Journal of Research in Weed Science

Journal homepage: www.jrweedsci.com

Original Research

Performance of different herbicides and their combinations on weed control, growth and yield parameters of onion (*Allium cepa* L.)

Soliman El-Sagheer [a,*], Taha Yossef Hilal [b], Sobhy Ahmed Hassan Temerak [c], Sherif Abou elkassem [d]

a Pesticides lecturer, Plant Protection Department, Faculty of Agriculture, Al-Azhar University, Assiut, Egypt.

b Plant Protection Department, Faculty of Agriculture, Assiut University, Assiut 71526. Egypt.

c Plant Protection Dept., Fac. of Agric., Assiut Univ., Egypt.

d Plant Protection Dept., Fac. of Agric., Al-Azhar Univ., Assiut, Egypt.

ARTICLE INFORMATION

Received: 11 November 2019

Revised: 1 February 2020

Accepted: 8 February 2020

Available online: 10 February 2020

DOI: 10.26655/JRWEEDSCI.2020.3.7

KEYWORDS

Clethodim

Combinations

Oxyfluorfen

Weeds

ABSTRACT

Two experiments were carried out to study the efficacy of herbicides with different rates for controlling broadleaf and narrow leaves weeds, growth and yield parameters of onion. The treatments of herbicides applied include the single of active ingredient and their combinations. The single of active ingredient such as Oxyfluorfen at the dose of 270; 180; and 90 g a.i./fed, Clethodim at the dose of 93.75; 62.5; and 31.25 g a.i./fed. The combination used the Oxyfluorfen + Clethodim such as 270+93.75; 180+62.5; and 90+31.25 g a.i./fed. Results showed that Weed control efficiency (WCE) for broadleaves species the maximum percent was recorded for Oxyfluorfen (270 g a.i./fed). In controlling narrow leaves weed species, the maximum percent was recorded in Clethodim (93.75 g a.i./fed). While controlling broadleaf and narrow leaves weeds, the maximum percent was recorded in Oxyfluorfen + Clethodim (270+93.75 g a.i./fed). Growth, and yield parameters as plant height, bulb weight and bulb diameters were recorded maximum in Oxyfluorfen + Clethodim (270+93.75 g a.i./fed) compared to rest for the treatments. We suggest that the best treatment was Oxyfluorfen + Clethodim (270+93.75 g a.i./fed) for controlling all species of weeds in the onion plant.

Introduction

Onion, *Allium cepa* L. belonging to the family Alliaceae one of the important bulbous vegetable crop of economic importance and widely cultivated all over the world (Prakash et al. 2000; Ramalingam et al. 2013). Onion is one of the most important field and vegetable crops for both local or export market in Egypt (Ghalwash et al. 2008). Onion is inherently a poor competitor with weeds because of its narrow leave morphology, slow growth, and small leaf canopy (Bond

Corresponding author, email: selemmaan@azhar.edu.eg (Soliman El-Sagheer).

and Burston, 1996) Weed competes with crops for water, nutrients and light so weed infestation is one of the major threats to crop (Fahad et al. 2013). Weeds are one of the most important problems in onion (*Allium cepa* L.) production areas (Uygur et al. 2010). Modern agricultural production depends considerably on the use of herbicides to control weeds in crops (Tadeo et al. 2000). Evaluating appropriate herbicidal combination and their optimum doses and proper time of application is a potential solution for effective weed management in this crop (Patel et al. 2012), there is need to evaluate the efficacy of grass killers in different crop ecosystems. It is also necessary to work out the efficacy of newer herbicides whenever developed in terms of their effect on weed flora, phytotoxicity to the main crop as well as on the succeeding crops under varied agro-climatic situations before recommending them to the farming community. The objective of this research was to evaluate response of different treatment of herbicides applied include the single of active ingredient and their combinations on weed control, growth, and yield parameters of onion.

Materials and Methods

Experimental area and procedures used cultivars: Two field experiments were carried out at farm of Faculty of Agriculture, Al Azhar University, Assiut in 2014/ 2015 and 2015/2016 seasons. Giza 6 cultivar was used in all studies and obtained from Shandaweel Research Station.

