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Effect of Sowing Dates and Weed Control on Growth and Yield of Broadcasted-seeded Rice (Giza 179 cv)

El-Ghandor, A. M. A.; I. H. Abou El-Darag and S. S. M. Abd El-Naby
Rice Dept., Field Crop Research Institute, ARC, Giza, Egypt.

ABSTRACT

A field study was conducted during 2015 and 2016 seasons in Sakha experimental farm, Kafrelsheikh, Egypt to study the effect of sowing dates and weed control on growth and yield of broadcasted-seeded rice (Giza 179 cv). Three sowing dates viz., May 20th, May 30th and June 10th in individual experiments. Seven weed control treatments i.e., weedy check, Penoxsulam (2.5% OD) at 24 g.ai ha^{-1}, Bispyribac-sodium (2% SL) at 38 g.ai ha^{-1}, Fenoxaprop-p-ethyl (7.5% EW) at 63 g.ai ha^{-1}, Penoxsulam (2.5% OD) plus Azimsulfuron (50% WG) at 14 g.ai ha^{-1}, Bispyribac-sodium plus Azimsulfuron (50% WG) and Fenoxaprop-p-ethyl (7.5% EW) plus Azimsulfuron (50% WG), companied analysis was done for the three sowing dates. The results showed that rice sowing on May 20th reduced the highest number of tillers m^{-2} and total weeds dry weight while increased dry weight for rice, number of panicles m^{-2}, panicle weight, number of filled grains $panicle^{-1}$ and rice grain yield as compared to rice sowing on May 30th and June 10th. The application of Penoxsulam (2.5% OD) or Bispyribac-sodium (2% SL) mixed with Azimsulfuron (50 %WG) at recommended doses recorded the lowest number of weed tillers m^{-2}, total weeds dry weight and highest rice yields as compared to weedy check. The interaction between sowing date and weed control treatment was significant for number of tillers m^{-2}, total weeds dry weight, rice yield and its components. Sowing date May 20th with The mixture of Penoxsulam (2.5% OD) or Bispyribac-sodium (2% SL) mixed with Azimsulfuron (50% WG) recorded the lowest total weed characters, highest dry weight, number of panicles m^{-2} panicle weight, number of filled grain $panicle^{-1}$ and yield of broadcasted-seeded rice under this study conditions. ai= active ingredient ha. = Hectar

Keywords: Sowing dates,Weed control,Penoxsulam,Bispyribac-sodium,Fenoxaprop, Azimsulfuron,Total weeds,Rice grain yield.

INTRODUCTION

Rice (*Oryza sativa,* L.) is one of the most important cereal crops not only in Egypt but also all over the world, it is considered as the most important food for about the half of world population, contributing about 20% of cereal consumption. Moreover, it is the principle food of the majority of Egyptians. FAOSTAT (2014), stated that the Egyptian harvested area, total production, and productivity per feddan of paddy rice were 1,376,889 feddan, 5,467,392 tons and 3.99 tons, respectively.

Planting rice at the optimum time is very important for obtaining high yield and good quality panicles, Chauhan (2012). Delay in seeding increased yield losses of rice might be due to crop-weed competition and weather, Caton *et al.* (1999). The decreasing trend in the grain yield due to delayed seeding might be associated with significantly lower dry weight, number of panicles m^{-2}, number of filled grains $panicle^{-1}$ and grain yield, Mishri and Kailash (2005). Therefore, to improve the yield potential of direct-seed rice (DSR), optimum planting time needs to be precisely determined, Kathiresan and Manoharan (2002).

Rice faces multiple problems during its growth and development processes from sowing to maturity. Out of many problems viz., low plant population and presence of weeds in the field cause a great loss in the crop yield. Weeds share the plant in nutrition, water, land spaces, carry insect pests and diseases, lower quality of produce and sometimes causes complete failure of the main crop. So, it is imperative to look into the ways to control weeds, El-Ghandor (2013).

Weeds are one of the main constraints in Egyptian rice production, the major food crop of Egypt, as they contribute to great yield losses, if no weed control measures were applied, Hassan (2002). These losses were estimated as 40% in Bangladesh, Karim *et al*. (1998), 36-90% in Egypt, Hassan (1999) and 10-85% in general, Labrada, (2001).

