Effect of Water Depth, Two Rice Cultivars and Som Herbicides on Weeds and Direct- Seeded Rice (*Oryza sativa* Linn.)

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ABSTRACT

Two field experiments were conducted at EL-Serw Agricultural Research Station, Agricultural Research Damietta Governorate, Egypt, during 2013 and 2014 summer seasons to study the effect of water depth, cultiva and weed control treatments on weeds and rice crop .The experimental design was a split- split plot design, whi combination of twenty treatments, each experiment included two water depths, which were determined in the ma two rice cultivars and five weed control treatments, the two cultivars treatments were assigned to the sub plots a control treatments, that were put in the sub-sub plots. It was found that the water depth of 3cm increased total w flag leaf area (cm^2) by 0.31, 46, 30.5 and 10.5% through the two seasons, compared with water depth respectively. Water productivity was estimated by, 1.342, 0.765, 1.229 and 0.692 m^3 to each kg of rice grain yiel 2013 and 2014 seasons, respectively. Giza 178 cultivar decreased fresh weight of grassy weeds and total weeds t 30%, but, flag leaf area was increased by 18%, compared with Orabe2 cultivar, respectively, during the second Bispyribac- sodium, penoxsulam (13.6%) and penoxsulam (1.6%)+ triclopyr (12%) decreased the fresh weight weeds up to 36, 35 and 61%, compared with the untreated check in the second season, respectively.

The interaction between 3cm and 7cm water depths x bispyribac-sodium recorded 8.5 and 10% increase in height, but, the interaction between water depth at 3cm x penoxsulam (13.6%) and penoxsulam ((1.6%))+ triclop increased flag leaf area (cm^2) by 18.5 and 8.65%, in the first season, respectively, compared to the untreated water depth at 3cm.

The interaction between water depth of 7cm x Giza 178 x penoxsulam (1.6%)+ triclopyr (12%) decreased weight of total weeds by 82% and plant height by 76%, but, the interaction between water depth of 3cm x C bispyribac-sodium and Giza 178 x penoxsulam (1.6%)+ triclopyr (12%), increased panicle length up to 9 and 8% interaction between water depth of 3cm x Giza 178 x penoxsulam (1.6%)+ triclopyr (12%) and water depth o Orabe2 x penoxsulam (1.6%)+ triclopyr (12%) recorded an increased in flag leaf area (cm^2) up to 91 and 69% second season, respectively, compared to the untreated check x water depth of 3cm x Giza178.

The main findings of this study show that the depth water at 3 cm of soil surface saved water of 1533 and per faddan, or by 41 and 41% than the depth water at 7 cm without any significant differences in either grai faddan, respectively. Water productivity was higher in 3 cm water depth, which were 1.345 and 1.23as compa 0.765 and 0.69 (WUE) for each produced kg of rice grain. On the other hand, a slight reduction in weed gro estimated by percent with deep water irrigation to 7 cm from soil surface.

Giza 178 exhibited weed depression by 30 % than Orabe 2 cultivar in spite of the insignificant differences grain or straw yields per faddan.

All weed control treatments, Bispyribac- sodium, penoxsulam (13.6%) and penoxsulam (1.6%)+ triclopy exerted significant weed control reduction than untreated check, accompanied with increases in rice grain per fad untreated check. The effect of interaction between all studied factors on weeds and rice production were discussed

Key words: Rice, water depth, herbicides, water productivity, grain yield.

INTRODUCTION

Rice (*Oryza sativa* L.) is, drought tolerance will be important not only to reduce losses due to moisture stress, but also to maintain or improve the crop's competitiveness against weeds (Asch *et al.*, 2005). In agricultural systems, where irrigation and flooding are common practices (e.g. rice), the environment, in which weed seeds have to germinate, is characterized by the existence of low oxygen concentrations. Low oxygen concentration terminates dormancy in seeds of some weed species. Increased temperatures affect herbicide persistence in the soil and the 'windows' for herbicide effectiveness (Bailey, 2004). Will *al.*, 1990, observed that growth was always s during seedling establishment in standing w that deep water can jeopardize the rice cro important, then, to determine a safe limit fo depths in order to avoid unacceptable Flooding, up to a depth of 10 cm, pr germination of most weed seeds and k majority of weed seedlings.The morph similarity between crop and certain grassy makes hand weeding difficult (Maity Mukherjee, 2009). The dominance of gra favored by saturated and below-sa conditions, whereas (aquatic) broadleav sedges grow rapidly when soil is submerged with water under aerobic soil conditions, weed diversity is much higher, compared to saturated or flooded conditions (Anwar *et al.*, 2010). Williams *et al.*,1990 compared the growth of several weeds in water-seeded rice under shallow (5cm), moderate (10cm) and deep (20cm) continuous flooding. In the absence of herbicides, 20 cm of standing water gave better weed control than other water depths. Ismail *et al.* (1996), also, indicated that emergence of *E. crus-galli*, *E. colona*, *C. iria*, *L. hyssopifolia* and *Rhyncospora corymbosa* was lower in soils flooded up to 4 cm water depth, compared to seeds sown at all sowing depths in saturated soil. Wrinkle grass (*Ischaemum rugosum*) seeds failed to germinate when subjected to all depths of inundation (4–12cm), except for those inundated with 2cm, which registered 2% germination (Moody and De Data, 1982). Weedy rice infestation in rice fields is dangerous because seeds in seed bank increase over time with self-regeneration and there is no effective selective herbicide for controlling weedy rice (Duong *et al.*, 2007). Mamun (1990) reported that weed growth reduced the grain yield by 68-100% for direct-seeded rice. Uncontrolled weed growth is reported to cause yield losses in the range of 28–89% in direct-seeded lowland rice and 48–100% in upland ecosystems, and improved weed control has been estimated to raise rice yields by 15–23%, depending on production ecosystem (Rodenburg and Johnson,2009). Chemical control is the most commonly used and reliable method for controlling weeds in rice. The importance of their control was emphasized in the past by various authors (De Datta and Baltazar 1996; Labrada 1996 and Ze-Pu Zhang 1996). Excellent control of *Echinochloa crus-galli*, with penoxulam applied at the three-to-four leaf growth stage, was reported by Ottis *et al.* (2003). According to Joy *et al.* (1991), weed flora in rice consisted of 37% grasses, 33% sedges and 30% broadleaves weeds. Barnyardgrass control, with penoxsulam, was reported to be at least 99% at 21 days after application, if applied alone (Ottis *et al.* 2004).Talbert and Burgos (2007) found that penoxsulam did not injure rice and improved rice yields, compared with standard propanil-based programs. Weed species respond differently to changing water regimes (Bhagat *et al.*, 1999). Yadav *et al.*, (2007), also, reported the broad spectrum action of bispyribac -sodium.