Experimental design and treatments: Each plot in bulb onion experiments consisted of 3×3.5 m^2, 15 rows× 3.5 long and 20 cm. apart, with transplants spaced 7 cm apart 1/400 from Feddan. Sowing dates were November 15^{th}, 18^{th} in the first and second season. Both of the experiment used the Randomized complete block (RCB) design was used with three replications having eight treatments in each replication.

Herbicide used: Clethodim: Select super® 12.5% EC ((±)-2-[(*E*)-1-[(*E*)-3-chloroallyloxyimino] propyl]-5-[2 (ethylthio) propyl]-3-hydroxycyclohex-2-enone). Oxyfluorfen: Goal 24% EC (2-chloro-α,α,α-trifluoro-*p*-tolyl 3-ethoxy-4-nitrophenyl ether).

Herbicide treatments: Oxyfluorfen (270, 180 and 90)) a.i. g/fed; Clethodim (93.75, 62.5 and 31.25)) g a.i./fed; Oxyfluorfen+Clethodim (270+93.75, 180+62.5 and 90+31.25) a.i. g/fed.

Weed parameters

Weed Density: The density of narrow and broadleaf weeds was recorded at 30 and 60 days after treatment. The weed count was recorded species wise using one square meter from each plot in the experiments.

Total fresh weight of weeds: Weeds were sprayed at 30 and 60 days after transplanting. Weed species in each plot were isolated and then weed plants were cleaned from mud and fresh weight of weeds was measured by scale.

Total dry weight of weeds: After scaling fresh weight, weeds were putted at oven with temperature of 70^{O} C for 48 hours (Mirshekari and Karimi, 2015).

Weed control efficiency (WCE): Weed population was counted before harvesting (transplanting) in each treatment and weed control efficiency was calculated by the formula as suggested by (Mani et al. 1973).

$$Weed\ control\ efficiency = \frac{WPC}{WPT} \times 100$$

Where: WPC = Weed population in control WPT = Weed population in treatment.

Vegetative characteristics: Plant height (cm): Height of plant was measured in centimeters from ground level to tip.

Bulb weight: Average bulb weight was worked out and expressed as grams and bulb diameter (cm).

Bulb diameter (cm): The diameter of onion bulbs was determined using verniercalliper and the average bulb diameter was calculated

Total bulb yield (kg/plot): The crop was harvested and bulbs of each plot were weighted in kilogram

Statistical Analysis

All studied data were statistically analyzed according to the procedures outlined by (Gomez and Gomez, 1984) and the treatments mean were compared by least significant range according to (Duncan, 1955).

Results and Discussion

Effect of oxyfluorfen herbicides on broadleaf weed density in 2014/2015 season:

As showed in Table 1, At 30 days after oxyfluorfen (270 a.i g/fed) application, the minimum decreased significant density was recorded in *A. majus* with (0.67), *C. endivia* with (0.67), *P. major* with (0.67), *A. viridis* with (1), *M. parviflora* with (1), *S. marianumt* with (1), *C. arvensis* with (1), *R. dentatus* with (1.33), *C. ambrosioides* with (1.67), *S. oleraceus* with (1.67). At 60 days after oxyfluorfen (270 a.i g/fed) application, the minimum decreased significant density was recorded in *A. majus* with (2.67), *C. ambrosioides* with (3), *R. dentatus* with (3.33), *S. marianumt* with (3.33), *C. arvensis* with (3.33), *C. endivia* with (3.67), *P. major* with (3.67), *A. viridis* with (4), *M. parviflora* with (5.33) and *S. oleraceus* with (5.33). The pre-emergence application of oxyfluorfen at 250 g ha-1controlled weeds effectively but resulted in lower yield because of its higher phytotoxicity on onion crop and it was only for a short period. Severity of the symptoms increased in onion with increase in rate of herbicide application and symptoms were visible up