Rice yield losses due to weed competition vary, depending on method of planting. The losses ranged from 14-93% in direct-seeded rice, 17-47% in transplanted rice, Ranjit (1997), and ranged from 40-80% in direct-sown rainfield upland rice, Thakur and Bassi (1994).

Weeds in DSR can be controlled by several methods which can be used in various sets of conditions keeping in view the socio-economic condition of growers and several other factors. Historically, hand-weeding was the most important method for weed removal in rice in Pakistan, Alam (1991); however, because of scarcity of agricultural workers, hand-weeding is not economical now, Farooq *et al.* (2011).

Chemical weed control is a commonly used, an easy, reliable, effective and economically viable method for controlling different weed species in DSR, Chandra *et al.* (1998). Several herbicides are registered and available commercially for weed control in rice and their application has increased rice yield by reducing crop-weed competition.

Weed management is a combination of several factors to reduce weed population, including time of planting, planting methods, land preparation, plant population, preventive weed control methods and chemical control, Smith (1993). Therefore, the objectives of this study were to evaluate the best seeding time, to determine the best weed control method and to evaluate the interaction effects of seeding time and weed control methods on growth and yield of broadcasted-seeded rice (Giza 179 cv) in DSR.

MATERALS AND METHODS

Six field experiments were conducted in the Experimental Field of Rice Research and Training Center (RRTC) Sakha, Kafr El-Shelkh, Egypt on broadcast-seeded rice during 2015 and 2016 growing seasons. The study aimed to explore the effect of

sowing dates and herbicide application on weed control, growth and yield of rice (Giza 179 cv) under broadcasting method. The plot area was 3x4 m^2 in both seasons. A random complete block design (RCBD) with four replications was used for each sowing date. Combined analysis was done for the three sowing dates according to Gomez and Gomez (1984). The results were statically analyzed and significance of treatment differences estimated through Duncan (1955) multiple range test.

Studied factors:

A – Three experiments including sowing dates:

1-May 20th. 2- May 30th.

3- June 10th.

B- Weed control treatments:

1-Weedy check. 2- Penoxsulam 2.5% OD (24 g. ai ha^{-1}).

3- Bispyribac-sodium 2% SL (38 g. ai ha^{-1}.).

4- Fenoxaprop-p-ethyl 7.5% EW (63 g. ai ha^{-1}.).

5- Penoxsulam 2.5% OD + Azimsulfuron 50% WG (24 +39 g. ai ha^{-1}.).

6- Bispyribac-sodium 2% SL + Azimsulfuron 50% WG (38 +39 g.ai ha^{-1}.).

7- Fenoxaprop 7.5% EW + Azimsulfuron 50% WG (63 +39 g. ai ha^{-1}.).

Rainbow (Penoxsulam 2.5% OD) alone or plus Gulliver (Azimsulfuron 50% WG) were applied at 15 days after sowing (DAS), while, Nominee (Bispyribac-sodium 2% SL) alone or plus Gulliver (Azimsulfuron 50% WG) were applied at 22 days after sowing (DAS) and Whipsuper (Fenoxaprop-p-ethyl 7.5% EW) alone or plus Gulliver (Azimsulfuron 50% WG) were applied at 35 days after sowing (DAS). All herbicide treatments were sprayed using Gloria sprayer as 5 liters capacity with a rate of water as 280 liter $hectar^{-1}$ on drained plots while, flooding was introduced 48 h after treatment. All fertilizer applications and other pest managements were applied as recommended in broadcast-seeded rice.

Sampling and recorded data:

A - Weed measurements:

The following data were recorded on weed characters at 55 days after herbicidal treatments (DAT) in broadcasted rice:

1-Number of tillers of total weeds m^{-2}: The average number of two random 1/4 m^{-2} (50 x 50 cm) were counted in each plot and number m^{-2} was recorded.

2- Dry weight of total weeds ($g.m^{-2}$): weed plants from random (50 x 50 cm) of each plot which were cleaned, weighed (without roots) as fresh weight and air dried for two days. The air dried samples were oven dried at 70 °C up to constant weight and the average weight was recorded as $g.m^{-2}$.

B - Rice growth measurements:

The following data were recorded on rice plants at 55 days after herbicidal treatments (DAT) in broadcasted rice:

Dry weight of rice plants ($g.m^{-2}$) : Rice plants from random (50 x 50 cm) of each plot which were cleaned, weighed (without roots) as fresh weight and air dried for two days. The air dried samples were oven dried at 70 °C up to constant weight and the average weight was recorded as $g.m^{-2}$.

