While, Pyrazosulfuron + Penoxsulam gave the highest increment in plant height, fresh and dry weight of whole plant and straw yield in the second season.

The interaction between bio horm and weed management treatment had significant effect on total fresh and dry weight of weeds, number of productive tillers and 1000 grain weight. Pyrazosulfuron produced the maximum values of number of productive tillers when bio horm was used in the second season, while, application of Bentazon + Penoxsulam gave the highest values of 1000 grain weight when bio horm was used in the second season. It could be concluded that using the bioregulator (bio horm) resulted in increment of growth and productivity of rice crop under salinity soils. Using the combinations of herbicides caused more reduction of weeds and increased rice grain yield.

INTRODUCTION

Rice is the second most important cereal crop in the world. It constitutes food for over half (54%) of the world's population. In Egypt, rice is the second staple food after wheat and is very important for local consumption, as well as for export. In Egypt rice annually grown in more than one million feddan, mostly in the Northern part of the Nile Delta. The cultivation area in 2006 season was

1.59 million feddan, produced about 6 million tons of paddy rice with an average yield of about 10.1 t/ha, which is considered one of the highest average yield in the world (Rice National Campaign Report, 2006).

Salinity problem is obviously occurring in 70% of North of Nile Delta and electrical conductivity may exceed 8 ds/m in saturated soils. Rice is moderately susceptible to salinity. Plant growth regulators and antioxidant (GA₃, Kinetin, Ascorbic acid, Salicylic acid, Citric acid, Amino acid and others material) are widely applied for crop improvement. These regulators protect plant from various stress e.g. salinity and drought (Li *et al.*, 1998). Applying growth regulators, especially cytokinin, modify morphological and physiological characteristic of plant and may also induce better adaptation of plant to environment which improving the growth and yield. Kinetin is one of the cytokinins known to improve the growth, yield and chemical constituents of many crop (Salama and Awadalla, 1987). Amin, 2003 reported that growth characters, yield and yield components as well as chemical constituents significantly responded to foliar application with 40 mg/L kinetin. Abd El-Fatah, 2008 found that the kinetin increased growth, yield and yield components as well as chemical compositions in grains rice under saline condition.

Ascorbic acid and citric acid is a common antioxidant component in the apoplast and had effects on plant growth and many physiological processes. L-Ascorbic acid serves as a co-factor for many enzymes (Arrioni and DeTullio, 2002) and it contributes to the detoxification of reactive oxygen species (Conklin and Barth, 2004). Foliar spray of ascorbic acid and citric acid have a positive effect on plant growth and yield of many crops (Mourad, 2006 and Al-Kahal *et al.*, 2008).

Weed control is one of the essential cultural practices for raising rice yield and improving its quality. Using chemical weed management in intensively grown crops (e. g. rice) is easier and more economical than manual or mechanical ones, especially after labors scarce and pay rise. But under the warnings manipulating herbicides recently, the supply of their authorized components became extremely restricted. As well known rice is a vital and strategic food crops. Most available herbicides used in rice are assigned for controlling particular weeds, unlike little (e. g. Benthiocarb) that controls broad spectrum of weeds. However, one or more of these weed species may appear resistant of herbicides. So, it's essential to use mixtures (combinations) of herbicides for broadening the spectrum of weed control and for reducing the risk of evolution weed resistance against herbicides. The benefits of using herbicide mixtures include also saving time, control efforts and costs.

Many researchers have been reported that herbicides application attended to provide a great weed control and maximum yield of rice (Cavanna *et al.*, 2004 and larelle *at al.*, 2003) by using Penoxsulam, (Govindra *et al.*, 2003); Fenoxaprop – p – ethyl (Mondal *et al.*, 2005 and Saini, 2003) and by using pyrazosulfuron. El – Desoki, 2002 found that two hand hoeing at 20 and 40 days after transplanting was very effective in controlling rice weed growth and increasing the yield. Zhang *et al.*, 2005 stated that the combination of Fenoxaprop with Bentazon controlled effectively both broad and narrow leaved weeds and increased rice grain yield. Similarly, pyrazosulfuron with molinate controlled broad and narrow leaved weeds in rice and increased rice grain yield compared to single application (Moorthy, 2002).

Therefore the present study aimed to investigate: (1) the role of the bio regulator (Bio horm) in improving the growth and yield of rice and its effects on the associated weeds under saline conditions. and (2) the efficacy of some herbicides used alone and combined in sequence on growth, yield, yield components and some chemical compositions of rice grains as well as associated weeds.

MATERIALS AND METHODS

Two field experiments were conducted during the two successive seasons of 2007 and 2008 at the Agricultural Experimental Station of Agricultural Research Center, at EL-Serw, Damietta Governorate, Egypt, to study the effect of biohormone and weed control treatments on growth, yield and its components and NPK percentage of grains on direct seeded rice as well as associated weeds in salinity soils. The chemical and physical analysis of the used soil during the two growing seasons are illustrated in Table (1). The soil analysis done according to Chapman and Pratt (1978).

Table (1). The chemical and physical analysis of used soil during the two growing seasons.