Thus, the present study was underta develop water management-based on the e two rice cultivars and weed control herbici direct-seeded rice.

MATERIALS AND METHODS

Two field experiments were conducted and 2014 summer seasons at EL-Serw Agri Research Station, Damietta Governorate, Res. Center, Egypt, on loamy soil (Table1), the effect of twenty treatments, which we combination of two water depths, two rice c and five weed control treatments on weeds crop. The main soil characteristic is heavy cl mechanical composition is shown in Table ((1950).

The experimental fields were prepared two plowings and harrowing and leveling. superphosphate (15.5% P_2O_5) was added at of 100 kg/faddan before soil plowing experiment was set in a split –split-plot desi four replicates. The size of sub-sub pl $21m^2$(3mx7m). Rice seeds were planted at of 60kg/faddan in the 15th and 20th May in 20 2014 summer seasons, respectively, and ha in 25th and 30th of September through t successive seasons. Two water depths of 3 7cm, and irrigation each four days were allo the main plots and Giza 178 and Orab cultivars were assigned to the sub- plots an control treatments in the sub-sub plots.

Weed control treatments were:

1- Nomiene SL 2% (bispyribac-sodium) at of 0.8L/faddan applied after twenty da sowing.
2- Rainbo OD 2.5% (penoxsulam) 13.6%) rate of 0.4 L/faddan applied after fifte from sowing.
3- Falkon OD (13.6%) (penoxsulam (1. triclopyr (12%)) at the rate of 0.9 L applied after twenty days post sowing.
4- Hand weeding twice at thirty and fo days post sowing.
5- Untreated check.

Nitrogen, in the form of urea (46%N) rate of 60kg/faddan, was splitted into thre doses, before seeding in the dry soil, at tiller at panicles initiation. The other usual practices of rice planting were conduc recommended by the Egyptian Minis Agriculture and Land Reclamation.

Table 1: Physical and chemical properties of the soil samples before sowing rice plants during 20 2014 summer seasons.

Summer Season	Soil depth (cm)	Particle size distribution: Coarse sand(%)	Fine Sand(%)	Silt (%)	Clay (%)	Texture class	O.M. (%)	CaCo3 (%)	PH (1:2.5) suspension
2013	0-30	1.73	13.30	21.62	63.15	Clayey	1.21	2.35	7.9
2014	0-30	1.69	13.32	21.70	63.18	Clayey	1.22	2.31	7.8

Data recorded the following estimations:

A) Water productivity:

The amounts of applied water were shown in Table (2). The amount of applied water, delivered to each experimental plot, was measured by using the cut – throat flume. The 20x90 cm dimensions water productivity was determined, according to the following equation:

$$\text{Water productivity} = \frac{\text{Rice grains}}{\text{Amount of applied water}} \ (\text{kg/ m}^3)\ (\text{WUE}).$$

B) Weeds:

The studied characters included one weed sample from each m^2, taken at sixty days after sowing, using one square quadrate and weeds were separated and identified as to species, according to Tackhőlm (1974).

C) Rice growth:

Ten rice plants were randomly taken at ninety days after sowing (DAS) from each sub-sub plot and the following measures were recorded: Growth parameters were:

1) Plant height (cm) was estimated from the soil surface to the top of the main stem
2) Flag leaf area per plant (cm^2).

D) Grain yield and yield components:

At harvest, the following measures were recorded:

1- Panicle length: It was measured (in cm) from the collar to the end of panicle in a random sample of ten main panicles.
2. Grain yield (ton/faddan): The two inner square meters of each sub-sub plot were harvested and were left for five days for air drying and, then, the grains threshed, then, the grains were separated and weighed. The grain yield was recorded and, then, converted into ton/faddan.
3- Straw yield (ton/faddan): It was estimated by weighing the straw after separating the grains from the same samples of grain yield (item 2).

E) Statistical analysis:

All data obtained were subjected to the proper statistical analysis of a split –split-plot design, according to Steel and Torrie (1980) and were compared, according to Duncan multiple range test at 0.05 level.

RESULTS AND DISCUSSION

1-A) - Effect of water depth:

1-A) 1- On weeds:

Weed flora of the experimental plots is below, including grasses as: *Echinochloa c Echinochloa crus-galli* and broad-leaved *Ammannia* spp. *and Cyperaceae as C difformis*.

Results in Table (3) showed that the amo applied water per faddan was increase increasing irrigation depth from 3 to 7cm fro surface and reached to 2205, 3738, 2293 and m^{-3} faddan, respectively, during the two g season period during 2013 and 2014 seaso the another hand, irrigation with the water d 7cm from soil surface significantly decreas total weeds, during 2013 season, and fresh of *Cyperus difformis* and total weeds (g/m^2) 2014 season, respectively. These de amounted to 0.4 and 46% through the two s compared with the water depth of respectively. Water depth, also, did not h significant effect on fresh weight of *E. crus E. clonum* and *A.* spp. during 2013 and seasons.

This may be due to poor weed seed gern under deep water conditions compared to water due to soil aeration as mentioned by (2004).

1-A) 2 On rice:

Table (4) shows that all studied cha namely, plant height (cm), panicle lengt straw yield (ton/ faddan) and grain yiel faddan) did not significantly differ under bot 7 cm water regimes, except for flag leaf area(2013 season and plant height in 2014 seas water use productivity kg/m^3 during the t seasons.