to 30 DAS when the herbicide was applied at higher dose of 400 g ha-1. The crop injury was transient and appeared stunted for one month, after that the crop appeared normal (Sathyapriya et al. 2013). At 30 days after oxyfluorfen (180 a.i g/fed) application, the minimum decreased significant density was recorded in *C. endivia* with (1), *P. major* with (1), *S. marianumt* with (1), *C. arvensis* with (1), *A. majus* with (1.33), *C. ambrosioides* with (1.33), *M. parviflora* with (1.33), *R. dentatus* with (1.33), *S. oleraceus* with (1.33) and *A. viridis* with (2). At 60 days after oxyfluorfen (180 a.i g/fed) application, the minimum decreased significant density was recorded in *R. dentatus* with (5.33), *C. ambrosioides* with (5.67), *A. majus* with (6), *C. endivia* with (6), *C. arvensis* with (6), *A. viridis* with (6.67), *P. major* with (7.67), *S. marianumt* with (8), *M. parviflora* with (8.33) and *S. oleraceus* with (9.33).

Hand hoeing at 30 days, the minimum decreased significant density was recorded in *Chenopodium ambrosioides*, *Plantago major*, *Silybium marianumt* and *Convonvulus arvensis* with (0.33), *Amaranthus viridis* and *Cichorium endivia* with (0.67), *Rumex dentatus* with (1), *Ammi majus* and *Malva parviflora* with (1.33) and *Sonchus oleraceus* with (1.67). While, hand hoeing at 60 days, the minimum decreased significant density was recorded in *Convonvulus arvensis* with (3.33), *Plantago major* with (3.67), *Silybium marianumt* with (4), *Chenopodium ambrosioides* with (4.33), *Cichorium endivia* with (4.67), *Ammi majus* with (5.67), *Malva parviflora* with (5.67), *Rumex dentatus* with (5.67), *Sonchus oleraceus* with (5.67), *Amaranthus viridis* with (6).

Effect of oxyfluorfen herbicides on broadleaf weed density in 2015/2016 season:

As showed in Table 2, At 30 days after oxyfluorfen (270 a.i g/fed) application, the minimum decreased significant density was recorded in *P. major* with (0.67), *A. majus* with (0.67), *A. viridis* with (1), *C. endivia* with (1), *M. parviflora* with (1), *S. marianumt* with (1), *C. ambrosioides* with (1.33), *R. dentatus* with (1.33), *S. oleraceus* with (1.33) and *C. arvensis* with (1.33). At 60 days after oxyfluorfen (270 a.i g/fed) application, the minimum decreased significant density was recorded in *A. majus* with (4), *C. ambrosioides* with (4.67), *C. endivia* with (5), *S. marianumt* with (5), *C. arvensis* with (5), *R. dentatus* with (5.67), *A. viridis* with (6), *P. major* with (6), *M. parviflora* with (7.33) and *S. oleraceus* with (7.33). At 30 days after oxyfluorfen (180 a.i g/fed) application, the minimum decreased significant density was recorded in *A. majus* with (1), *C. endivia* with (1), *M. parviflora* with (1), *P. major* with (1), *C. arvensis* with (1), *R. dentatus* with (1.33), *S. marianumt* with (1.33), *S. oleraceus* with (1.33), *A. viridis* with (1.67) and *C. ambrosioides* with (1.67). At 60 days after oxyfluorfen (180 a.i g/fed) application, the minimum decreased significant density was recorded in *C. endivia* with (6.67), *C. ambrosioides* with (7.67), *C. arvensis* with (8.33), *A. viridis* with (8.67), *R. dentatus* with (8.67), *A. majus* with (8.67), *S. marianumt* with (9), *M. parviflora* with (9.33), *P. major* with (9.67) and *S. oleraceus* with (11).

Table 1. Effect of herbicide treatments on broadleaf weeds density (m^2) at 30 and 60 DAT during 2014/2015 season.