Particle Size distribution					PH Of soil Susp 1:25	E.C ds/m At25c°	MO %	Total N %	Available N ppm	Available P ppm	Available K ppm
Coarse sand %	Fine sand %	Silt %	Clay %	Texture							
0.24	17.65	17.52	64.59	Clayey	8.7	3.6	1.20	0.038	32	8.30	520

A split plot design with four replicates was used where the main plots were arranged to study the effect of with and without Bio horm treatments. The plot area was 16 m² (4m x 4m) in both seasons. Bio horm consists of: Kinetin, Citric and Ascorbic acid as well as Fulvic Cids with: L Free Amino Acids 20%, Molybdenum (MO) 4% and CO 0.005%. Bio horm applied at the rate of 50 mL with 200 L water/fed after 50 DFS. The sub- plots included ten weed control treatments as follows:-

- 1-Bentazon AS 48% (Basagran) was applied at rate of 1.5 L/fed after 15 days from sowing (DFS).
- 2-Pyrazosulfuron ethyl WP 10% (Sirius) was applied at rate of 80 gm /fed. after 10 days from sowing.
- 3- Fenoxaprop ethyl EW 7.5% (Whip super) at rate of 350 cm/fed at 4th leaf stage of rice.
- 4-Penoxsulam OD 25% (Rainbow) at rate of 400 cm/fed after 15 DFS.
- 5- Bentazon AS 48% (Basagran) at rate of 1.5 L/fed after 15 DFS + Fenoxaprop ethyl EW 7.5% (Whip super) at rate of 350 cm /fed at 4th leaf stage of rice.
- 6- Bentazon AS 48% (Basagran) at rate of 1.5 L/fed after 15 DFS+ Penoxsulam OD 25% (Rainbow) was applied at rate of 400 cm/fed after 15 DFS.
- 7- Pyrazosulfuron ethyl WP 10% (Sirius) was applied at rate of 80 gm/fed after 10 DFS + Fenoxaprop ethyl EW 7.5% (Whip super) was applied at rate of 350 cm/fed at the 4th leaf stage of rice.
- 8-Pyrazosulfuron ethyl WP 10% (Sirius) was applied at rate of 80 gm/fed after 10 DFS + Penoxsulam OD 25% (Rainbow) was applied at rate of 400 cm/fed after 15 DFS.
- 9-Hand weeding twice after 30 and 45 days from sowing.
- 10-Unweeded cheek (control).

Rice c.v. Giza 178 was sown on May 30th in both seasons at 70 kg/fed. The sand coating involves mixing the herbicides and broadcast by hand. All the recommended cultural practices of growing rice were applied. During the growing seasons, one weed sample was taken randomly by using one square meter from each plot after 60 DFS. Number of fresh and dry weight of total weed species was estimated. Rice was harvested at September 20th in both seasons. Plant height, No. of productive tillers, fresh and dry weight of whole plants, panicle length, number of panicles/m² and weight of 1000 grain were recorded.

The grain and straw yields were calculated in t/fed. NPK percentages of rice grain were determined by Micro Kjeidahl technique as description by Chapman and Pratt (1978). All the obtained data were statistically analyzed according to Snedecor and Cochran 1981, using L.S.D. to compare between the means.

RESULTS AND DISCUSSION

I-Weeds:

The major weed species presented in the experimental area were common *Echinochloa crus – galli* (L.)Beauv (Barnyardgrass), *Echinochilon columum* (L.) Link (Jungle Rice), *Cyperus difformis* (L.) Smallflower umbrellaplant, *Cyperus longus* (L.) Nutsedge.

A- Effect of bio horm:

Results in Table (2) reveal that bio horm treatments significantly affect on total fresh and dry weight of weeds after 60 days from sowing. Application of bio horm increased fresh and dry weight of weeds in both seasons as compared with untreated plots. No significant effects of bio horm treatment were found on the total number of weeds/m².

Table (2). Number, fresh and dry weight of total weeds after 60 days from sowing as affected by bio horm and weed management during 2007 and 2008 seasons.

Treatments	Characters	Total number of weeds/m ²		Total fresh weight of weeds/m ²		Total dry weight of weeds/m ²	
		2007	2008	2007	2008	2007	2008
Bio horm		7.9	7.9	1457	1431.9	302.3	297.2
Control		8.1	7.8	1292	1279.4	263.7	257.4
F – Test		NS	NS	**	**	**	**
L.S.D. at 5%		95.3	61.62	15.29	10.78
1-Bentazon		9.0	9.3	1884	1822.5	365.4	354.3
2-Pyrazosoulfuron		6.0	5.8	788	758.3	149.9	144.3
3-Fenoxaprop ethyl		7.6	8.0	1535	1542.5	321.7	324.0
4-Penoxsulam		7.0	7.1	1434	1436.6	297.6	298.0
5-Bentazon+Fenoxaprop ethyl		8.8	8.5	1479	1471.6	302.5	304.3
6- Bentazon + Penoxsulam		8.3	6.5	788	759.3	145.1	139.8
7- Pyrazosoulfuron +Fenoxaprop ethyl		6.7	6.2	690	818.0	152.6	150.7
8-Pyrazosoulfuron+ Penoxsulam		6.3	6.0	834	798.8	157.9	151.3
9-Hand weeding twice		7.1	7.0	949	907.5	177.1	170.4
10-Unweeded check		15.3	15.8	3360	3241.6	760.0	736.0
F – Test		**	**	**	**	**	**
L.S.D. at 5%		1.23	1.07	214	137.79	34.19	24.11