C - Grain yield and its attributes:

At harvest, the following data on rice plants were recorded.

1- Number of panicles m^{-2}: The average number of two random 1/4 m^{-2} (50 x 50 cm) were counted in each plot and panicles m^{-2} was recorded.

2- Panicle weight (g): It was estimated by weighing ten random panicles per plot and their average was recorded.

3- Number of filled grains $panicle^{-1}$: Average number of filled grains of ten matured random panicles was recorded.

4- Grain yield (t ha^{-1}.): A guarded area of 6 m^2 were manually harvested, air dried and thrashed. Rice grain yield of each treatment was estimated, adjusted to 14 % moisture and converted into tons per hectare.

Statistical analysis:

Data of the each experiment were subjected to proper statistical analysis of variance, according to Snedecor and Cochran (1971). Duncan Multiple Range Test was used for comparisons among factor means.

RESULTS AND DISCUSSION

Weeds parameters

Effect of sowing dates and weed control treatments on weeds.

The recorded weeds species in broadcast-seeded rice plots during two seasons were: Grassy weeds including; a- *Echinochloa crus- galli* (barnyardgrass). b- *Echinochloa colona* (jungle rice) and c- *Cyperus difformis* (small flower). Data on total weed species only is shown.

Data on number of tillers m^{-2} and dry weights of total weeds ($g.m^{-2}$) as affected by sowing dates and weed control treatments in 2015 and 2016 seasons are presented in Table (1).

Number of tillers m^{-2} and dry weight of total weeds as shown in (Table 1) were significantly affected by sowing dates during the two seasons of study. The lowest values for number of tillers m^{-2} and dry weight of total weeds were recorded in early seeding date of rice (May 20th) as compared to late seeding dates (May 30th and June 10th). While, the highest values of tillers m^{-2} and dry weight of total weeds were recorded in the late seeding date of rice (Jun 10th) during two seasons of study. The decrease in number of tillers m^{-2} and dry weight of total weeds in early sowing time (May 20th) might be due to better conditions for crop to establish and overcome the weed and that led to improved seedling vigor, better growth, rapid and competitive ability of rice sowing on May 20th that reduced these characters of total weeds. On the other side, increase number of tillers m^{-2} and dry weight of total weeds in late sowing time (Jun 10th) might be due to more weed population and increased crop-weed competition. These results are in agreement with those pointed out by Bera *et al*. (2016), Mubeen *et al*. (2014), Longkumer and Singh (2013).

Table 1. Number of tillers m^{-2} and dry weights of total weeds (g. m^{-2}) as affected by sowing dates and weed control treatments in broadcast-seeded rice during 2015 and 2016 seasons.

Treatments	Rate (ai g . ha^{-1}.)	Number of tillers m^{-2}		Dry weight (g m^{-2})	
		2015	2016	2015	2016
A-Sowing dates:					
1- May 20th		110.3 c	97.7 c	36.01 c	21.19 c
2- May 30th		154.9 b	133.1 b	61.51 b	31.07 b
3- June 10th		324.0 a	268.0 a	110.29 a	44.10 a
F. test		**	**	**	**
B-Weed control:					
1- weedy check	-	538.7 a	457.3 a	227.18 a	130.28 a
2- Penoxsulam	24	205.3 d	172.0 d	48.72 c	21.27 c
3- Bispyribac-sodium	38	210.7 c	180.0 c	56.43 c	20.97 c
4- Fenoxaprop	63	241.3 b	213.3 b	87.01 b	32.40 b
5-Penoxsulam+Azimsulfuron	24 + 14	50.7 f	40.0 f	18.38 d	5.73 d
6-Bispyribac-odium+Azimsulfuron	38 + 14	54.6 f	42.7 f	16.29 d	5.86 d
7-Fenoxaprop+ Azimsulfuron	63 + 14	73.3 e	58.6 e	30.89 d	8.35 d
F. test	-	**	**	**	**
Interaction:					
AxB		**	**	**	**

**** indicate P < 0.01. In each column, means followed by a common letter are not significantly different at the 5% level according to DMRT. DAT= days after herbicidal treatment.**

All weed management treatments were effective in reducing number of tillers m^{-2} and dry weight of total weeds compared to weedy check in both seasons (Table 1). Application of Penoxsulam or Bispyribac-sodium mixed with Azimsulfuron recorded the lowest value of these characters as compared to weedy check which recorded the highest value for number of tillers m^{-2} and dry weight of total weeds in 2015 and 2016 seasons. Generally, no significant differences between application of Penoxsulam or Bispyribac-sodium as well as Fenoxaprop mixed with Azimsulfuron on dry weight of total weeds in 2015 and 2016 seasons. The reduction in number of tillers m^{-2} and dry weight of total weeds due to herbicidal application may be related to the herbicidal efficiency in inhibition germination and growth of weeds. These results are confirmed with those cited by Pal *et al*. (2009) and Hussain *et al*. (2008).