Weed species	Oxyfluorfen						Hand hoeing		Control %	
	270 (a.i g/fed)		180 (a.i g/fed)		90 (a.i g/fed)					
	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT
A. viridis	1.00	4.00	2.00	6.67	10.67	19.33	0.67	6.00	16.66	45.66
A. majus	0.67	2.67	1.33	6.00	16.00	22.00	1.33	5.67	26.00	37.33
C. ambrosioides	1.67	3.00	1.33	5.67	5.00	13.33	0.33	4.33	7.33	32.00
C. endivia	0.67	3.67	1.00	6.00	4.33	9.67	0.67	4.67	8.33	30.33
M. parviflora	1.00	5.33	1.33	8.33	15.00	22.00	1.33	5.67	26.66	41.33
P. major	0.67	3.67	1.00	7.67	5.33	11.33	0.33	3.67	6.66	21.33
R. dentatus	1.33	3.33	1.33	5.33	10.33	14.67	1.00	5.67	16.33	29.66
S. marianumt	1.00	3.33	1.00	8.00	4.33	11.33	0.33	4.00	7.00	25.00
S. oleraceus	1.67	5.33	1.33	9.33	14.00	19.33	1.67	5.67	25.00	40.33
C. arvensis	1.00	3.33	1.00	6.00	5.33	10.33	0.33	3.33	6.33	21.00
LSD 0.05	0.214	0.354	0.358	0.254	19.061	6.346	0.932	0.014	11.354	1.369

Table 2. Effect of herbicide treatments on broadleaf weeds density (m^2) at 30 and 60 DAT during 2015/2016 season.

Weed species	Oxyfluorfen						Hand hoeing		Control %	
	270 (a.i g/fed)		180 (a.i g/fed)		90 (a.i g/fed)					
	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT
A. viridis	1.00	6.00	1.67	8.67	11.33	22.67	1.67	7.33	17.00	50.00
A. majus	0.67	4.00	1.00	8.67	13.33	25.00	1.67	7.00	27.00	43.33
C. ambrosioides	1.33	4.67	1.67	7.67	4.33	17.67	1.33	5.33	8.33	36.33
C. endivia	1.00	5.00	1.00	6.67	5.00	12.33	1.33	5.67	8.00	39.00
M. parviflora	1.00	7.33	1.00	9.33	14.33	25.00	2.33	6.33	26.66	45.33
P. major	0.67	6.00	1.00	9.67	5.00	16.00	0.67	5.33	8.00	28.33
R. dentatus	1.33	5.67	1.33	8.67	11.00	21.00	2.00	6.33	18.00	40.33
S. marianumt	1.00	5.00	1.33	9.00	5.00	15.33	0.67	4.67	8.00	30.33
S. oleraceus	1.33	7.33	1.33	11.00	14.33	25.33	2.67	7.33	27.33	46.66
C. arvensis	1.33	5.00	1.00	8.33	5.00	14.33	0.67	4.33	7.00	24.00
LSD 0.05	0.770	0.458	0.362	2.358	28.245	7.821	0.827	1.530	23.821	57.304

Hand hoeing at 30 days, the minimum decreased significant density was recorded in *Plantago major* with (0.67), *Silybium marianumt* with (0.67), *Convonvulus arvensis* with (0.67), *Chenopodium ambrosioides* with (1.33), *Cichorium endivia* with (1.33), *Amaranthus viridis* with (1.67), *Ammi majus* with (1.67), *Rumex dentatus* with (2), *Malva parviflora* with (2.33) and *Sonchus oleraceus* with (2.67). Oxyfluorfen, significantly reduced the weed population and increased onion yield to levels comparable to yields of weeded control (Sanjeev et al. 2003). While, hand hoeing at 60 days, the minimum decreased significant density was recorded in *Convonvulus arvensis* with (4.33), *Silybium marianumt* with (4.67), *Chenopodium ambrosioides* with (5.33), *Plantago major* with (5.33), *Cichorium endivia* with (5.67), *Malva parviflora* with (6.33), *Rumex dentatus* with (6.33), *Ammi majus* with (7), *Amaranthus viridis* with (7.33) and *Sonchus oleraceus* with (7.33).

