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Weed Management in Transplanted Rice (*Oryza sativa* L.)

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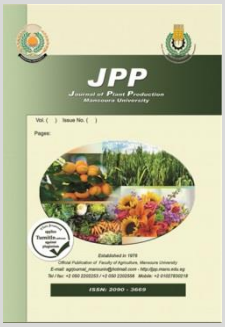

ABSTRACT

A field study was conducted during 2021 and 2022 seasons at Sakha Agricultural Research Station, Kafr Elsheikh, Egypt to investigate the management of accompanied weeds to Sakha 109 new released rice cultivar under transplanting cultivation. Six weed management treatments included thiobencarb 50% (2.38 kg ai ha^{-1}) (W_1), ready-made of penoxsulam 1.6% (0.0343 kg ai ha^{-1}) + triclopyr-butotyl 12% (0.257 kg ai ha^{-1}) (W_2), penoxsulam 24% (0.0286 kg ai ha^{-1}) (W_3), hand weeding twice at 20 and 40 days after transplanting (W_4), Un-treated plots (W_5) and weed free (W_6) were randomly tested in Randomized Complete Block Design with three replications. Results showed that W_2 as ready-made herbicide surpassed other chemical and manual control treatments and achieved the highest reduction in dry weights of grasses, sedges, broad-leaf weeds (BLW) and total weeds in addition to the highest values of weed control efficiency (WCE) for grasses, sedges, BLW and total weeds in both seasons. While, the highest dry biomass of rice, grain yield and its attributes of rice were obtained by W_2 in both seasons, moreover reduced yield losses in both seasons. The lowest rice dry weight, yield attributes and grain yield of rice were recorded under weedy check treatments in 2021 and 2022 seasons, in addition to lowest WCE and highest yield losses in both seasons. Based on obtained results under transplanted rice, it could be concluded that using ready-made of penoxsulam + triclopyr-butotyl at recommended doses achieved the best weed control, minimize yield losses and improve rice grain yield.

Keywords: Rice, weeds, transplanting, chemical control

INTRODUCTION

Among cereal crops, rice (*Oryza sativa* L.) is the main food for more than two billions and four millions population in Asia and Africa, respectively (IRRI, 2006). It is considered stable food for about 60% of world's populations (FAO, 2006). In Egypt, rice is the main cereal crop during summer season, the cultivated area was 1.13 million feddan (474,494 ha) as reported by FAOSTAT, 2021 distributed mainly in eight governorates (Kafr Elsheikh, Sharkia, Gharbia, Dakahlia, Behira, Damietta, Port said and Ismailia) moreover, Alexandria and new valley (high temperature) governorates started rice cultivation in the latest few years as reclamation crop to improve soil characters. Rice saves many features for farmers and Egyptian economy, in addition to facing salt desertification in wide area beside Mediterranean Sea especially in Kafrelsheikh, Damietta and Port Said Governorates.

Transplanting cultivation is the traditional method for rice planting not only in Egypt but also in most countries which cultivate rice because of its higher productivity (Tomar *et al*., 2019). Transplanting method keep permanent field empty of plants for about one month except for nursery area, moreover transplanted rice is more competitiveness against weeds than direct-seeded rice because of the difference in seedling age for rice and germinated weeds in permanent field for at least one month which help farmers to easily differentiate and remove any weeds and off types in the field between rice hills, in addition to give more choices for integrated weed management (Pandey and Velasco, 1999). On the opposite, transplanting method faces many obstacles such as the high cost for transplanting process and water flooding which increase the amount of irrigation water consequently decreases water productivity as compared to direct seeded rice (Chen *et al*., 2017).

Weeds as desirable and un-wanted plants is the main enemy for rice plants, it is depleting water, nutrients from the soil and decrease the benefits of sun light which plays a main role in photosynthesis process, moreover it is compete with rice plants on space which resulted in a huge yield reduction and economic losses in rice production system. Parthipan and Ravi, (2016) concluded that most of efforts to develop agricultural practices and improve rice grain yield around the world failed because of poor weed management programs. Weed flora in Egypt becomes huge and different, it is including many weeds belong to Poaceae, Cyperacea, Convolvulaceae, Composite and others. The dominant weeds under transplanting conditions are Poaceae especially *Echinochloa crus-galli* and *Echinochloa colona*, Cyperacea including *Cyperus difformis* and *C. rotundus* in addition to broad leaf weeds such as *Eclipta* sp. and *Ammannia* sp. Tomar *et al*., (2019) found that weed flora in transplanted rice almost include grassy weeds, sedges and broad-leaf weeds, this weeds complex reduced rice grain yield by 76%. Sustainable weed management is mainly depending on herbicides especially under reverse conditions such as water shortage and climatic changes which help weeds to be more aggressive and very hard. Herbicides as the basic defines line in rice production system help farmers on killing different weed spices and wide spectrum in the same time. Herbicides which contain more than one active ingredient differed at mode and site of action achieve a high weed control and sustainable management. (Abd El-Naby *et al*., 2023). The main target of this study is to obtain the best weed control for Sakha 109 as a new released rice cultivar under transplanting method.