Effect of the interaction between sowing dates and weed control treatments on weeds.

The interaction between sowing dates and weed control treatments as shown in (Table 2) highly significantly affected both number of tillers and dry weight of total weeds in 2015 and 2016 seasons.

Table 2. Number of tillers m^{-2} and dry weight (g.m^{-2}) of total weeds as affected by the interaction between sowing dates and weed control treatment during 2015 and 2016 seasons.

Weed control treatments	Number of tillers m^{-2} Sowing dates					
	2015 season			2016 season		
	May 20th	May 30th	June 10th	May 20th	May 30th	June 10th
1-weedy check	308 e	412 b	896 a	292 d	372 b	708 a
2- Penoxsulam	112 ij	152 g	352 d	92 h	132 f	292 d
3-Bispyribac-sodium	120 i	160 g	352 d	100 h	140 f	300 d
4-Fenoxaprop	132 h	208 f	384 c	116 g	180 e	344 c
5-Penoxsulam + Azimsulfuron	24 n	40 m	88 k	20 l	28 kl	72 i
6-Bispyribac-sodium+Azimsulfuron	28 n	44 m	92 k	24 l	32 kl	72 i
7-Fenoxaprop + Azimsulfuron	48 m	68 l	104 j	40 jk	48 j	88 h
	Total dry weight (g.m^{-2})					
	2015 season			2016 season		
	May 20th	May 30th	June 10th	May 20th	May 30th	June 10th
1-weedy check	117.00 c	183.75 b	380.80 a	101.25 c	127.33 b	162.25 a
2- Penoxsulam	26.00 g-j	48.00 e-h	72.15 de	10.50 i	21.18 fg	32.13 e
3-Bispyribac-sodium	25.43 g-j	49.95 e-h	93.93 cd	15.25 ghi	21.53 fg	26.14 ef
4-Fenoxaprop	61.01 ef	94.43 cd	105.60 c	17.58 gh	31.45 e	48.16 d
5-Penoxsulam + Azimsulfuron	3.25 j	15.50 ij	36.40 f-i	0.00 k	3.00 jk	14.19 hi
6-Bispyribac-sodium+Azimsulfuron	4.25 j	17.75 hij	26.86 g-j	0.00 k	4.00 jk	13.58 hi
7-Fenoxaprop + Azimsulfuron	15.13 ij	21.25 hij	56.30 efg	3.80 jk	9.02 ij	12.24 hi

Means followed by a common letter within a season are not significantly different at 5% level, using Duncan's Multiple Range Test. DAT= days after herbicidal treatment.

All herbicide treatments under all sowing dates suppressed the values of number of tillers m^{-2} and dry weight of total weeds as compared with weedy check treatment during the two seasons. Application of Penoxsulam or Bispyribac-sodium mixed with Azimsulfuron when rice was seeded at May 20th significantly reduced number of tillers m^{-2} and dry weight of total weeds more than the other treatments of herbicides under other seeding dates in May 30th and June 10th during the two seasons. While, weedy check treatment gave the highest values of these characters when rice seeded at June 10th in 2015 and 2016 seasons.

The significant reduction of these characters might be due to the effect of chemical weed control on the germinated weeds and competitiveness ability of rice sown at May 20th that reduced these characters of total weeds. The obtained results are confirmed with those obtained by Ehsanullah *et al*. (2014).

Rice parameters

Effect of sowing dates and weed control treatments on yield and yield attributes.

Data on dry weight (g), number of panicles m^{-2} panicle weight (g), number of filled grain $panicle^{-1}$ and grain yield (t ha^{-1}) of rice as affected by sowing dates and weed control treatments in 2015 and 2016 seasons are presented in Table (3).