Table 2: The amount of applied irrigation water (cm) and total used amount per faddan to seeded rice, in the two summer seasons.

Month	The amount of applied irrigation water							
	2013 season				2014 season			
	3cm	TWM^3/F°	7cm	TWM^3/F°	3cm	TWM^3/F°	7cm	TWM^3/F°
June	6.9	289.8	12.9	541.8	3.7	155.4	18.5	777.0
July	23.8	999.6	45.6	1915.2	26.2	1100.0	42.2	1772.4
Augst	21.8	915.6	30.5	1281.0	24.7	1037.4	32.5	1365.0
TWM^3/F°	-----	2205	-----	3738	-----	2293	-----	3914

These values were measured after establishment and up to harvesting process.
TWM^3/F° = Total water / faddan(cubic meter).
Irrigation water depth of:
Ponding water depth at 3cm all season.
Ponding water depth at 7cm all season.

Table 3: Effect of water depth on weeds during 2013 and 2014 seasons(over rice cultivars and control).

Water depth (cm)	Amount of water (m^3 / faddan)	*E. crus-galli* (g/m^2)	*C. difformis* (g/m^2)	*E. colonum* (g/m^2)	*A. spp.* (g/m^2)	Total weeds (g/m^2)	*E. crus-galli* (g/m^2)	*C. difformis* (g/m^2)	*E. colonum* (g/m^2)	*A. spp.* (g/m^2)	Total weeds (g/m^2)
		2014 season					2014 season				
3	2205	1985	388	183	10	2293	1830	702 a	110	11	2653 a
7	3738	2251	275	28	2	3914	1627	169 b	24	1	1821 b

Means followed by the same letter, within each column, are not significantly different according to Waller-Du ratio t test, 0.05level.

Table 4: Effect of water depth on rice traits during 2013 and 2014 seasons (over rice cultivars an control).

Water depth (cm)	Amount of water (m^3 / faddan)	Plant height (cm)	Flag leaf area (cm2)	panicle length(cm)	Straw yield (ton/faddan)	Grains yield (ton/faddan)	water use productivity kg/m^3
season 2013							
3	2205	73	17.1 a	19.0	3.58	2.96	1.342
7	3738	74	13.1 b	19.1	3.73	2.82	0.765
2014 season							
3	2293	77 a	15.97	19.73	3.96	2.86	1.229
7	3914	71 b	14.45	18.87	3.59	2.71	0.692

Means followed by the same letter, within each column, are not significantly different according to Waller-Du ratio t test, 0.05level.

Concerning plant height, water depth of 3cm increased it up to 8.4%, compared with the water depth of 7cm in the second season. This means that we can save systematized water by about 1533 and 1621 m^3/ faddan, in the two seasons, respectively. Water productivity values recorded 1.342, 0.765, 1.229 and 0.692 m^3 to each kg rice grains yield during 2013 and 2014 seasons, respectively, which means that water productivity was larger with the water depth of 3cm than 7cm through the two seasons.

These results suggest that the same yield of rice per faddan can be produced by either the two irrigation systems and water use efficie increased by, 1.342 and 1.25 under s irrigation than deep water irrigation and save by 1533 and 1621 m^3 / faddan or by 41 a percent from deep irrigation system.

1-B): Effect of rice cultivars:

1-B) -1: On weeds:

Data in Table (5) revealed that Gi cultivar decreased the total weeds in both and arrived to the level of significance i season than Orabe 2 by 30% between t cultivars through the two seasons, respectivel

Table 5: Effect of rice cultivars on weeds during 2013 and 2014 summer seasons(over depths wat weed control).

Rice Cultivar	*E. crus-galli* (g/m^2)	*C. difformis* (g/m^2)	*E. colonum* (g/m^2)	*A. spp.* (g/m^2)	Total weeds (g/m^2)	*E. crus-galli* (g/m^2)	*C. difformis* (g/m^2)	*E. colonum* (g/m^2)	*A. spp.* (g/m^2)	Total weeds (g/m^2)
	2013 season					2014 season				
Giza178	2103 b	189	170	0.0	2462	1318 b	392	134 a	4.0	1848 b
Orabe2	2133 a	474	41	12	2650	2137a	479	0.0 b	13	2629 a

Means followed by the same letter within each column are not significantly different according to Waller-Du ratio test, 0.05level.

Giza 178 cultivar depressed the fresh weight of *E. crus-galli, C.difformis*, *E. colonum, A.* spp. and the total weeds up to 1.4, 60, 0.0, 100 and 7 %, in the first season, respectively, and, 38, 18, 0.0, 69 and 29%, respectively, in the second season, but arrived to the significance in most cases. This may indicate that Giza 178 cultivar had some allelopathic potential against associated weeds. Allelopathic rice cultivars suppress weed emergence, root and shoot developments, tillering capacity and plant canopy were recorded, according to Hassan (2002).

1-B)- 2: On rice:

Results in Table (6) showed that the differences between the two studied cultivars did not arrive to the level of significance, concerning the characteristics; namely, plant height (cm), flag leaf area (cm^2), panicle length (cm), straw yield (ton/faddan) and grains yield (ton/faddan) in both seasons, except for, flag leaf area (cm^3) and water use productivity (kg/m^3) during the two seasons. This can explain that Orabe 2 cultivar increased plant height, flag leaf area, panicle length, straw yield and grain yield. Giza 178 cultivar decreased fresh weight of total weeds up to 30% due to the increase in flag leaf area up to 18%, as compared with Orabe2 cultivar, during the second season, respectively. This means that the two rice cultivars had a similar potentiality for rice production.The two rice cultivars, in this study, suggested that water use efficiency was increased by 1.10 and 0.99 over Orabe2 cultivar, but, Giza 178 cultivar recorded a reduction in water use efficiency by 0.95 and 0.99, through the two seasons, respectively.