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MATERIALS AND METHODS

In 2021 and 2022 seasons, a field investigation was carried out at the Experimental Farm of Rice Research and Training Center (RRTC), Sakha Agricultural Research Station, Kafrelsheikh Governorate, Egypt to study the management of accompanied weeds to Sakha 109 new released rice cultivar (2020) under traditional transplanting cultivation. Randomized Complete Block Design (RCBD) in three replicates was used in this study with plot area of 16 m^2 (4 m x 4m) during both seasons of study. The source of Sakha 109 breeder seed was breeding program in RRTC. Sowing date of nursery was on 5th and 12th May through 2021 and 2022, respectively then transplanting at permanent field was done at 25 days seedling age. The rest agricultural practices for transplanted rice were done as recommended according to RRTC, 2020 recommendations. The pedigree, year of released, type, duration, plant height and milling percentage of Sakha 109 are shown in Table 1.

Table 1. Sakha 109 pedigree, year of released, type, duration, plant height and milling percentage.

Sakha 109 new released rice cultivar	
Pedigree	Sakha 101 x Sakha 105
Year released	2020
Type	Japonica (bold grain)
Duration	125 days
Plant height	100 cm
Milling (%)	72

- Tested weed management treatments were as follow:

1- Saturn 50% EC (thiobencarb) at the rate of 2.38 kg ai ha^{-1}) applied at 4 days after transplanting (DAT).
2- Pindar 13.6% OD (as ready mix of penoxsulam 1.6 % + triclopyr butotyl 12%) at the rate of 0.0343 + 0.0257 kg ai ha^{-1} applied at 15 DAT.
3- Granite 24% SC (penoxsulam) at the rate of 0.0286 kg ai ha^{-1} applied at 15 DAT.
4- Hand weeding twice (at 20 and 40 DAT).
5- Un-treated (Weedy check).
6- Weed free (weeded by hand after transplanting every two weeks along the growing season).

- Methods of herbicides application:

Saturn 50% EC was homogenously mixed with sand then broadcasted in the flooded field and kept the field flooded by water for three days after treatment, while Pindar 13.6% OD and Granite 24% SC were sprayed using knapsack sprayer in 300 liter water ha^{-1} on saturated land, then the field was flush irrigated after 24 hrs from herbicidal treatments. The studied herbicide characters, trade name, active ingredient (ai), rate fed^{-1}., rate kg ai ha^{-1}, chemical group, molecular formula, site of action and target weeds are presented in Table 2.

- Sampling and data record:

a- Weed data collection:

After 30 days from herbicidal treatment, weeds samples were collected from each plot by frame (0.5 mx 0.5 m) quadrate replicated four times, then separated and classified into three categories (grasses, sedges and broad leaf weeds), all weed samples air dried, then dried in oven at 70 °C up to constant weight, then dry weights as g m^{-2} for every weed category was recorded, data for total weeds were calculated as summation of individual weeds during two seasons of study.

Studied traits:

A- **Studied traits of weeds**

1- Dry weight (g m^{-2}).
2- Weed control efficiency (WCE %) according to Drost and Moody, 1982.

Table 2. Studied herbicide characters, trade name, active ingredient (ai), rate fed^{-1}., rate kg ai ha^{-1}, chemical group, molecular formula, site of action and target weeds.