Dry weight, number of panicles m^{-2} panicle weight, number of filled grain $panicle^{-1}$ and grain yield of rice were greatly affected by sowing dates during two seasons of study. Seeding rice in early date (May 20th) recorded the highest value of these characters compared to late seeding (May 30th and June 10th) since they recorded the lowest value of these characters in both seasons. The highest values of these characters in case of sowing on May 20th was attributed due to the favorable environmental condition which enabled the plant to improve its growth and development as compared to other sowing dates (May 30th and June 10th). These results are similar to that of Rakesh and Sharma (2004) they indicated that seeding rice in early date resulted in significant increased in dry weight and number of panicles per meter square. Additionally, the increased rice grain yield under early sowing date is confirmed by the results obtained by Habibullah *et al*. (2007) and Longkumer and Singh (2013), they stated that increasing grain yield might be due to early sowing rice, more number of active tillers panicle weight and increase number of filled grain per panicle. These results are also confirmed with those cited by Iqbal *et al*. (2008) and Nadeem *et al*. (2010).

Table 3. **Panicle weight (g) number of filled grain $panicle^{-1}$ and grain yield (t ha^{-1}) of rice as affected by sowing dates and weed control treatment in 2015 and 2016 seasons.**

Weed control treatments	Rate (ai.g ha^{-1})	Rice dry weight (g m^{-2})	Rice number of panicles (m^{-2})	Panicle weight (g)	No. of filled grain $panicle^{-1}$	Grain yield (ton ha^{-1})
			2015 season			
A-Sowing dates:						
1- May 20th		977.79 a	484.0 a	2.36 a	93.93 a	8.52 a
2- May 30th		651.13 b	405.7 a	2.15 b	79.36 b	6.51 b
3- June 10th		556.61 c	297.2 b	1.93 c	72.96 c	5.97 c
F. test		**	**	**	**	**
B-Weed control:						
1- weedy check	-	285.36 f	198.7 e	1.64 e	61.42 e	3.13 f
2- Penoxsulam	24	741.28 c	384.0 c	2.08 c	80.17 c	7.01 c
3- Bispyribac-sodium	38	727.79 d	380.0 c	2.06 c	80.16 c	6.86 d
4- Fenoxaprop	63	563.40 e	308.0 d	1.96 d	74.67 d	6.28 e
5- Penoxsulam + Azimsulfuron	24+14	966.90 a	526.8 a	2.53 a	95.00 a	8.81 a
6-Bispyribac-sodium+Azimsulfuron	38 +14	964.53 a	522.8 a	2.49 a	94.67 a	8.82 a
7- Fenoxaprop + Azimsulfuron	63+14	850.28 b	449.3 b	2.26 b	88.50 b	8.10 b
F. test	-	**	**	**	**	**
Interaction:						
AxB		**	**	**	**	**
			2016 season			
A-Sowing dates:						
1- May 20th		1068.81 a	525.9 a	2.36 a	97.21 a	9.31 a
2- May 30th		882.68 b	458.3 b	2.11 b	89.35 b	7.77 b
3- June 10th		794.29 c	352.0 c	1.96 c	84.78 c	6.63 c
F. test		**	**	**	**	**
B-Weed control:						
1- weedy check	-	414.93 e	228.0 f	1.48 e	68.92 e	3.81 f
2- Penoxsulam	24	916.53 c	468.0 c	2.08 c	88.83 c	8.17 c
3- Bispyribac-sodium	38	917.94 c	460.0 d	2.09 c	88.75 c	7.61 d
4- Fenoxaprop	63	724.87 d	352.0 e	1.84 d	80.92 d	6.92 e
5- Penoxsulam + Azimsulfuron	22 +14	1202.33 a	562.8 a	2.63 a	103.50 a	9.99 a
6-Bispyribac-sodium+Azimsulfuron	38 +14	1152.04 a	556.3 a	2.52 a	103.75 a	9.91 a
7- Fenoxaprop + Azimsulfuron	63+14	1078.18b	490.7 b	2.36 b	98.50 b	8.91 b
F. test	-	**	**	**	**	**
Interaction:						
AxB		**	*	*	*	**

**** indicate P < 0.01. In each column, means followed by a common letter are not significantly different at the 5% level according to DMRT. DAT= days after herbicidal treatment.**