1-C) - Effect of weed control treatments:

1-C) -1: On weeds:

Data in Table (7) indicated that the effect of weed control treatments arrived to the level of significance on *E.crus-galli*, *C. difformis* and the total weeds during the two seasons, where, Falkon **(**penoxsulam (1.6%) + triclopyr (12%)), bispyribac-sodium and penoxsulam (13.6%) decreased the fresh weight of *E. crus-galli* and *C. difformis* up to 49, 14, 20, 77, 86 and 91%, in 2013 season, respectively, and 62, 39, 42, 76, 24 and 17%, in the second season, respectively, and with total weeds by 61, 36 and 36%, respectively, in the first season.

From this study, it was indicated that the effect of penoxsulam (1.6%)+ triclopyr (12%) was more observed on total weeds than another herbicidal treatments, which broadened the weed control spectrum, where penoxsulam (1.6%) controlled the broad-leaf and triclopyr (12%) controlled grassy weeds. bispyribac- sodium, penoxsulam (13.6%) and penoxsulam (1.6%)+ triclopyr (12%) decreased fresh weight of total grassy and total weeds by 39, 39.2, 59, 36, 35 and 61%, compared with the untreated check in the second season, respectively.

Bispyribac- sodium is a selective herbici effective for the control of grasses, sedg broadleaf weeds in rice and is effective as a foliar treatment (Schmidt *et al*., 1999), as penoxsulam, a triazolopyrimidinee sulfonam herbicide, which inhibits the plant Acetolactate Synthase (ALS), which is essen the synthesis of branched-chain amino acids leucine and isoleucine. Inhibition of amin production, subsequently, inhibits cell divisi control annual sedges and many broadleaf also *Echinocloa* spp., but it is safe to rice (La 2014).

The growth stage of weed species may effect on herbicide efficacy by influencing and metabolism of herbicides (Singh and 2004). Direct wet seeding, broadcasting germinated seeds on puddled soil, results i weed growth than transplanting (Bhagat 1999).

1-C) – 2: On rice crop:

Results in Table (8) indicated th differences between weed control treatments to the level of significance on straw yielc yield and water use productivity (kg/m^3) du two seasons, and plant height, flag leaf area, length, straw yield and grain yield in the season. All herbicidal and hand-weeding treatments increased plant height by 78, 75, 72 cm in the second season, than the u check. Flag leaf area, also, were increase penoxsulam (1.6%) + triclopyr (12%), bisp sodium and penoxsulam (13.6%) by 45, 19%, compared with the untreated check second season, respectively. Straw yiel increased with, penoxsulam (1.6%) + t (12%), bispyribac- sodium and penoxsulam (by, 30, 33 and 30%, compared with untreate in the second season, respectively. Grain yi increased by the herbicidal treatments (bisp sodium, penoxsulam (13.6%) and penc (1.6%)+ triclopyr (12%)) and hand-weedin by 56, 41, 36 and 18%, ,in 2013 season, and 54 and 31%, in 2014 season, compared w untreated check in the two seasons, respectiv

The superiorly in grain yield (ton/fadda to the treatments, might be attributed to the i in plant height, flag leaf area and straw yie may be owing to the effect of herbicidal an weeding treatments and improved the rice p photosynthesis, which produced photosynthesis to be stored in grain in rice which prevented weed competition.

Concerning the effect of herbicide trea on water productivity (WP), it was obtaine each of weed control treatment gave percentage of WP more than hand-weeding and untreated check in the two seasons.

Table 7: Effect of weed control treatments on weeds during 2013 and 2014 summer seasons.

Treatments	*E. crus-galli*	*C. difformis*	*E. colonum*	*A.* spp.	Total weeds	*E. crus-galli*	*C. difformis*	*E. colonum*	*A.* spp.	Total weeds
	season 2013					2014 season				
bispyribac-sodium	2608 a	52 b	102	6	2768 b	1832 b	474 ab	39	0.0	2345 b
penoxsulam	2406 ab	32 b	100	0.0	2538 b	1741 bc	519 ab	119	0.0	2371 b
penoxsulam (1.6%)+ triclopyr (12%)	1552 ab	86 b	326	17	1971 d	1138 bc	150 b	128	17	1433 c
Hand weeding	1007 b	1114 a	0.0	8	2129 c	913 c	409ab	0.0	24	1346 c
Untreated check	3020 a	373 ab	0.0	0.0	a 3393	3015a	626 a	50.0	0.0	3691 a

Means followed by the same letter, within each column, are not significantly different according to Waller-Du ratio t test, 0.05level.

From Figure (1) it was observed that bispyribac- sodium, penoxsulam 13.6% and penoxsulam (1.6%)+ triclopyr (12%) decreased fresh weight of total weeds by 19, 25 and 42 in the first season, and 36, 35and 61% in the second season. Grain yield was 3.46, 3.14, 3.02, 3.11, 2.95 and 3.15 (tons/faddan), in the two seasons, respectively, but, hand-weeding twice, thirty and forty five days from sowing decreased fresh weight of total weeds to 8.94 and 5.65, and grains yield to 2.63 and 2.68 (tons/faddan), in the two seasons, respectively.

2- The interactions:

2-1)- Effect of interaction between water depths x two rice cultivars:

2 -1)- 1 On weeds

The effect of interaction between water depth and rice cultivars treatments was not statistically significant on various fresh weight (g/m^2) of weed species in rice field; namely, *E. crus-galli*, C. difformis, *E. colonum, A.* spp. and total weeds in the two seasons. This means that the factors independently acted and the result did not discuss weed flora composition (Drost and Moody, 1982 and Anwar *et al.*, 2010).

2 -1)- 2 On rice:

Data presented in Table (10) showed that the effect of interaction between water depths x rice cultivars treatments were statistically significant on plant height, flag leaf area and water use productivity (kg/m^3) in both seasons and, grain yield (ton/ faddan) in the first season, and on straw yield in 2014 season. But the interaction was not no significant on panicle length in the two seasons. Plant height increased with shallow water depth of 3cm with Orabe2 cultivar in both seasons, but, grains yield increased with water depth of 3cm x Orabe2 during 2013 season, in comparison with the other treatments.