Effect of clethodim herbicides on narrow leaves weed density in 2014/2015 and 2015/2016 seasons:

Data in Tables 3 and 4 shows the effect of clethodim (93.75, and 62.5 a.i g/fed), herbicide with three rates on narrow leaves weed density in 2014/2015 season, weed density of was recorded at 30 and 60 days after application. At 30 days after clethodim (93.75a.i g/fed) application, the minimum decreased significant density was recorded in *L. temulentum* with (3), *A. fatua* with (4.33), *C. dactylm* with (5), *P. monspeliensis* with (5.33) and *C. rotundus* with (10). At 60 days after clethodim (93.75a.i g/fed) application, the minimum decreased significant density was recorded in *L. temulentum* with (6.33), *C. dactylm* with (6.67), *A. fatua* with (7.33), *P. monspeliensis* with (7.67) and *C. rotundus* with (14). At 30 days after clethodim (62.5 a.i g/fed) application, the minimum decreased significant density was recorded in *L. temulentum* with (4), *A. fatua* with (5.33), *P. monspeliensis* with (5.33), *C. dactylm* with (5.67) and *C. rotundus* with (9.33). At 60 days after clethodim (62.5 a.i g/fed) application, the minimum decreased significant density was recorded in *C. dactylm* with (8), *L. temulentum* with (10.33), *P. monspeliensis* with (11), *A. fatua* with (12.67) and *C. rotundus* with (15). At 30 days after clethodim (31.25 a.i g/fed) application, the minimum decreased significant density was recorded in *L. temulentum* with (6), *C. dactylm* with (8.67), *P. monspeliensis* with (9), *A. fatua* with (13.33) and *C. rotundus* with (19.33). At 60 days after clethodim (31.25 a.i g/fed) application, the minimum decreased significant density was recorded in *L. temulentum* with (11.67), *C. dactylm* with (12.67), *P. monspeliensis* with (16), *A. fatua* with (24.67) and *C. rotundus* with (29) compared with control.

Table 3. Effect of herbicide treatments on narrow leaved weeds density (m^2) at 30 and 60 DAT during 2014/2015 season.

Weed species	Clethodim						Hand hoeing		Control %	
	93.75 (a.i g/fed)		62.5 (a.i g/fed)		31.25 (a.i g/fed)					
	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT
A. fatua	4.33	7.33	5.33	12.67	13.33	24.67	1.33	5.00	19.33	41.66
L. temulentum	3.00	6.33	4.00	10.33	6.00	11.67	1.66	4.33	7.66	27.66
P. monspeliensis	5.33	7.67	5.33	11.00	9.00	16	0.67	5.00	12.66	38
C. dactylm	5.00	6.67	5.67	8.00	8.67	12.67	0.66	4.33	10.66	26.33
C. rotundus	10.00	14.00	9.33	15.00	19.33	29.00	1.67	5.33	35.66	49.00
LSD 0.05	11.718	7.621	1.982	3.071	7.251	3.871	2.760	22.521	11.341	12.831

Table 4. Effect of herbicide treatments on narrow leaved weeds density (m^2) at 30 and 60 DAT during 2015/2016 season.

Weed species	Clethodim						Hand hoeing		Control %	
	93.75 (a.i g/fed)		62.5 (a.i g/fed)		31.25 (a.i g/fed)					
	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT
A. fatua	5.33	10.67	6.00	14.67	14.00	27.00	1.67	6.00	21.66	44.66
L. temulentum	2.33	6.67	3.33	12.67	5.33	14.33	1.33	5.67	6.66	31.33
P. monspeliensis	3.33	8.67	6.00	12.67	6.67	19.33	0.67	5.33	10.33	41.66
C. dactylm	5.00	7.67	5.33	8.67	7.00	16.00	1.00	5.33	9.33	30.66
C. rotundus	10.33	13.67	10.00	16.00	20.33	31.67	1.67	5.33	35.00	53.00
LSD 0.05	11.245	7.931	0.080	0.007	13.812	22.381	0.854	1.330	5.824	7.338