B- Effect of weed management:

The results in Table (2) clear that weed control treatments had a significant effect on number of fresh and dry weight of total weeds/m² after 60 DFS, in first and second seasons. In both seasons, the highest decrease in total number of weeds was obtained by Pyrazosoulfuron followed by Pyrazosoulfuron + Penoxsulam, Pyrazosoulfuron + Fenoxaprop and Penoxsulam treatments. Pyrazosoulfuron + Fenoxaprop treatment gave the highest decrease in total fresh weight of weeds followed by Bentazon + Penoxsulam, Pyrazosoulfuron and Pyrazosoulfuron + Penoxsulam, respectively in 2007 season. While, in the second season Pyrazosoulfuron treatment gave the lowest values of total fresh weight of weeds. Bentazon + Penoxsulam was more effective than other treatments in reducing the dry weight of total weeds in both seasons. Pyrazosoulfuron came in the second rank followed by Pyrazosoulfuron + Fenoxaprop, Pyrazosoulfuron + Penoxsulam treatments in the two seasons. However, there were no significant differences among the superior treatments. All herbicides used in this study are selective post-emergence herbicides with intensive control of broad-leaved weeds or grassy weeds. Bentazon and Pyrazosoulfuron are selective post-emergence herbicides for controlling broad-leaved weeds and *Cyperus difformis* as well as *Cyperus longus*. Fenoxaprop is selective post-emergence herbicides for controlling *Echinochloa crus – galli*, *Echinochilon columum* while, Penoxsulam for controlling *Cyperus difformis*, *Echinochloa crus – galli* and *Echinochilon columum*. In general, application of herbicides mixtures in sequence was more effective than single herbicide. Similar results were obtained by Moorthy (2002) and Zhang *et al.*(2005). These results may be due to the inhibition effect of weed control treatments on growth of weeds.

C- Interaction:

Results also cleared that there was a significant interaction effect between bio horm and weed management treatments on total fresh weight of weeds/m² in 2008 season and dry weight of weeds/m² in 2007 and 2008 seasons Table (6). Bentazon + Penoxsulam without bio horm produced the lowest values of total fresh weight of weeds in 2008 season. Pyrazosoulfuron without bio horm produced the lowest values of total dry weight of weeds / m² in both seasons. Bentazon + Penoxsulam without biohormone came in the second rank followed by Pyrazosoulfuron + Penoxsulam when bio horm unused. Vice – versa, unweeded treatment with bio horm recorded the highest values of fresh weight of total weeds/m² in the first season. These results are in good harmony with those of Abd El-Wahed *et al.*(2003).

II- Rice plants

1- Growth:

Plant height, number of productive tillers as well as fresh and dry weight of plant of rice has been estimated under different treatments of bio horm and weed management as shown in Table (3).

Table (3). Plant height, number of productive tillers, fresh and dry weight of rice plant after 60 days from sowing as affected by bio horm and weed management during 2007 and 2008 seasons.

Characters	Plant height (cm)		No. of productive tillers/plant		Fresh weight (g/plant)		Dry weight (g/plant)	
	2007	2008	2007	2008	2007	2008	2007	2008
Treatments								
Bio horm	59.1	58.8	18.3	18.3	74.6	72.6	27.3	27.6
Control	55.9	56.1	16.2	16.4	65.7	66.3	23.5	23.7
F – Test	**	**	**	**	**	**	**	**
L.S.D. at 5%	1.38	1.06	1.00	0.56	2.86	3.48	1.02	0.74
1-Bentazon	53.1	52.5	15.3	15.3	58.8	59.0	21.5	21.6
2-Pyrazosoulfuron	60.8	59.5	19.1	19.0	78.8	72.9	28.7	28.4
3-Fenoxaprop ethyl	54.3	53.3	16.3	16.1	66.2	66.1	24.1	24.1
4-Penoxsulam	54.8	56.1	18.1	18.3	70.6	69.5	25.7	25.3
5- Bentazon + Fenoxaprop ethyl	58.1	59.1	18.1	17.5	68.1	68.8	24.8	25.1
6- Bentazon + Penoxsulam	62.0	60.6	19.1	19.6	81.0	81.1	29.4	29.4
7-Pyrazosoulfuron + Fenoxaprop ethyl	60.8	60.8	18.1	18.0	75.5	76.9	27.5	28.0
8-Pyrazosoulfuron + Penoxsulam	61.5	62.8	19.0	19.1	77.5	81.7	28.2	29.7
9-Hand weeding (twice)	58.3	58.0	16.5	17.3	70.7	67.6	25.8	26.4
10-Unweeded check	51.0	51.6	13.0	13.1	49.7	50.8	18.2	18.6
F – Test	**	**	**	**	**	**	**	**
L.S.D. at 5%	3.08	2.39	2.25	1.27	6.41	7.78	2.28	1.67

A- Effect of bio horm:

Bio horm had a significant effect on plant height, number of productive tillers as well as fresh and dry weight of rice plant. In this connection, bio horm increased significantly the previous characters as compared to without bio horm treatment in both seasons Table (3). The increase in growth characters by bio horm treatment could be due to stimulating dry mass production through enhancement of cell division and chlorophyll accumulation which leads to higher photosynthetic activity, accumulation of dry matter, turn reflected on the increasing in translocation accumulation of certain microelements in plant organs, this in turn on their growth characters (Salama and Awadalla, 1987). Smirnoff (1996) reported that the increase in the growth and development of plants in response to antioxidant treatment might be due to the enlargement of cell division and/or the influence on DNA replication. Dallia (1996) found that shoot dry weight of wheat plants was significantly increased by foliar spray of citric or ascorbic acid. The increase of shoot dry weight of wheat plants may be due to the effect of the organic acids on many metabolic and physiological processes, mineral uptake and phyto-hormone balance. Also, Miernyk and Trelease (1981) stated that citric acid as an organic acid presented in tricarboxylic acid cycle and synthesized either from acetyl –CoA, glycine and ketoglutaric, or malic acid conversion citric acid. It can be mentioned that plant height reached its maximum value when plants sprayed with bio horm. Confirming results in this respect were cited by Amin (2003), Mourad (2006) and Al-Kahal *et al.* (2008).

B- Effect of weed management:

According to results in Table (3) plant height, number of productive tillers as well as fresh and dry weight of rice plant were significantly affected by weed management treatments in both seasons. Bentazon + Penoxsulam was superior treatment for increasing plant height, fresh and dry weight of plant in the first season. Also, the same treatment produced maximum values of number of productive tillers in 2007 and 2008 seasons. Moreover, Pyrazosulfuron + Penoxsulam treatment was statistically leveled for improving each of plant height as well as fresh and dry weight of plant in second season. On the other hand, the lowest values of the aforementioned characters were recorded from the unweeded treatments in the first and second seasons. The enhancement of rice growth in the weeded plots might be attributed to the efficiency in weed elimination Table (2) and consequently decreased weed competitive ability against rice plants. This made more efficient use of the environmental growth factors by rice plants reflecting on improving their growth. Successful integrate chemical weed control in rice was recorded by El – Desoki (2002), Moorthy (2002) and Zhang *et al.* (2005).

C- Interaction :

The results in Table (6) indicated that the interaction between bio horm and weed control treatments on number of productive tillers after 60 days from sowing was significant. The highest number of productive tillers was obtained from foliar sprayed bio horm with Bentazon+ Fenoxaprop followed by, Pyrazosulfuron + Penoxsulam treatments. In contrast, the lowest value of number of productive tillers was recorded from the unweeded treatment with spraying of water (control) in average of the second season. These results are in good harmony with those of Abd El-Wahed *et al.*(2003).

2- Yield and its components:

Yield and its components criteria of rice plants as affected by bio horm and weed management treatments are presented in Tables (4 and 5).

A- Effect of bio horm:

Results in Tables (4 and 5) demonstrated that bio horm treatment markedly increased number of panicles/m², of 1000 grain, grain yield and straw yield in both seasons. Moreover, bio horm treatment significantly increased panicle length in the second season only. Plant growth substances counteracting the deleterious effects of salinity on plant growth and yield by increasing succulence in plant due to the increase in cell number and elongation, tend to dilute the internal ionic concentration (Ismail, 2003). In addition, it may induce the cambium differentiation to yield xylem and phloem tissue which improved the absorption and conducting water to the growing organs, and improved the translocation of photo-assimilate thus increased plant growth and yield. Ozdemir *et al.*(2004) reported that the role of growth substances (kinetin) or antioxidant (salcilic and citric acid) on overcoming the depressing effect of salinity stress on growth and biochemical constituents may be due to one or more of the following: (a) Increase root dry weight and decreasing root resistance to water flow and Cl⁺ uptake. (b) Nullifying the changes on mineral composition, photosynthetic pigments and endogenous hormonal level. (c) Increasing water absorption capacity of the roots. (d) Increasing K⁺ uptake and sugars accumulation within the plant tissues as well as oligosaccharides contents (e) increasing water status within the plant tissues by sustaining the determined metabolite level including selective K⁺ over Na⁺ increasing organic acid contents and ion uptake.(f)increasing stimulators/inhibitors ratio in the plant tissues. (g) Increasing carbohydrates, proline and organic acids which can be used as an indicator in the osmoregulation of tissues under salinity stress. The positive effect of growth substances or antioxidant practices on rice yield and its components have been conformed by Abd El- wahed *et al.*, 2003; Abd El-Fatah, 2008 and El-Mwafy, 2008.

Table (4). Rice yield and its components as affected by bio horm and weed management during 2007 and 2008 seasons.