Flag leaf area increased with shallow depth of 3cm x Orabe2, and water depth of Giza 178 during 2014 by 59 and 47% durin and 2014 seasons, respectively, compare water depth of 7cm x Orabe 2. The inte between water depth of 3 cm x Giza 178 and depth of 7 cm x Orabe 2 recorded an in panicle length up to 19.97 and 19.49 (cm^2) the second season. Grain yield increase water depths of 3 cm x Orabe 2, water dep cm x Orabe 2 and water depth of 3 cm x Gi up to 3.10, 2.98 and 2.83 (ton/ faddan) durin season.

Concerning the effect of interaction b water depths x two rice cultivars on stra recorded high increase with water depth of Orabe 2. On the other hand, the percentage o yield/ grain yield ratio increased with water o 7 cm x Orabe 2 and water depth of 7 cm x C up to 1.33 and 1.31 % in the first season. Thi that the two rice cultivars (Giza 178 and C can be grown with water depth of 3 c irrigation each four days and did not cause ar on rice plant and its potential yield.

2-2)- Interaction between water depths x control treatments:

2 -2)-1 On weeds:

Data presented in Table (11) showed th effect of interaction between water depth and control treatments on fresh weight of weeds s (g/m^2), under this study; namely, *E. crus-ga difformis*, *E. colonum*, *A.* spp., and total weight (g/ m^2) was not statistically sign during the two seasons. This means th interaction between the two studies factors b in a similar manner under each other.

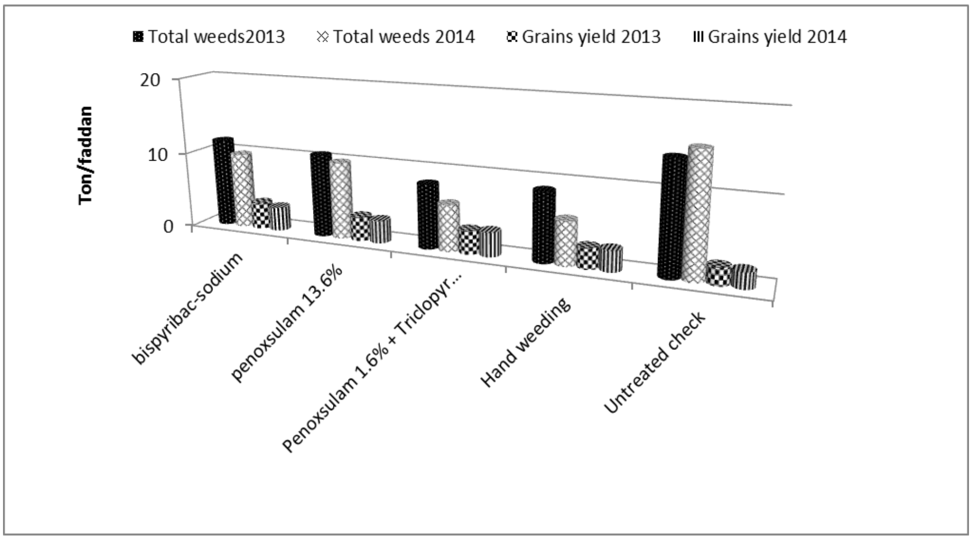

Fig. 1: The relationship between the effect of weed control treatments on total weeds and grai (ton/faddan) during 2013 and 2014 summer seasons.

Table 9: Effect of interactions between, water depth x rice cultivars on weeds during 2013 an summer seasons.

Treatments		***E.crus-galli***	***C.difformis***	***E. colonum***	***A.* spp.**	**Total weeds**	***E.crus-galli***	***C.difformis***	***E. colonum***	***A.* spp.**	**Total weeds**
		season 2013					2014 season				
3cm	G.178	2140	360	284	0.0	2784	1514	704	221	5.0	2444
	Orabe2	1832	417	82	20	2351	2145	700	0.0	26	2871
7cm	G.178	2067	18	56	0.0	2141	1124	79	48	2.0	1253
	Orabe2	2435	532	0.0	5.0	2972	2129	260	0.0	0.0	2389

2 -2)-2 On rice:

Data presented in Table (12) noticed that the effect of interactions between water depths of 3cm and 7cm on flag leaf area, panicle length, rice grain and straw yields were statistically significant, in 2013 season, and water use productivity (kg/m^3) during the two seasons, where the rest of characters in 2013, and all studied character, in 2014 season, did not arrive to the level of significance where bispyribac-sodium recorded 8.5 and 10% increase in plant height, but, the interaction between water depth of 3cm x penoxsulam (13.6%) and penoxsulam (1.6%) + triclopyr (12%) gave increased flag leaf area (cm^2) by 18.5 and 8.65%, in the first season, respectively, compared to the untreated check x water depth of 3cm. Phogat *et al.* (1999), also, reported that water regimes significantly increased grain yield under herbicide treatments.

On the other hand, the interaction b depth water x weed control treatments clarifi water depth of 3cm x bispyribac-s penoxsulam (13.6%) and penoxsulam (1. triclopyr (12%) recorded WP values of 1.4 and 1.37, in the first season, and 1.70, 1. 1.34, in the second season, respectively, b untreated check x water depth of 7 cm gave of 0.53 and 0.55, during the two the s respectively.

2 -3)- Between two rice cultivars x weed treatments:

2 -3)-1 On weeds:

It was noticed from Table (13) that the of interaction between two rice cultivars x control treatments was not statistically sign on fresh weight of *E. crus-galli, E. colon difformis, A.* spp. and total weeds (g/m^2) in t seasons. This mean that the weed treatments behaved in a similar manner und 3 or 7 cm water regimes.

2-3)-2: On rice:

Table (14) indicated that the grain yield increases, generally, were higher when the weed control treatments were more efficient to weed control under the effected interaction between two rice cultivars and weed control treatments. Meanwhile, the effect of the interaction between, rice cultivars and weed control treatments did not arrive to the level of significance in both season, but, the effect of such interaction was highly significant on plant height in the first season, flag leaf area (cm^2) in the second season and water use productivity (kg/m^3) during the two seasons.