Hand hoeing at 30 days, the minimum decreased significant density was recorded in *Cynodon dactylm* with (0.66), *Polypogon monspeliensis* with (0.67), *Avena fatua* with (1.33), *Lolium temulentum* with (1.66) and *Cyperus rotundus* with (1.67). While, at 30 days, the minimum decreased significant density was recorded in *Lolium temulentum* with (4.33), *Cynodon dactylm* with (4.33), *Avena fatua* with (5), *Polypogon monspeliensis* with (5) and *Cyperus rotundus* with (5.33). Data in table () shows the effect of clethodim (93.75, and 62.5 a.i g/fed), herbicides with three rates on narrow leaves weed density in 2015/2016 season, weed density of was recorded at 30 and 60 days after application. At 30 days after clethodim (93.75a.i g/fed) application, the minimum decreased significant density was recorded in *L. temulentum* with (2.33), *P. monspeliensis* with (3.33), *C. dactylm* with (5), *A. fatua* with (5.33), *C. rotundus* with (10.33). At

60 days after clethodim (93.75a.i g/fed) application, the minimum decreased significant density was recorded in *L. temulentum* with (6.67), *C. dactylm* with (7.67), *P. monspeliensis* with (8.67), *A. fatua* with (10.67), *C. rotundus* with (13.67). At 30 days after clethodim (62.5 a.i g/fed) application, the minimum decreased significant density was recorded in *L. temulentum* with (3.33), *C. dactylm* with (5.33), *A. fatua* with (6), *P. monspeliensis* with (6) and *C. rotundus* with (10). At 60 days after clethodim (62.5 a.i g/fed) application, the minimum decreased significant density was recorded in *L. temulentum* with (12.67), *P. monspeliensis* with (12.67), *C. dactylm* with (8.67), *A. fatua* with (14.67) and *C. rotundus* with (16) compared with control.

Hand hoeing at 30 days, the minimum decreased significant density was recorded in *Polypogon monspeliensis* with (0.67), *Cynodon dactylm* with (1), *Lolium temulentum* with (1.33), *Avena fatua* with (1.67) and *Cyperus rotundus* with (1.67). While, at 30 days, the minimum decreased significant density was recorded in *Polypogon monspeliensis* with (5.33), *Cynodon dactylm* with (5.33), *Cyperus rotundus* with (5.33), *Lolium temulentum* with (5.67) and *Avena fatua* with (6).

Effect of oxyfluorfen+clethodim herbicide combinations on broadleaf and narrow leaves weed density in 2014/2015 and 2015/2016 seasons:

As showed in Tables 5 and 6, at 30 days after oxyfluorfen+clethodim (270+93.75 a.i g/fed) application, the minimum decreased significant density was recorded in *A. viridis* with (0), *L. temulentum* with (0) *A. majus* with (0), *C. ambrosioides* with (0), *C. endivia* with (0), *M. parviflora* with (0), *P. major* with (0), *R. dentatus* with (0), *S. oleraceus* with (0), *A. fatua* with (0.33), *P. monspeliensis* with (0.33), *C. arvensis* with (0.33), *S. marianumt* with (0.33), *C. dactylm* with (0.67), *C. rotundus* with (0.67). At 60 days after oxyfluorfen+clethodim (270+93.75 a.i g/fed) application, the minimum decreased significant density was recorded in *P. major* with (1), *M. parviflora* with (1), *S. marianumt* with (1.33), *C. endivia* with (1.33), *A. viridis* with (1.33), *C. ambrosioides* with (1.33), *C. dactylm* with (1.67) , *C. arvensis* with (1.67), *L. temulentum* with (2), *P. monspeliensis* with (2), *A. majus* with (2), *R. dentatus* with (2.67), *A. fatua* with (3), *S. oleraceus* with (3) and *C. rotundus* with (3.33).