Treatments	Panicle length (cm)		No. of panicles /m ²		1000 - grain weight (gm)		Grain yield (ton) / fed.		Straw yield (ton) / fed.	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
Bio horm	21.2	21.2	310.5	312.0	24.0	24.4	3.62	3.59	4.78	4.85
Control	20.5	20.3	288.8	288.8	21.3	21.4	3.38	3.37	4.53	4.48
F – Test	NS	**	**	**	**	**	**	**	**	**
L.S.D. at 5%	...	0.66	4.84	3.77	0.52	0.34	0.07	0.04	0.07	0.02
1-Bentazon	19.3	19.5	282.0	288.0	21.7	22.3	2.80	2.92	3.95	4.07
2-Pyrazosoulfuron	21.3	21.8	320.0	320.0	23.9	24.1	4.40	4.39	5.55	5.54
3-fenoxaprop ethyl	20.6	20.1	289.3	283.3	22.3	22.1	2.97	2.92	4.12	4.07
4-Penoxsulam	21.1	21.0	293.3	292.6	22.3	22.4	3.24	3.18	4.39	4.33
5- Bentazon + Fenoxaprop ethyl	21.0	20.8	289.3	290.0	22.3	22.6	3.15	3.04	4.35	4.22
6- Bentazon + Penoxsulam	22.3	21.3	322.6	326.6	24.3	24.2	4.58	4.52	5.73	5.72
7-Pyrazosoulfuron+Fenoxaprop ethyl	21.3	22.3	312.6	316.6	22.9	23.2	4.00	4.00	5.15	5.15
8- Pyrazosoulfuron + Penoxsulam	21.5	21.3	316.0	314.6	23.1	23.4	4.12	4.07	5.27	5.50
9-Hand weeding (twice)	21.1	20.8	298.0	298.6	22.7	23.1	3.50	3.50	4.65	4.65
10-un weeded check	19.0	18.3	273.3	271.5	21.0	21.1	2.20	2.24	3.35	3.39
F – Test	*	**	**	**	**	**	**	**	**	**
L.S.D. at 5%	1.83	1.48	10.83	8.43	1.17	0.76	0.16	0.10	0.17	0.45

Effect of weed management:

All weed management statistically increased panicle length, number of panicles/m², weight of 1000 grain, grain and straw yield in both seasons Tables (4 and 5). The highest increase in panicle length, number of panicles/m², weight of 1000 grain, grain and straw yield was obtained by Bentazon + Penoxsulam treatment. Grain yield was markedly affected by weed management treatments in both seasons. The highest increase in grain yield was obtained by Bentazon + Penoxsulam, Pyrazosoulfuron, Pyrazosoulfuron + Penoxsulam, Pyrazosoulfuron + Fenoxaprop, twice hand weeding and Penoxsulam. The increases amounted to 108.2, 100.0, 87.3, 81.8, 59.1 and 47.3 % in the first season and 104, 95.9, 81.7, 78.6, 56.3 and 41.9 % in the second season over the unweeded treatment, respectively.

The increase in yield attributed by different weed control treatments may be due to good control of rice weeds and minimizing weed competition which gave good chance of rice growth and improved good characters. The promoting effect of weed control treatments on plant height, panicle length, No. of panicle/ m², No. of productive tillers and weight of 1000 grain weight criteria may be reflected on increasing the yield and its components of rice plants. Also, this in turns increased plant height (until harvesting) and produced more assimilates synthesized, translocated and accumulated in various plant organs. Thus, positively on reflected biological, straw and grain yields .The positive effect of weeded practices on rice yields and its components have been conformed with Moorthy (2002), Govindra *et al.*(2003), Cavanna *et al.* (2004), Mondal *et al.*(2005) and Zhang *et al.* (2005).

C- Interaction:

Results in Table (6) indicated that there was a significant interaction between bio horm and weed control treatments on 1000- grain weight in the second season. The maximum values of 1000 grain weight was obtained from bio horm foliar spray with Bentazon + Penoxsulam followed by Pyrazosoulfuron + Penoxsulam treatments. On the other hand, the lowest value of 1000- grain weight was recorded from the unweeded treatment with spraying of water (control) in the second season. These results are in good harmony with those of Abd El-Wahed *et al.* (2003).

3- Chemical composition of rice grains:

A- Effect of bio horm:

The percentage of nitrogen, phosphorus, potassium was appreciably influenced by bio horm treatment in both seasons Table (5). The increases in nitrogen, phosphorus and potassium content in rice grains with bio horm may be due to the stimulation and enhancement of cell division and chlorophyll accumulation which led to higher photosynthetic activity of rice plants and this in turn enhancement of rice growth and increased nitrogen, phosphorus and potassium accumulation in rice grains (Abd El-Fatah, 2008). Growth substances used increased phosphorus content caused an increase

in photosynthetic rates resulting in increasing the dry matter accumulation (Foyer and Harbinson, 1986). Also, Growth substances used increased potassium content in shoot under normal and saline conditions. Potassium plays a vital role in a wide range of biochemical and biophysical processes in plants. It is a highly mobile charge carrier, neutralizes the effects of anions, and plays an important role in enzymes activation and membrane transport (Hasegawa *et al.*, 2000). The same conclusion was mentioned by Amin (2003), Mourad (2006) Abd El-Fatah (2008), Al-Kahal, *et al.*(2008) and El-Mwafy (2008).

Table (5). Averages of N, P, and K elements percentage in rice grain as affected by bio horm and weed management during 2007 and 2008 seasons.