The interaction between Orabe 2 cultivar and bispyribac-sodium and penoxsulam (13.6%) recorded 4 and 1.3% increase in plant height, in the first season, but, Orabe 2 x bispyribac-sodium and penoxsulam (1.6%)+ triclopyr (12%) increased plant height up to,14 and 9.8%, in the second season, respectively, compared to the untreated check x Giza 178. The interaction between Orabe 2 cultivar and bispyribac-sodium and penoxsulam (1.6%)+ triclopyr (12%) recorded an increase in flag leaf area(cm^2) up to 60 and 59.5%, in the second season, respectively, compared to the untreated check x Giza178.

2 -4)- Between water depths, two rice cultivars and weed control treatments:

2 -4)1- On weeds:

Data presented in Table 15 showed that the effect of the mentioned interaction caused highly significant differences among fresh weight of *E. crus-galli* and *C. difformis* (g/faddan) in the first season, and among fresh weight of *E. crus-galli* and total weeds (g/faddan) in the second season. The interaction between water depth of 3cm x Orabe2 x penoxsulam (1.6%)+ triclopyr (12%), water depth of 3cm x Giza 178 x hand-weeding twice and water depth of 7cm x Giza 178 x hand-weeding decreased the fresh weight of *E. crus-galli* (g/m2) by 83, 79 and 78%, respectively, in the first season, but, water depth of 3cm x Giza 178 x hand-weeding twice, water depth of 7cm x Giza 178 x penoxsulam (1.6%)+ triclopyr (12%) and water depth of 7cm x Orabe 2 x hand-weeding twice decreased the fresh weight of *E. crus-galli* (g/m2) up to 87, 83 and 83%, respectively, compared with the untreated check x depth 3cm x Giza 178, in the second season. Concerning the interaction effect on fresh weight of the total weeds (g/faddan), water depth of 7cm x Giza 178 x penoxsulam (1.6%)+ triclopyr (12%), water depth of 7cm x Orabe 2 x hand-weeding twice and water depth of 3cm x Giza 178 x hand-weeding twice decreased the fresh weight of total weeds (g/m^2) up to 82, 77 and 76%, compared with the untreated check x depth 3cm x Giza 178, in the second season, respectively.

2 -4) 2- On rice:

Data presented in Table 16 showed that significant effects were obtained with plant flag leaf area and water use productivity during the two seasons, and panicle length 2014 season. The interaction between water of 7cm x Orabe2 x bispyribac-sodium, water of 3cm x Orabe2 x penoxsulam (13.6%) and depth of 3cm x Orabe2 x hand-weeding increased, plant height up to 17, 15 and 1 2013 season, respectively, but, the inte between water depth of 3cm x Orabe2x bisp sodium, water depth of 3cm x Orabe2 untreated-check and water depth of 3cm x G x bispyribac-sodium increased plant height 15, 15 and 13%, compared with the untreated x depth 3cm x Giza 178, in the second respectively. Besides, the interaction between depth of 7 cm x Orabe2 x bispyribac-sodium depth of 3 cm x Orabe2 x penoxsulam (13.6 water depth of 3 cm x Orabe2 x hand-w twice increased flag leaf area(cm^2) up to 46, 32%, in the first season, whereas, the inte between water depth of 3 cm x Ora penoxsulam (1.6%)+ triclopyr (12%), water of 7 cm x Orabe2 x penoxsulam (1.6%)+ tr (12%) and water depth of 3 cm x Giza penoxsulam (1.6%)+ triclopyr (12%), in flag leaf area(cm^2) up to 91, 69 and 62%, second season, respectively.

Panicle length was increased according interaction between water depth of at 3cm x x bispyribac-sodium, water depth of 3cm 178 x penoxsulam (1.6%)+ triclopyr (12% water depth of 7cm x Giza 178 x peno (1.6%)+ triclopyr 12 up to 9, 8 and 7%, second season, respectively.

From this study, it was noticed th untreated check treatments decreased grai from 28 to 64% with other herbicide trea and 28 to 66% with the interaction between depths x weed control treatments, and 26 t with interaction between the two rice cult weed control treatments, and 23 to 69% w interaction between water depths x tw cultivars x weed control treatments.

The interaction between water depths, t cultivars and weed control treatments, re larger value of WP than hand-weeding twi untreated check in the two seasons. Water d 3 cm x Orabe 2 x bispyribac-sodium, water d 3 cm x Giza 178 x bispyribac-sodium, wate of 3 cm x Orabe 2 x penoxsulam (1.6%)+ tr (12%), water depth of 3 cm x Orabe penoxsulam (13.6%), water depth of 3 cm 178 x penoxsulam (1.6%)+ triclopyr (12 water depth of 3 cm x Giza 178 x peno (13.6%) interaction recorded 1.76, 1.64, 1.49 1.33 and 1.27(WUE), in the first season,

but, water depth of 3 cm x Orabe 2 x bispyribac-sodium, water depth of 3 cm x Giza 178 x bispyribac-sodium, water depth of 3 cm x Giza 178 x penoxsulam (13.6%), water depth of 3 cm x Orabe 2 x penoxsulam (1.6%)+ triclopyr (12%), water depth of 3 cm x Giza 178 x penoxsulam (1.6%)+ triclopyr (12%) and water depth of 3 cm x Orabe 2 x penoxsulam (13.6%) interaction gave 1.44, 1.42, 1.38, 1.38, 1.36 and 1.27 WUE values in the second season, respectively. Hand-weeding twice and the untreated check recorded a reduction in WP in the two seasons than herbicides treatments.

Concerning the effect of herbicidal mixtures, causes it was found that it gave the best results to control weeds under this study; namely, *E. crus-gali* and *C. difformis* and this indicates the use of herbicidal mixture with a depth water of 7 cm with the tow rice cultivars. Herbicides use caused a high effect until 77.8 and 81.7% with the depth water.