Herbicide trade name	Active ingredient (ai)	Rate fed^{-1}	Rate (Kg ai ha^{-1})	Chemical group	Molecular formula	Site of Action	Target weeds
Saturn 50% EC	Thiobencarb	2 litter	2.38	Thiocarbamate	$C_{12}H_{16}ClNOS$	Systemic – photosynthesis inhibitors	Grasses + *C. diffformis*
Pindar 13.6% OD	Penoxsulam	900 ml.	0.0343	Triazolopyrimidine	$C_{16}H_{14}F_5N_5O_5S$	Systemic – ALS inhibitors	Grasses + broad leaves + *C. diffformis*
	Triclopyr-butotyl		0.257	Pyridine carboxylic	$C_{13}H_{16}Cl_3NO_4$	Systemic – synthetic auxin herbicide	Broad-leaf weeds
Granite 24% SC	**P**enoxsulam	50 ml.	0.286	Triazolopyrimidine	$C_{16}H_{14}F_5N_5O_5S$	Systemic – ALS inhibitors	Grasses + broad leaves + *C. diffformis*

Fed. = feddan (4200 m^2), ha = hectare (10000 m^2), kg = kilo gram, ALS = acetolactate synthase

B- Studied traits of rice:

Dry matter of rice (g m^{-2}) was estimated as done with weed samples (at 30 days after herbicidal treatment). Rice number of productive tillers m^{-2} were counted in two random quadrats (0.5 m x 0.5 m) then the main was calculated and recorded as number of panicles per square meter. After rice maturity, ten rice panicles were sampled to determine panicle weight (g), panicle length (cm), 1000-grain weight (g), number of filled grains per panicle and their average was recorded. Six square meters from the center of each plot were harvested rice plants and grain yield was converted at 14% moisture content then recoded as tons per hectare.

Yield losses percentages were calculated by using the following formula:

$$\text{Yield losses (\%)} = \frac{Y_{\text{weed free}} - Y_{\text{treatment}}}{Y_{\text{weed free}}} \times 100$$

Statistical analysis

All data of the experiment were subjected to proper statistical variance analysis, according to Snedecor and Cochran, (1971). Data of weeds were analyzed statistically by program of MSTATC after transformed according to transformation of square-root ($\sqrt{[x + 0.5]}$). Data of rice were collected and directly analysis using program of MSTATC. Duncan´s Multiple Range Test (DMRT) according to Duncan, (1955) was used for comparison between the means of both weeds and rice characteristics.

RESULTS AND DISCUSSION

A- Weeds growth:

The current study was concentrate on accompanied weeds a new released rice cultivar (Sakha 109) belongs to Japonica type, dominant weeds were divided in to three

categories included (1) grassy weeds contained *E. colona* (jungle rice) and *E. crus-galli* (barnyard grass (2) sedges included *C. difformis* (small flower) and (3) broad-leaf weeds (BLW) contained *E. prostrate* and *A. baccifera* during both seasons of study. Total weeds dry matter gram per square meter and WCE % for each category were determined as true indicators for weed control treatments. All weeds in weed free plots were removed every two weeks along growing period, the results will be discussed as follow:

A- Effect on weeds:

Data in Tables 3 and 4 showed the influence of weed management on dry weight of target weeds accompanied transplanted rice during 2021 and 2022 seasons. As clear from data in Table 3, there were considerable differences among tested weed management treatments in 2021 and 2022 seasons, results revealed that chemical weed control achieved the best weed suppression and recorded the lowest values of dry weights for grasses, sedges and BLW as well as total weeds in 2021 and 2022 compared to hand weeding (two times). During both seasons of study ready mix of penoxsulam + triclopyr-butotyl sprayed at 15 DAT gave the lowest dry matter of grassy weeds, sedges, BLW and total weeds with no significant differences between penoxsulam 24% SC in dry weight of grasses in 2022 season, while hand weeding twice ranked fourth. While, un-treated pots recorded the highest values of weed species and total weeds through 2021 and 2022 seasons. Grassy weeds were dominant under current study (69.6 %), sedges ranked second (16.7 %) while BLW were 13.7 % as average for both seasons of investigation. Tomar *et al*., (2019) found that weed flora in transplanted rice almost include grassy weeds, sedges and broad-leaf weeds, this weeds complex reduced rice grain yield by 76%. The superiority of Pindar 13.6% OD as ready mix of penoxsulam as ALS inhibitor which control grasses and sedges (Jabusch and Tjeerdema., 2005), while triclopyr-butotyl as growth hormone which control BLW (Dias *et al.*, 2017) due to the different mode of action of the two active ingredients which achieve wide spectrum weed control without no harmful effects on rice plants. Mahajan and Chauhan (2008) found that penoxsulam application reduced weeds dry biomass by 90% compared with un-treated plots.

Table 3. Weed management effectiveness on dry weight (g m^{-2}) of grassy, sedges and broadleaves weeds in 2021 and 2022 seasons.