Treatments	Characters	Nitrogen %		Phosphorus %		Potassium %	
		2007	2008	2007	2008	2007	2008
Bio horm		1.08	1.08	0.11	0.11	0.29	0.28
Control		1.01	1.01	0.10	0.10	0.27	0.27
F – Test		**	**	**	**	**	**
L.S.D. at 5%		0.022	0.013	0.002	0.001	0.006	0.003
1-Bentazon		0.83	0.87	0.08	0.09	0.22	0.23
2-Pyrazosulfuron		1.30	1.30	0.14	0.13	0.35	0.35
3-fenoxaprop ethyl		0.88	0.87	0.09	0.09	0.23	0.23
4-Penoxsulam		0.96	0.94	0.10	0.10	0.25	0.25
5- Bentazon + Fenoxaprop ethyl		0.93	0.90	0.10	0.09	0.25	0.24
6- Bentazon + Penoxsulam		1.36	1.34	0.14	0.14	0.36	0.35
7-Pyrazosulfuron+Fenoxaprop ethyl		1.19	1.19	0.12	0.12	0.31	0.31
8- Pyrazosulfuron + Penoxsulam		1.22	1.21	0.13	0.12	0.32	0.32
9-Hand weeding (twice)		1.04	1.04	0.11	0.11	0.27	0.27
10-un weeded check		0.75	0.76	0.08	0.08	0.20	0.20
F – Test		**	**	**	**	**	**
L.S.D. at 5%		0.049	0.031	0.005	0.003	0.013	0.008

B- Effect of weed management:

Weed management had a significant effect on nitrogen, phosphorus and potassium percentage of rice grains Table (5). Bentazon + Penoxsulam treatments increased significantly the content of N, P, and K in grains as compared to the other weed management. The increments of N, P, K exceeded the unweeded treatment by 81.3, 75.0 and 80.0% in the first season 76.3, 75.0 and 75.0 in the second season, respectively. These results may be due to the less competition for environment factors particularly nutrients, water and light through limiting weeds infestation with herbicidal treatments due to increasing the uptake of different nutrients. Similar results were obtained by El-kholy *et al.*(1999) and El-Desoki (2003).

Table (6). Averages of fresh and dry weight of total weeds, number of productive tillers and 1000 grain weight as affected by the interaction between bio horm and weed management during 2007 and 2008 seasons.

Treatments	Characters		Total fresh weight of weeds/m ²				Total dry weight of weeds/m ²				No. of productive tillers		1000 - grain weight (gm)	
	Biohorm	Control	Biohorm	Control	Biohorm	Control	Biohorm	Control	Biohorm	Control	Biohorm	Control		
	2008		2007		2008		2008		2008		2008			
1-Bentazon	1920.3	1724.6	381	349.5	375.0	333.7	17.0	13.6	23.6	21.1				
2-Pyrazosulfuron	796.0	720.6	168	131.6	163.8	124.9	20.3	17.6	26.1	22.1				
3-Fenoxaprop ethyl	1611.3	1473.6	340	303.4	342.7	305.3	17.0	15.3	22.9	21.2				
4-Penoxsulam	1465.6	1407.6	320	275.4	315.9	280.1	19.0	17.6	23.8	21.0				
5- Bentazon + Fenoxaprop ethyl	1483.0	1460.3	320.6	284.5	310.1	298.5	20.0	15.0	24.0	21.3				
6- Bentazon + Penoxsulam	809.0	709.6	153.3	136.9	150.9	128.6	19.6	19.6	26.4	22.1				
7- Pyrazosulfuron + Feoxaprop ethyl	826.3	809.6	153.8	151.4	154.4	147.0	18.6	17.3	24.9	21.6				
8- Pyrazosulfuron + Penoxsulam	811.3	786.3	166.2	149.1	160.8	141.8	20.0	18.3	25.0	21.8				
9-Hand weeding (twice)	980.0	835.0	192.3	162.0	186.0	154.9	17.3	17.0	24.5	21.7				
10-Un weeded	3616.3	2867.0	827.6	692.5	812.6	659.5	14.0	12.3	21.9	20.4				
F – Test	**		*		**		*		*					
L.S.D.	194.40		48.25		34.02		1.79		1.06					