The untreated check treatment increased the total weeds up to 12.95 tons/faddan than the herbicidal mixtures (penoxsulam (1.6%) + triclopyr 12), and decreased grain yield up to 1.06 tons/faddan in 2013 season and increased the total weeds up to 14.54 tons/faddan than the herbicidal mixture (penoxsulam (1.6%) + triclopyr 12), but decreased grain yield up to 1.44 tons/faddan in 2014 season. This means that each increase in total weeds up to 12.95 (tons/faddan) caused a decrease in grain yield up to 1.06 (ton/faddan) and each 12.22 k g weeds causes decrease 1 k g grain yield in first season and each 10.1 k g weeds caused a decrease of 1 k g grain yield in the second season.

Vegetative phase (plant height and flag leaf area) of plant growth from the beginning to generative and ripening phases will determine the yield level (straw yield and grain yield tons/faddan).

Productivity of rice depends on the interaction of various physiological and biological functions in plants. Higher filled grains/plant percentage is the indication of higher photosynthetic efficiency of plants cause higher grain yield.

CONCLUSIONS

It can be concluded that direct-seeded rice strongly suffered, from grassy weeds, as *Echinochloa spp*. and *Cyperus difformis* and some broadleaf weeds, as *Ammannia spp*. Weed infestation may decrease grain and straw yields (tons/faddan) until 35 and 36 percent. Under this study, such weeds can be managed by the use of reduced irrigation, following, herbicides and rice genotypes integration. On the other hand, both rice cultivars can reduce irrigation water till 3cm depth by 41 and 41 percent better than normal irrigation (7 cm) and save about 1533 and 1621 m^{-3}. The use of new selective herbicides, as falkon (ready-made mixture herbicides) can gave similar rice gra to hand-weeding and save irrigation water.

~~**1- Yield/ vine:**~~

~~Data in Table (1) clearly show that s clusters of Early sweet grapevines with GA_3 40 ppm or Sitofex at 2.5 to 10 ppm was signi effective in improving the yield relative to th treatment. The promotion on the yiel accompanied with increasing concentrations plant growth regulator. Using GA_3 at 10 to significantly preferable than using Sitofex a 10 ppm in improving the yield. A slig unsignificant promotion on the yield was at to increasing concentrations of GA_3 from 2 ppm and Sitofex from 5 to 10 ppm. The ma yield was produced on the vines that recei spray of GA_3 at 40 ppm but the best treatme economical point of view was the applica GA_3 at 20 ppm (since no measurable promo the yield was recorded between 20 and 40 GA_3). Under such promised treatment, yiel reached 13.6 and 14.0 kg during both s respectively. The control vines produced 9.1 kg during 2013 and 2014 seasons, respective percentage of increase on the yield application of GA_3 at 20 ppm over the treatment reached 49.5 and 45.8 % durir seasons, respectively. The beneficial effects on the yield might be attributed to their action on increasing cluster weight. The pro effects of GA_3 on the yield was supported results of Dimovska *et al*., (2011) and Abu and Salameh (2012) on different grapevine c~~

~~The results regarding the beneficial eff Sitofex on enhancing the yield are in harmo those obtained by Juan *et al*. (2009); Abdel *et al*., (2010) and Al- Obeed (2011).~~

~~**2- Harvesting date:**~~

~~It is clear from the data in Table (1) that and Sitofex treatments had significantly dela the harvesting date of Early Sweet grapevine than the control treatment. The degree of de on harvesting date was correlated to the incr the concentrations of both GA_3 and Sitofex GA_3 significantly delayed harvesting comparing with using Sitofex. Inc concentrations of GA_3 from 20 to 40 pp Sitofex form 5 to 10 ppm failed to show sig delay on harvesting date. A cons advancement on harvesting date was obser untreated vines the great delay on harvesti was observed on the vines that received GA ppm during both seasons. GA_3 and Sitofe shown by many authors to retard the rel ethylene and the disappearance of pigments chlorophylls and carotenoids and onest of r start. Also they were responsible for prolong maturity stages Nickell (1985). These regarding the delaying effect of GA_3 and Sit~~

harvesting date were in harmony with those obtained by Wassel *et al*., (2007), Kassem *et al*. (2011), Abu- Zahra and Salameh (2012) and Refaat *et al*. (2012).

3- Cluster weight and dimensions:

It is evident from the data in Table (1) that treating clusters with GA_3 at 10 to 40 ppm or Sitofex at 2.5 to 10 ppm was significantly accompanied with enhancing weight, length and width of cluster relative to the control treatment.

The promotion was significantly associated with increasing concentrations of GA_3 and Sitofex. Using GA_3 was significantly favourable than using Sitofex in this respect. The maximum values were recorded on the vines that received one spray of GA_3 at 40 ppm. Meaningless promotion was detected with increasing concentrations of GA_3 from 20 to 40 ppm and Sitofex from 5 to 10 ppm. The untreated vines produced the minimum values during both seasons. The positive action of GA_3 on cluster weight and dimensions might be attributed to its essential role on stimulating cell division and enlargement of cells, the water absorption and the biosynthesis of proteins which will lead to increase berry weight. Dimovska *et al*., (2011); Abu- Zahra and Salameh, (2012) and Dimovska *et al*., (2014).

The previous essential role of CPPU on cluster weight was attributed to its higher content of cytokinin when applied to plants (Nickell, 1985).

4- Shot berries %:

Data in Table (2) obviously reveal that percentage of shot berries in the clusters of Early Sweet grapevines was significantly controlled with spraying GA_3 at 10 to 40 ppm or Sitofex at 2.5 to 10 ppm relative to the check treatment. Using GA_3 was preferable than using Sitofex in reducing the percentages of shot berries. There was a gradual reduction on the percentage of shot berries with increasing concentrations of GA_3 and Sitofex. There was a slight reduction on such unfavourable phenomenon with increasing concentrations of GA_3 form 20 to 40 ppm and Sitofex from 5 to 10 ppm. The minimum values of shot berries (7.3 and 6.9 % during both seasons, respectively) were recorded on the clusters harvested from vines treated with GA_3 at 40 ppm. The maximum values of shot berries (12.0 & 12.5 %) during both seasons were recorded on the untreated vines during both seasons. The reducing effect of GA_3 on shot berries might be attributed to its important role on enhancing cell division and the biosynthesis of proteins Nickell, (1985). These results were supported by the results of wassel *et al*. (2007) and Abu Zahra and Salameh (2012).