Weed management	Dry weight (gm^{-2})							
	Grasses		Sedges		Broadleaves		Total weeds	
	2021	2022	2021	2022	2021	2022	2021	2022
Thiobencarb 50%	110.1 (10.5 c)	91.6 (9.6 c)	60.1 (7.8 c)	51.6 (7.2 c)	64.3 (8.1 b)	53.8 (7.4 b)	234.5 (15.3 c)	196.9 (14.0 c)
Penoxsulam 1.6% + triclopyr-butotyl 12%	29.6 (5.5 e)	25.2 (5.1 d)	22.9 (4.9 e)	20.1 (4.5 e)	23.3 (4.9 d)	20.8 (4.6 c)	75.8 (8.7 e)	65.9 (8.2 e)
Penoxsulam 24%	44.1 (6.7 d)	38.2 (6.2 d)	39.4 (6.3 d)	33.4 (5.8 d)	43.5 (6.6 c)	39.2 (6.3 b)	127.0 (11.3 d)	110.7 (10.5 d)
Hand weeding	315.3 (17.7 b)	281.4 (16.8 b)	83.3 (9.2 b)	73.5 (8.6 b)	60.8 (7.8 bc)	55.6 (7.5 b)	459.5 (21.4 b)	410.5 (20.3 b)
Weedy check	1151.6 (33.9 a)	1103.3 (33.2 a)	279.6 (16.7 a)	262.4 (16.2 a)	235.3 (15.3 a)	210.6 (14.4 a)	1666.5 (40.8 a)	1576.3 (39.7 a)
Weed free	0.0 (0.7 f)	0.0 (0.7 e)	0.0 (0.7 f)	0.0 (0.7 f)	0.0 (0.7 e)	0.0 (0.7 d)	0.0 (0.7 f)	0.0 (0.7 f)
F. test	**	**	**	**	**	**	**	**

**** = P< 0.01. Means within a column of transformed data fb the same letter are not significantly different at 5% level, using DMRT.**

Data on weed control efficiency percent (WCE %) for studied weed categories and total weeds in 2021 and 2022 seasons (Table 4). Depending on weeds dry weight in un-treated plots as a balance, chemical control treatments recorded WCE against total weeds ranged from 86.7% to 95.6 % as average in both seasons of study, in addition to hand weeding two times recorded 73.2 %. Moreover, ready-made of penoxsulam 1.6% + triclopyr-butotyl 12% at recommended doses sprayed at 15 DAT was the best in weed control efficiency and recorded 95.7% as average in both seasons of investigation and exceeded the application of both penoxsulam 24% SC alone (92.7%) and thiobencarb 50% EC (86.7%). These results may be due to the higher concentration of penoxsulam (34.3 g ai ha^{-1}) in ready-made Pindar 13.6% OD in addition to triclopyr-butotyl which mainly control BLW, while Granite 24% SC contain penoxsulam at rate of 28.6 g ai ha^{-1} which explain higher killing ability of Pindar 13.6% OD for all studied categories of weeds under this study. Singh *et al*., (2007) found that penoxsulam herbicide treatment (0.0225 kg ai/ha) applied at 12 DAT gave the best chemical weed control and improved weed efficiency (87.1%).

Table 4. Weed management effectiveness on weed control efficiency (%) against grasses, sedges, Broadleaves and total weeds dry weight (gm^{-2}) in 2021 and 2022 seasons.

Weed management	Weed control efficiency (%)							
	Grasses		Sedges		Broadleaves		Total weeds	
	2021	2022	2021	2022	2021	2022	2021	2022
Thiobencarb 50%	90.4	91.7	78.5	80.3	72.7	74.4	85.9	87.5
Penoxsulam 1.6% + triclopyr-butotyl 12%	97.4	97.7	91.8	92.3	90.1	90.1	95.5	95.8
Penoxsulam 24%	96.2	96.5	85.9	87.3	81.5	81.3	92.4	93.0
Hand weeding	72.6	74.5	70.2	72.0	74.2	73.6	72.4	74.0
Weedy check	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Weed free	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

b- Effects on rice parameters:

Data in Tables 5 and 6 showed the significant effects of weed management on rice dry matter, grain yield and its attributes throughout 2021 and 2022 seasons. All tested chemical control treatments recorded the highest values of rice studied traits as compared to hand weeding twice, while

weedy check plots recorded the least values of abovementioned rice characteristics during 2021 and 2022 seasons of investigation. Dry matter of rice plants, panicles number m^{-2}, panicle weight and panicle length as affected by weed management during two growing seasons (Table 5). Ready-made of penoxsulam + triclopyr-butotyl applied at 15 DAT ranked first and achieved the highest values of abovementioned rice traits through both seasons of study, at the same level of significance with weed free treatment followed by penoxsulam alone at rate of 0.0286 kg ai ha^{-1}, while hand pooling of weeds twice ranked fourth in this respect. While, weedy check plots achieved the lowest values of rice dry biomass, number of panicles m^{-2}, panicle weight and panicle length during 2021 and 2022 seasons. High performance of penoxsulam + triclopyr-butotyl as ready-made (0.0343 + 0.257 kg ai ha^{-1}) may be due to high killing ability of both active ingredients against grasses, sedges and BLW with no toxicity on rice plants consequently save water, nutrients, sun light and soil space for more photosynthesis and increase dry matter accumulation, panicles and increase yield components which reflex on improving rice grain yield. Barbieri *et al*., (2022) reported that herbicide mixtures became a common application in agriculture because of mixing two different active ingredients or more achieve a high performance in weed control. These results are in confirmed with those cited by Hassan and Shebl., 2005, Shebl *et al*., 2009, Mahajan and Chauhan., 2015 and Abd El-Naby *et al*., 2017.

Table 5. Weed management effectiveness rice dry weight (gm^{-2}), panicles number m^{-2}, panicle weight (g) and panicle length (cm) in 2021 and 2022 seasons.

Weed management	Rice dry weight (gm^{-2})		Number of panicle m^{-2}		Panicle weight (g)		Panicle length (cm)	
	2021	2022	2021	2022	2021	2022	2021	2022
Thiobencarb 50%	1535.8 bc	1557.7 bc	383.3 c	400.0 c	2.0 c	2.1 c	16.9 c	17.7 c
Penoxsulam 1.6% + triclopyr-butotyl 12%	1942.1 a	2108.6 a	466.7 ab	500.0 ab	2.6 ab	2.8 ab	19.6 b	19.8 b
Penoxsulam 24%	1706.5 b	1801.9 b	450.0 b	466.7 b	2.4 bc	2.5 b	17.6 c	18.2 c
Hand weeding	1399.7 c	1449.7 c	341.7 c	366.7 c	1.8 c	1.8 cd	15.7 c	15.9 d
Weedy check	258.5 d	308.5 d	125.0 d	150.0 d	1.4 d	1.5 d	11.7 d	12.7 e
Weed free	2081.5 a	2219.5 a	516.7 a	525.0 a	2.91 a	3.0 a	21.0 a	21.1 a
F. test	**	**	**	**	**	**	**	**

**** = P< 0.01. In a column, means fb the same letter are not significantly different at 5% level, using DMRT.**

For number of field grains per panicle, 1000-grain weight (g), grain yield tons per hectare and yield losses percent of Sakha 109 new released rice cultivar are presented in Table (6). It is clear from obtained results that tested weed control treatments significantly affected rice grain yield and its attributes in addition to yield losses during both seasons of investigation. Penoxsulam + triclopyr-butotyl as ready-made applied at 15 days after transplanting produced the heaviest thousand grain weight and highest values of filled grains $panicle^{-1}$ and grain yield (27.8 g, 110 grains, 9.582 tons per hectare) as average of two seasons, respectively. Additionally, the lowest values of previous rice traits were observed in un-treated treatment in 2021 and 2022 seasons of investigation. Vasilakoglou *et al.,* (2018) cited that penoxsulam + triclopyr achieved the highest rice grain yield (10.48 t/ ha).

Data on yield losses percent of Sakha 109 new released rice cultivar, data cited in Table (6) shown that full season weed competition in weedy check plots caused 66.7% yield losses as average for 2021 and 2022 seasons. On the opposite that, yield losses under chemical control treatments ranged from 17.6% for thiobencarb 50% EC up to 2.6% in plots treated with ready-made of penoxsulam + triclopyr-butotyl, while yield losses under hand weeding was 26.4% as average for both seasons of study. Minimization of yield losses percent under penoxsulam + triclopyr-butotyl as ready mix may be due to the high performance of such combination in controlling grasses, sedges and BLW as well as decreasing weed competition against rice plants consequently reduced yield reduction comparing to weed free plots along growing season of rice. The obtained findings are agreement with those reported by Abd El-Naby *et al*., (2023).