References

- Abd El-Fattah, G. A. (2008). Physiological and morphological studies on some rice cultivars and their relation to salt tolerance. Ph. D. Thesis, Fac. Agric., Mansoura Univ., Egypt.
- Abd El-Wahed, M.S. A.; E. R. El-Desoki and R. A. El-Mergawi (2003). Influence of the herbicide (thiobencarb) and sitosterol on rice plant (*Oryza sativa* L.). J. Agric. Sci. Mansoura Univ., 28(3):1655-1671.
- AL-Kahal, A. A.; S. M. Ahmed and M. M. Fahmy (2008). Response of barley growth, yield and microbial population in the rhizosphere to soil application of yeast and foliar spray of citric and ascorbic acid. J. Agric. Sci. Mansoura Univ., 33(11):7783-7791.
- Amin, A. A. (2003). Physiological effect of gamma irradiation and kinetin on growth yield and chemical constituents of wheat. Egypt, J. Appl. Sci., 18(6):34-49.
- Arrioni, O. and M. C. DeTullio (2002). Ascorbic acid: much more than just an antioxidant. *Biochimica et Biophysica Acta* .1569:1-9.
- Cavanna, S. ; L. Bacci; D. Larelleand and A. Carone (2004). Penoxsulam: New post-emergence rice herbicide. *Giornate-Fitopatologiche-2004,-Montesilvano-Pescara,-4-6-maggio-2004-Atti,-volume-primo*: 301-307.
- Chapman, H. D. and P. F. Pratt (1978). Methods for analysis for soil, plant and water. Univ. of California, Dept. of Agric. Sci., USA: 1-309.
- Conklin, P. L. and C. Barth (2004). Ascorbic acid, a familiar small molecule intertwined in the response of plants to ozone, pathogens and the onset of senescence. *Plant Cell and Environment*., 27:959-971.
- Dalia, A. S. S. El Hamzawi (1996). Biochemical studies on some organic acids on some plants .M.Sc., Thesis, in Agric. Sci. (Biochemistry), Cairo Univ..
- El-Desoki, E. R. (2002). Effect of some weed control treatments and levels of nitrogen on performance of direct seeded rice and weeds. Egypt, J. Appl. Sci; 17(8):124-137
- El-Desoki, E. R. (2003). Effect of some weed control treatments on transplanting rice and nutrients uptake by rice and weeds. J. Agric. Sci. Mansoura Univ., 28(1):23-35.
- El-kholy, M. H.; M. H. Hegazy and Faiza K. Abd El-Fattah (1999). Response of rice yield to N-fertilization, BGA inoculation and herbicide application. J. Agric. Sci. Mansoura Univ., 24(9):5165-5173.
- El-Mwafy, M. R. A.. (2008). Effect of some antioxidant on seed quality and yield of wheat. Ph.D. Thesis, Fac. Agric., Mansoura, Univ., Egypt.
- Foyer, C. H. and J. Harbinson (1994). Oxygen metabolism and the regulation of photosynthetic electron transport .In: Foyer ,C. and P. Mullineaux (eds): *Cuses of Photooxidative Stresses and Amelioration of Defense Systems in Plants*, CRC Press, Boca Raton, FL, pp.1-42
- Govindra, S.; V. P. Singh; M. Singh and S. P. Singh (2003). Effect of fenoxaprop-p-ethyl on transplanted rice and associated weed. *Indian J. of Weed Sci.* 35(1/2):119-120.
- Hasegawa, P. M.; R. A. Bressan, J. K. Zhu and H. J. Bohnert (2000). Plant cellular and molecular responses to high salinity. *Annu. Rev. Plant Physiol. Plant Mol. Biol.* 51:463-499.
- Ismail, A. M. (2003). Physiological studies on the influence of cytokinin or GA3 in the alleviation of salt stress in sorghum plants. *Acta-Agronomica-Hungarica*. 2003, 51(4):371-380.
- Larelle, D.; R. Mann ;S. cavanna; R. Bernes; A. Duriatti and C. Mavrotas (2003). Penoxsulam, a new broad spectrum rice herbicide for weed control in European Union paddies . *The –BCPC –International –Congress :-Crop-Science –and –Technology.-Volumes-1-and-2-Proceeding –of –an-international –congress-held-at-the-SECC,-Glasgow,-Scotland ,-UK,-10-12-November-2003*, pp. 75-80.
- Li, L.; J. Van Staden, and A. K. Jager (1998). Effects of plant growth regulators on the antioxidant system in two maize cultivars subjected to water stress. *Plant Growth Reg.* 25:81-87.
- Miernyk, J.A. and R.N. Trelease (1981). Role of malate synthesis in citric acid synthesis by maturing cotton embryos. *A Prosal. Plant Physiol.*, 68:875-881.

- Mondal, D. C.; A. Hossain and B. Duary (2005). Effect of pyrazosulfuron-ethyl on weeds and yield of transplanted rice under lateritic belt of West Bengal . Indian J. of Weed Sci. 37(3/4):263-264.
- Moorthy, B. T. S. (2002). Evaluation pyrazosulfuron -ethyl alone and in combination with molinate for controlling weeds in rainfed direct –seeded lowland yield. Indian J. of Weed Sci. 34(3/4):285-286.
- Mourad, A. E. A. A.(2006). Response of grain sorghum to foliar spray with ascorbic and citric acids under different rates of nitrogen fertilizer in sandy soils. J. Agric . Sci . Mansoura Univ., 31(11):6825-6837.
- Ozdemir, O.; B. Melike, D. Tijen, and T. Ismail (2004). Effects of 24-epibrassinolide on seed germination, seedling growth, lipid peroxidation, praline cotent and antioxidative system of rice (*Oryza sativa* L.) under salinity stress. Plant Growth Regulation. 42:203-211.
- Salama, F. M. and A. A. Awadalla (1987). The effects of different kinetin application methods on some chlorophyll parameters of two crop plants grown under salinity stress. Phyton. 21:81-193.
- Saini, J. P. (2003). Efficacy of pyrazosulfuron-ethyl against mixed weed flora in transplanted rice. Pesticide Res. J., 15 (2):157-159.
- Snedecor, G. W. and W. G. Cochran (1981). Statistical Methods.7th Ed., Iow State Univ., Press, Am., USA, pp. 325-330.
- Smirnoff, N. (1996). The function and metabolism of ascorbic acid in plant .Ann.Bot.,78:661-669.
- WSSA (Weed Science Society of America) 1994. Herbicide Handbook 7th Ed.Champaign, Illinois, USA.
- Zhang, W.; E. P. Webster; D. C. Blouin and C. T. Leon (2005). Fenoxaprop interactions for barnyardgrass (*Echinochloa crus-galli*) control in rice. Weed Technology.19 (2):293-297.