5- Fruit quality:

Data in Tables (2, 3 & 4) clearly show that spraying clusters with GA3 at 10 to 40 ppm or Sitofex at 2.5 to 10 ppm significantly was accompanied with enhancing weight, long and equatorial of berry, total acidity%, pro and percentages of P, K and Mg and T. reducing sugars %, T.S.S. / acid an carotenoids relative to the check treatme effect either increase or decrease was as with increasing concentrations of each auxi GA_3 significantly changed these paramete using Sitofex. A slight effect was recorded quality parameters with increasing concentra GA_3 from 20 to 40 ppm and Sitofex from ppm. From economical point of view, t results with regard to fruit quality were o due to treating clusters with GA_3 at 2 Untreated vines produced unfavourable eff fruit quality. These results were true duri seasons. The effect of GA_3 on increasin weight and dimensions might be attribute effect in promoting cell division and enlarge cells, water uptake and the biosynthesis of Nickell (1985). These results were in conc with those obtained by Williams and Ayars and Dimovska *et al*., (2014).

The higher content of Sitofex from cy surly reflected on enhancing cell division elongation of berries Nickell (1985). These were in agreement with those obtained b Zahra (2013) and Retamales *et al*. (2015).

CONCLUSION

Treating Early Sweet grapevines once w average berries reached 6mm with GA_3 at was responsible for promoting yield an quality.

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الملخص العربى

تأثير عمق ماء الري واصناف الارز وبعض معاملات مكافحة الحشائش على الحشائش والارز البدار

~~رش حامض الجبريليك والسيتوفكس فى تحسين المحصول وجودة حبات العنب الايرلى سويت فى منطقة المنيا– مصر~~

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ت تجربتان حقليتان في صيف 2013 و2014 بمحطة البحوث الزراعية بالسرو – مركز البحوث الزراعية– مصر وذلك لدراسة تأثير عمق ماء الري واصناف الارز وبعض معاملات مبيدات الحشائش على نبات الارز المصاحبة له. شملت عشرين معاملة حيث تم وضع عمق الماء في القطع الرئيسية بينما الاصناف في القطع معاملات المبيدات في القطع تحت – الشقية فى أربع مكررات. ويمكن تلخيص أهم النتائج المتحصل عليها فيما

ت معاملات ارتفاع المياه 3 سم من سطح التربة زيادة معنوية في الوزن الكلى للحشائش و مساحة ورقة العلم الارز بمعدل . 31، 46، 30.5 &10.5% خلال عامي الدراسة وذلك بالمقارنة بارتفاع 7سم. بينما كان الاستفادة من المياه (انتاجية وحدة المياه من الارز البدار) 1.342، 0.765، 1.229 0.69 متر مكعب لكل كيلو جرام واحد محصول حبوب خلال عامي الدراسة و هذا يؤكد ان معدل الاستفادة من ه كان اعلى في حالة ارتفاع 3 سم عن 7 سم خلال موسمي 2013 و2014.

لسنه الثانية تحت الدراسة سجل الصنف جيزة 178 انخفاضاً في الوزن الغض للحشائش العريضة والحشائش ة ل 47 و30% الا ان الصنف "عرابي 2" سجل زيادة في مساحة ورقة العلم بنسبة 18%.

ستعمال مبيدات الحشائش المستعملة في هذه الدراسة وهي نوميني(بيسبيرياك صوديوم 2%) ورينبو (بينوكسلام 13%)) وفالكون (بينوكسلام (1.6%) & ترايكلوباير 12 %) الى انخفاض في الوزن الطازج للحشائش الكلية ضة وضيقة الاوراق) 36، 35 و61% بالمقارنة بمعاملة المقارنة في العام الثاني تحت الدراسة.

ادى التفاعل بين ارتفاع المياه (3سم و7 سم) ومادة "بيسبيريباك صوديوم 2%" الى زيادة في ارتفاع النبات 8.5 و 10%، الا ان التفاعل بين ارتفاع 3 سم للمياه ومادتي بينوكسلام (13.6%) وبينوكسلام (1.6%) & لوباير 12 % ادى الى زيادة مساحه ورقة العلم بلغت 18 و 8.65% خلال عام 2013 بالمقارنة بمعاملة رنة مع ارتفاع 3 سم.

لتفاعل بين ارتفاع المياه 7 سم × الصنف "جيزة 178" × مادة بينوكسلام (1.6%) وترايكلوباير 12 % الى في الوزن الكلى للحشائش بلغت 82 و76% لارتفاع النبات، بينما سجل التفاعل بين ارتفاع 3سم × عرابى2 بيريباك صوديوم 2% وجيزة 178 × بينوكسلام (1.6%) و ترايكلوباير 12% زيادة في طول الدالية بلغت 9 %، الا ان التفاعلات بين ارتفاع المياه 3 سم × عرابى 2 × بينوكسلام (1.6%) وترايكلوباير 12% ادى الى في مساحة ورقة العلم للأرز بلغت 91 و69% بالترتيب خلال العام الثاني تحت الدراسة بالمقارنة بمعاملة رنة، ارتفاع 3 سم و جيزة 178.

ستخلص من ذلك انه لزيادة انتاجية محصول الارز البدار و توفير المياه بالري المنتظم لعمق 3 سم من سطح ة والرش بمبيد فالكون أو النوميني أو رينبو كبدائل للنقاوة اليدوية عن الري العميق 7 سم مع توفير المياه بمقدار 15 و1621 متر مكعب للفدان وكذلك يتم توفير المياه بنسبة 41 و41 % من ماء الري المستخدم.

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