As for chemical weed control treatments, it is clear from the results in Table (3) that all chemical weed control significantly increased dry weight, number of panicles m^{-2} panicle weight, number of filled grain $panicle^{-1}$ and grain yield of rice than untreated check plots during the two seasons of study. The highest values of these characters were obtained with the application of Penoxsulam as well as Bispyribac-sodium mixtures with Azimsulfuron. On the other hand, weedy check plots gave the lowest dry weight, number of panicles m^{-2} panicle weight, number of filled grain $panicle^{-1}$ and grain yield of rice in 2015 and 2016

seasons. The increase in dry weight, number of panicles m^{-2} panicle weight, number of filled grain $panicle^{-1}$ and grain yield of rice using Penoxsulam, Bispyribac-sodium and Fenoxaprop mixtures with Azimsulfuron during both seasons of study may referred to the high efficiency of these treatments against weeds consequently, allowed rice plants to obtained all needs. Similar results were reported by Hassan *et al*. (2004), Hassan *et al.* (2005), Shebl *et al*. (2009) and RRTC (2005).

Effect of the interaction between sowing dates and weed control treatments on yield and yield attributes.

The interaction between sowing dates and weed control treatments significantly affected dry weight (g) and number of panicles m^{-2} of rice in 2015 and 2016 seasons (Table 4).

Data in Table (4) showed that all herbicide treatments under all sowing dates produced dry weight and number of panicles m^{-2} of rice significantly more than those recorded by the untreated pots during the two seasons of study. Application of Penoxsulam as well as Bispyribac-sodium in mixture with Azimsulfuron under early sowing dates (May 20th) recorded the highest values of dry weight and number of panicles m^{-2} of rice. The same trend was observed in 2015 and 2016 seasons. On the other hand, the lowest value of dry weight and number of panicles m^{-2} of rice were produced from weedy check plots under late seeding date of rice (June 10th) in first and second season. Generally, no significant differences between seeding rice in May 30th and June 10th under weedy check for dry weight of rice in 2016 season and number of panicles m^{-2} in 2015 season**.**

The increase in dry weight, number of panicles m^{-2} panicle weight, number of filled grain $panicle^{-1}$ and grain yield of rice by using Penoxsulam as well as Bispyribac-sodium in mixture with Azimsulfuron during both seasons of study may be due to the efficiency of herbicide which, decreased weed population in early growth stages under seeding rice in may 20th, consequently gave the rice plant a good chance for growing healthy and increased the dry weight, number of panicles m^{-2} panicle weight, number of filled grain $panicle^{-1}$ and grain yield of rice. These results are confirmed by Hassan *et al*. (2004), Longhumer and Singh (2013).

Table 4. Rice dry weight ($g.m^{-2}$) and number of panicles m^{-2} of rice as affected by the interaction between sowing dates and weed control treatment during 2015 and 2016 seasons

Weed control treatment	Rice dry weight ($g.m^{-2}$) Sowing date					
	2015 season			2016 season		
	May 20th	May 30th	June 10th	May 20th	May 30th	June 10th
1-weedy check	377.00 l	271.78 m	207.30 n	494.95 f	394.25 g	355.58 g
2- Penoxsulam	972.63 c	705.28 h	545.30 i	1049.50 c	906.05 d	794.05 e
3-Bispyribac-sodium	885.85 d	745.48 f	550.05 i	1039.25 c	905.50 d	809.08 e
4-Fenoxaprop	802.50 e	485.18 j	402.53 k	910.00 d	716.23 e	548.38 f
5-Penoxsulam + Azimsulfuron	1343.58 a	814.38 e	742.75 f	1400.40 a	1177.50 b	1029.08 c
6-Bispyribac-sodium+Azimsulfuron	1341.00 a	811.38 e	741.23 f	1383.43 a	1050.85 c	1021.85 c
7-Fenoxaprop + Azimsulfuron	1121.95 b	722.45 g	706.45 gh	1204.13 b	1028.38 c	1002.03 c
	Number of panicles m^{-2}					
	2015 season			2016 season		
	May 20th	May 30th	June 10th	May 20th	May 30th	June 10th
1-weedy check	228.0 j	188.0 k	180.0 k	280 k	252 l	152 m
2- Penoxsulam	456.0 d	388.0 e	308.0 h	552 d	460 f	392 hi
3-Bispyribac-sodium	452.0 d	380.0 ef	308.0 h	540 d	452 f	388 i
4-Fenoxaprop	372.0 fg	304.0 h	248.0 i	404 h	368 j	284 k
5-Penoxsulam + Azimsulfuron	652.0 a	564.0 c	364.3 g	668.5 a	588 b	432 g
6-Bispyribac-sodium+Azimsulfuron	648.0 a	560.0 c	360.3 g	665 a	584 bc	420 g
7-Fenoxaprop + Azimsulfuron	580.0 b	456.0 d	312.0 h	572 c	504 e	396 hi

Means followed by a common letter within a season are not significantly different at 5% level, using Duncan's Multiple Range Test. DAT= days after herbicidal treatment.