المخلص العربي

استجابة الأرز والحشائش المصاحبة له للرش بمنظم النمو الحيوي (بيهورم) ومعاملات مكافحة الحشائش في التربة الملحية

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أقيمت تجربتان حقليتان في موسمي ٢٠٠٧/٢٠٠٨ بمحطة التجارب الزراعية بمركز البحوث الزراعية- بالسرو بمحافظة دمياط- مصر- لدراسة تأثير الرش بمنظم النمو (بيهورم) وبعض معاملات مكافحة الحشائش (البنزازون، البيرازوسلفرون، الفينوكسابروب، البينوكتسيولام، البنزازون+ الفينوكسابروب، البنزازون+ البينوكتسيولام ، البيرازوسلفرون+ الفينوكسابروب، البيرازوسلفرون+ البينوكتسيولام، نقاوة يدوية مرتين ومعاملة المقارنة (بدون مكافحة) على نمو ومحصول نباتات الارز وكذلك على الحشائش المصاحبة لها.

اظهر الرش بالبيهورم زيادة جوهريه في الوزن الغض والجاف للحشائش. كذلك ادى الرش بالبيهورم إلى زيادة معنوية في صفات النمو والمحصول ومكوناته والنسبة المئوية للنتروجين والفسفور والبوتاسيوم في الحبوب بالمقارنة بدون استخدام منظم النمو.. أدى استخدام معاملات مكافحة الحشائش الى نقص جوهري في عدد ووزن الحشائش الغض والجاف الكلى - حيث اشارت النتائج الى ان استخدام معاملة البيرازوسلفرون منفردا يلية معاملة البيرازوسلفرون+ البينوكتسيولام ثم البيرازوسلفرون+ الفينوكسابروب قد اعطت اقل عدد حشائش خلال موسمي الدراسة. بينما استخدام معاملة البيرازوسلفرون+ الفينوكسابروب اعطت اقل وزن غض للحشائش في الموسم الاول، بينما تفوقت معاملة البيرازوسلفرون منفردا على بقية المعاملات في الموسم الثاني ، اما معاملة البنزازون+ البينوكتسيولام فتفوقت على بقية المعاملات في مكافحة الحشائش المنتشرة حيث اعطت اقل وزن جاف للحشائش خلال موسمي الدراسة.

أوضحت النتائج أن استخدام معاملات مكافحة الحشائش ادى الى زيادة معنوية في صفات النمو والمحصول ومكوناته والمكونات الكيميائية للحبة. اظهر استخدام معاملة البنزازون+ الفينوكسابروب زيادة معنوية في عدد الاشطاء الخصبة ، عدد الداليات /م^٢، وزن الالف حبة ،محصول الحبوب والنسبة المئوية للنتروجين والفسفور والبوتاسيوم في الحبوب في كلا الموسمين . وتفوقت نفس المعاملة في صفات طول النبات ،الوزن الغض والجاف الكلى للنبات و طول الدالية ومحصول القش في الموسم الاول . بينما تفوقت معاملة البيرازوسلفرون+ البينوكتسيولام في صفات طول النبات و الوزن الغض والجاف الكلى للنبات محصول القش في الموسم الثاني.

أظهرت النتائج وجود تفاعل معنوي بين معاملات مكافحة الحشائش والرش بالبيهورم على صفات الوزن الكلى للحشائش الغض والجاف ،عدد الاشطاء الخصبة ووزن الالف حبة. ادى استخدام معاملة البنزازون+ البينوكتسيولام الى نقص معنوي في الوزن الكلى الغض للحشائش بعد ٦٠ يوم من الزراعة عند عدم استخدام الرش بالبيهورم في الموسم الثاني. بينما أدى استخدام معاملة البيرازوسلفرون الى نقص معنوي في الوزن الكلى الجاف للحشائش بعد ٦٠ يوم من الزراعة عند عدم استخدام الرش بالبيهورم في كلا الموسمين. كذلك احدث التفاعل بين معاملات مكافحة الحشائش والرش بالبيهورم زيادة معنوية في عدد الاشطاء الخصبة للنبات ووزن الالف حبة حيث أدى استخدام البيرازوسلفرون والرش بالبيهورم إلى زيادة معنوية في عدد الاشطاء الخصبة في الموسم الثاني بينما أدى استخدام معاملة البنزازون+ البينوكتسيولام والرش بالبيهورم إلى زيادة معنوية في وزن الالف حبة في الموسم الثاني .

ووفقا لتلك النتائج توصي الدراسة باستخدام المنظم الحيوي البيهورم لزيادة محصول الأرز في الاراضي الملحية كذلك استخدام مبيدات الحشائش خلطا للحصول على أعلى كفاءة في مقاومة الحشائش وأعلى محصول من الأرز تحت ظروف منطقة إجراء البحث.