At 30 days after oxyfluorfen+clethodim (180+62.5 a.i g/fed) application, the minimum decreased significant density was recorded in *A. viridis* with (0), *C. endivia* with (0), *M. parviflora* with (0), *P. major* with (0), *S. oleraceus* with (0), *A. fatua* with (0.33), *L. temulentum* with (0.33), *Polypogon, monspeliensis* with (0.33), *C. dactylm* with (0.33), *C. rotundus* with (0.33), *A. majus* with (0.33), *C. ambrosioides* with (0.33), *R. dentatus* with (0.33), *S. marianumt* with (0.33) and *C. arvensis* with (0.33). At 60 days after oxyfluorfen+clethodim (180+62.5 a.i g/fed) application, the minimum decreased significant density was recorded in *C. arvensis* with (3.33), *S. marianumt* with (4), *M. parviflora* with (4), *P. major* with (4), *C. endivia* with (4.33), *C.*

ambrosioides with (4.67), *A. fatua* with (5), *C. dactylm* with (5), *R. dentatus* with (5), *L. temulentum* with (5.33), *C. rotundus* with (6), *P. monspeliensis* with (6.33) , *A. majus* with (6.33), *A. viridis* with (7) and *S. oleraceus* with (7).

Hand hoeing at 30 days, the minimum decreased significant density was recorded in *Chenopodium ambrosioides* with (0.33), *Plantago major* with (0.33), *Silybium marianumt* with (0.33), *Convonvulus arvensis* with (0.33), *Cynodon dactylm* with (0.66), *Amaranthus viridis* with (0.67), *Cichorium endivia* with (0.67), *Polypogon monspeliensis* with (0.67), *Rumex dentatus* with (1), *Avena fatua* with (1.33), *Ammi majus* with (1.33), *Malva parviflora* with (1.33), *Lolium temulentum* with (1.66), *Sonchus oleraceus* with (1.67), *Cyperus rotundus* with (1.67). Hand hoeing at 60 days, the minimum decreased significant density was recorded in *Convonvulus arvensis* with (3.33), *Plantago major* with (3.67), *Silybium marianumt* with (4), *Cynodon dactylm* with (4.33), *Chenopodium ambrosioides* with (4.33), *Lolium temulentum* with (4.33), *Cichorium endivia* with (4.67), *Avena fatua* with (5), *Polypogon monspeliensis* with (5), *Cyperus rotundus* with (5.33), *Ammi majus* with (5.67), *Malva parviflora* with (5.67), *Rumex dentatus* with (5.67), *Sonchus oleraceus* with (5.67), *Amaranthus viridis* with (6).

In 2015/2016 season at 30 days after oxyfluorfen+clethodim (270+93.75 a.i g/fed) application, the minimum decreased significant density was recorded in *P. monspeliensis* with (0), *A. viridis* with (0), *A. majus* with (0), *L. temulentum* with (0), *C. ambrosioides* with (0), *C. endivia* with (0), *M. parviflora* with (0), *P. major* with (0), *R. dentatus* with (0), *S. oleraceus* with (0), *A. fatua* with (0.33), *S. marianumt* with (0.33), *C. arvensis* with (0.33), *C. dactylm* with (0.67) and *C. rotundus* with (0.67). At 60 days after oxyfluorfen+clethodim (270+93.75 a.i g/fed) application, the minimum decreased significant density was recorded in *C. endivia* with (1.67), *C. dactylm* with (2), *M. parviflora* with (2.33), *S. marianumt* with (2.33), *A. viridis* with (2.33), *C. ambrosioides* with (2.33), *C. arvensis* with (2.67), *P. monspeliensis* with (2.67), *L. temulentum* with (2.67), *A. majus* with (2.67), *P. major* with (3), *A. fatua* with (3.67), *C. rotundus* with (4), *R. dentatus* with (4) and *S. oleraceus* with (4.33). At 30 days after oxyfluorfen+clethodim (180+62.5 a.i g/fed) application, the minimum decreased significant density was recorded in *C. endivia* with (0), *A. viridis* with (0), *A. fatua* with (0.33), *L. temulentum* with (0.33), *P. monspeliensis* with (0.33), *C. dactylm* with (0.33), *C. rotundus* with (0.33), *A. majus* with (0.33), *M. parviflora* with (0.33), *P. major* with (0.33), *R. dentatus* with (0.33), *S. marianumt* with (0.33), *S. oleraceus* with (0.33), *C. arvensis* with (0.33) and *C. ambrosioides* with (0.67). At 60 days after oxyfluorfen+clethodim (180+62.5 a.i g/fed) application, the minimum decreased significant density was recorded in *C. arvensis* with (4), *P. major* with (5.33), *R. dentatus* with (5.67), *C. endivia* with (5.67), *A. fatua* with (6.67), *M. parviflora* with (6), *C. ambrosioides* with (6.33), *S. marianumt* with (6.33), *C. dactylm* with (6.67), *A. majus* with (7.33), *P. monspeliensis* with (7.67), *L. temulentum* with (8), *C. rotundus* with (8.33), *A. viridis* with (8.33) and *S. oleraceus* with (9.33)