Panicle weight, number of filled grain $panicle^{-1}$ and grain yield of rice as affected by the interaction between sowing dates and weed control treatments in 2015 and 2016 seasons are given in Table (5).

Seeding rice in May 20th under all chemical treatments resulted in significantly heavier Panicle weight, higher number of filled grain $panicle^{-1}$ and more grain yield of rice than those produced by untreated plots. Spraying of Penoxsulam as well as Bispyribac-sodium in mixtures with Azimsulfuron under planted rice in May 20th achieved the highest values of these characters during the two seasons of study. While the same result was obtained by Penoxsulam in mixture with Azimsulfuron under planted rice in May 30th on panicle weight in 2016 season. While, weedy check under the late seeding rice (June 10th) recorded the lowest values of these characters during the two seasons of study. No significant differences between Seeding rice in May 30th and June 10th under weedy check on number of filled grain $panicle^{-1}$ in 2016 season. Such increase of these characters may be attributed of high in controlling weeds species under early sowing date (May 20th), consequently better rice production due to favorable environment with decreased crop-weed competition at early growth stages of the crop growth as reported by Ehsanullah *et al*. (2014).

Table 5. Panicle weight (g), number of filled grain panicle^{-1} and grain yield (t ha^{-1}) of rice as affected by the interaction between sowing dates and weed control treatment during 2015 and 2016 seasons.

Weed control treatment	Panicle weight (g) Sowing date					
	2015 season			2016 season		
	May 20th	May 30th	June 10th	May 20th	May 30th	June 10th
1-weedy check	1.91 i	1.75 j	1.25 k	1.71 h	1.39 ij	1.32 j
2- Penoxsulam	2.29 de	2.19 fg	1.75 j	2.42 bc	2.08 def	1.75 h
3-Bispyribac-sodium	2.24 ef	2.11 gh	1.82 j	2.30 b-e	2.20 cde	1.78 fgh
4-Fenoxaprop	2.09 gh	2.02 h	1.78 j	2.03 efg	1.63 hi	1.87 bc
5-Penoxsulam + Azimsulfuron	2.74 a	2.43 c	2.44 bc	2.77 a	2.71 a	2.43 bc
6-Bispyribac-sodium+Azimsulfuron	2.73 a	2.36 cd	2.38 cd	2.76 a	2.37 bc	2.43 bc
7-Fenoxaprop + Azimsulfuron	2.54 b	2.18 gh	2.08 gh	2.59 ab	2.36 bcd	2.14 bc
	Number of filled grain panicle^{-1}					
	2015 season			2016 season		
	May 20th	May 30th	June 10th	May 20th	May 30th	June 10th
1-weedy check	71.5 g	60.5 i	52.2 j	73.8 h	68.5 i	64.5 i
2- Penoxsulam	91.8 c	77.0 f	71.8 g	95.0 be	87.3 f	84.3 fg
3-Bispyribac-sodium	94.5 c	75.0 f	71.0 g	93.8 e	87.3 f	85.3 fg
4-Fenoxaprop	86.8 d	72.3 g	65.0 h	88.2 f	81.5 g	73.0 h
5-Penoxsulam + Azimsulfuron	106.8 a	92.8 c	85.5 d	113.3 a	101.5 bc	95.8 de
6-Bispyribac-sodium+Azimsulfuron	105.5 a	93.3 c	85.3 d	112.3 a	100.8 bc	98.2 cd
7-Fenoxaprop + Azimsulfuron	100.8 b	84.8 d	80.0 e	104.3 b	98.8 cd	92.5 e
	Grain yield (t ha^{-1})					
	2015 season			2016 season		
	May 20th	May 30th	June 10th	May 20th	May 30th	June 10th
1-weedy check	4.62 m	2.51 n	2.26 o	5.48 l	3.09 n	2.86 o
2- Penoxsulam	8.41 c	6.71 h	5.88 k	9.16 d	7.95 g	7.39 i
3-Bispyribac-sodium	8.37 c	6.28 i	5.94 jk	9.10 d	7.78 h	5.96 k
4-Fenoxaprop	7.61 f	6.03 j	5.21 l	8.48 f	7.09 j	5.19 m
5-Penoxsulam + Azimsulfuron	10.78 a	8.13 d	7.54 f	11.62 a	9.78 b	8.58 ef
6-Bispyribac-sodium+Azimsulfuron	10.71 a	8.16 d	7.58 f	11.53 a	9.51 c	8.68 e
7-Fenoxaprop + Azimsulfuron	9.16 b	7.79 e	7.35 g	9.78 b	9.23 d	7.73 h