Table 6. Weed management effectiveness on number of filled grains $panicle^{-1}$, 1000-grain weight (g), grain yield tons per hectare and yield losses (%) in 2021 and 2022 seasons.

Weed management	Number of filled grains $panicle^{-1}$		1000-grian weight (g)		Grain yield (t ha^{-1})		Yield losses (%)	
	2021	2022	2021	2022	2021	2022	2021	2022
Thiobencarb 50%	86.3 d	88.7 d	22.5 bc	22.8 bc	7.973 c	8.228 c	17.8	17.4
Penoxsulam 1.6% + triclopyr-butotyl 12%	108.7 b	111.3 b	27.2 a	28.4 a	9.504 a	9.660 ab	2.1	3.0
Penoxsulam 24%	101.7 c	103.7 c	26.4 ab	26.4 ab	9.026 b	9.218 b	7.0	7.5
Hand weeding	79.0 e	81.7 e	19.0 c	21.0 c	7.152 d	7.323 d	26.3	26.5
Weedy check	36.7 f	42.0 f	13.4 d	14.7 d	3.138 e	3.419 e	67.6	65.7
Weed free	115.7 a	116.7 a	28.5 a	28.6 a	9.703 a	9.961 a	0.0	0.0
F. test	**	**	**	**	**	**	**	**

**** = P< 0.01. In a column, means fb the same letter are not significantly different at 5% level, using DMRT.**

CONCLUSION

Under traditional transplanting rice cultivation, dominant weeds were grasses (69.6%), sedges (16.7%) and broadleaves (13.7%), weeds caused about 66.7% yield losses. The application of ready-made penoxsulam 1.6% + triclopyr-butotyl 12% at recommended dose sprayed after 15 days from transplanting recorded the highest WCE (95.4%), in addition to minimized yield losses to 2.55% and improved grain yield of Sakha 109 (9.582 t ha^{-1}) under transplanted-rice.

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إدارة الحشائش في الأرز الشتل

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الملخص

أجريت دراسة حقلية خلال موسمي 2021 و 2022 بمحطة البحوث الزراعية بسخا، كفرالشيخ، جمهورية مصر العربية لإدارة الحشائش المصاحبة للصنف المستنبط حديثاً سخا 109 تحت طريقة زراعة الشتل اليدوي. ستة معاملات لمكافحة الحشائش تضمنت ثيوبينكارب 50% (2,38 كجم مادة فعالة للهكتار (W_1)، التركيبة الجاهزة من مادتي بينوكسولام 1,6% (0,0144 كجم مادة فعالة للهكتار) + ترايكلوبير- بيوتوتيل 12% (0,108 كجم مادة فعالة للهكتار) (W_2)، بينوكسولام 24 % منفرداً (0,012 كجم مادة فعالة للهكتار) (W_3)، نقاوة يدوية مرتين بعد 20 و 40 يوم من الشتل (W_4)، بدون معاملة أو الكنترول (W_5) والقطع الخالية من الحشائش طوال الموسم (W_6) تم إختبارها باستخدام تصميم القطاعات كاملة العشوائية في ثلاث مكررات. أظهرت النتائج أن W_2 كمبيد مخلوط جاهز قد تفوق على باقي المعاملات الكيماوية والنقاوة اليدوية وسجل أعلى إنخفاض في الوزن الجاف للحشائش النجيلية، السعديات، عريضة الأوراق والحشائش الكلية خلال موسمي الدراسة بالإضافة لأعلى القيم في كفاءة مكافحة الحشائش % لكل من النجيليات، السعديات، عريضة الأوراق والحشائش الكلية. على الجانب الاخر فإن أعلى وزن جاف، محصول حبوب الأرز ومكوناته قد سجلت أيضاً بواسطة W_2 كما قللت نسبة الفقد في المحصول خلال موسمي الزراعة. سجلت أقل القيم من الوزن الجاف ومحصول حبوب الأرز ومكوناته بواسطة القطع التجريبية غير المعاملة (الكنترول) بالإضافة إلى أقل نسبة كفاءة مكافحة للحشائش وأعلى نسبة فقد في محصول حبوب خلال موسمي الدراسة. بناءً على النتائج المتحصل عليها يمكن استخلاص أن استخدام المخلوط الجاهز من مادتي بينوكسولام + ترايكلوبير- بيوتوتيل بالمعدل الموصى به قد حقق أفضل مكافحة للحشائش وقلل نسبة الفقد في المحصول لأقل حد ممكن وحسنت محصول الحبوب للأرز الشتل.