Means followed by a common letter within a season are not significantly different at 5% level, using Duncan's Multiple Range Test. DAT= days after herbicidal treatment.

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تأثير مواعيد الزراعة ومعاملات مكافحه الحشائش علي نمو ومحصول الأرز البدار (صنف جيزة ١٧٩)

أحمد مصطفي أحمد الغندور، إبراهيم حمدي أبوالدرج و صبري صبحي محمد عبدالنبي

قسم بحوث الأرز، معهد بحوث المحاصيل الحقلية، مركز البحوث الزراعية، الجيزة، مصر

أقيمت دراسة حقليه بالمزرعة البحثية بسخا – كفرالشيخ – جمهوريه مصر العربية خلال الموسم الصيفي لعامي ٢٠١٥ - ٢٠١٦ م بهدف دراسة تأثير مواعيد الزراعة ومعاملات مكافحه الحشائش علي نمو ومحصول الأرز البدار (الصنف جيزة ١٧٩). تم تقييم ثلاث مواعيد زراعه (٢٠ مايو ، ٣٠ مايو ، ١٠ يونيو) في تجارب مستقله وسبع معاملات لمكافحه الحشائش (غير المعامل ، بينوكسيولام ٢.٥% بمعدل ٢٤ جم ماده فعاله/هكتار ، بيسبريباك صوديوم ٢% بمعدل ٣٨ جم ماده فعاله/هكتار ، فينوكسابروب ايثيل ٧.٥% بمعدل ٦٣ جم ماده فعاله/هكتار ، بينوكسيولام بمعدل ٢٤ جم مع ازيمسلفيورون ٥٠% بمعدل ١٤ جم ماده فعاله/هكتار ، بيسبريباك صوديوم بمعدل ٣٨ جم مع ازيمسلفيورون بمعدل ١٤جم ماده فعاله/هكتار ، فينوكسابروب ايثيل بمعدل ٦٣ جم مع ازيمسلفيورون بمعدل ١٤جم ماده فعاله/هكتار وتم عمل التحليل التجميعي للثلاث تجارب. أوضحت النتائج أن زراعه الأرز في ٢٠ مايو أدت إلي انخفاض عدد الأفرع و الوزن الجاف للحشائش الكلية وزيادة في الوزن الجاف , عدد السنابل , وزن السنبلة , عدد الحبوب الممتلئة في السنبلة ومحصول حبوب الأرز مقارنه بغير المعامل. كما أوضحت النتائج أن استخدام مبيدي بينوكسيولام بمعدل ٢٤ جم أو بيسبريباك صوديوم بمعدل ٣٨ جم مخلوطين مع مبيد أزيمسلفيورون بمعدل ١٤جم ماده فعاله/هكتار أدي إلي إنخفاض عدد الأفرع و الوزن الجاف للحشائش الكلية وزيادة في محصول الحبوب ومكوناته مقارنه بغير المعامل. كما أظهرت النتائج أيضاً أن هناك تأثيرا معنوياً للتفاعل بين مواعيد الزراعة ومعاملات مكافحه الحشائش علي صفه عدد الأفرع والوزن الجاف للحشائش الكلية وكذلك المحصول ومكوناته حيث كانت أفضل المعاملات هي زراعه الأرز في ٢٠ مايو مع استخدام مبيدي الحشائش بينوكسيولام بمعدل ٢٤ حم أو بيسبريباك صوديوم بمعدل ٣٨ جم مخلوطين مع مبيد أزيمسلفيورون بمعدل ١٤جم ماده فعاله/هكتار تحت ظروف التجربة.