compared with control. Hand hoeing at 30 days, the minimum decreased significant density was recorded in *Plantago major* with (0.67), *Convonvulus arvensis* with (0.67), *Silybium marianumt* with (0.67), *Polypogon monspeliensis* with (0.67), *Cynodon dactylm* with (1), *Cichorium endivia* with (1.33), *Lolium temulentum* with (1.33), *Chenopodium ambrosioides* with (1.33), *Avena fatua* with (1.67), *Cyperus rotundus* with (1.67), *Amaranthus viridis* with (1.67), *Ammi majus* with (1.67), *Rumex dentatus* with (2), *Malva parviflora* with (2.33) and *Sonchus oleraceus* with (2.67). Hand hoeing at 60 days, the minimum decreased significant density was recorded

in*Convonvulus arvensis* with (4.33), *Silybium marianumt* with (4.67), *Polypogon monspeliensis* with (5.33), *Cynodon dactylm* with (5.33), *Cyperus rotundus* with (5.33), *Chenopodium ambrosioides* with (5.33), *Plantago major* with (5.33), *Lolium temulentum* with (5.67), *Cichorium endivia* with (5.67), *Avena fatua* with (6), *Malva parviflora* with (6.33), *Rumex dentatus* with (6.33), *Ammi majus* with (7), *Amaranthus viridis* with (7.33) and *Sonchus oleraceus* with

(7.33).

Table 5. Effect of herbicide combinations treatments on broadleaf and narrow leaved weeds density (m^2) at 30 and 60 DAT during 2014/2015 season.

Weed species	Oxyfluorfen + Clethodim						Hand hoeing		Control %	
	270+93.75 (a.i g/fed)		180+62.5 (a.i g/fed)		90+31.25 (a.i g/fed)					
	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT
A. fatua	0.33	3.00	0.33	5.00	12.33	13.67	1.33	5.00	19.33	41.66
L. temulentum	0.00	2.00	0.33	5.33	7.00	7.67	1.66	4.33	7.66	27.66
P. monspeliensis	0.33	2.00	0.33	6.33	8.67	10.67	0.67	5.00	12.66	38.00
C. dactylm	0.67	1.67	0.33	5.00	9.33	7.00	0.66	4.33	10.66	26.33
C. rotundus	0.67	3.33	0.33	6.00	15.00	15.33	1.67	5.33	35.66	49
A. viridis	0.00	1.33	0	7.00	8.00	14.33	0.67	6.00	16.66	45.66
A. majus	0.00	2.00	0.33	6.33	13.33	12.00	1.33	5.67	26.00	37.33
C. ambrosioides	0.00	1.33	0.33	4.67	5.00	12.33	0.33	4.33	7.33	32.00
C. endivia	0.00	1.33	0.00	4.33	6.67	8.33	0.667	4.67	8.33	30.33
M. parviflora	0.00	1.00	0.00	4.00	13.00	18.00	1.33	5.67	26.66	41.33
P. major	0.00	1.00	0.00	4.00	4.00	9.00	0.33	3.67	6.66	21.33
R. dentatus	0.00	2.67	0.33	5.00	13.00	12.67	1.00	5.67	16.33	29.66
S. marianumt	0.33	1.33	0.33	4.00	5.33	8.00	0.33	4.00	7.00	25.00
S. oleraceus	0.00	3.00	0.00	7.00	12.33	18.33	1.67	5.67	25.00	40.33
C. arvensis	0.33	1.67	0.33	3.33	5.00	7.33	0.33	3.33	6.33	21.00
LSD 0.05	0.652	2.821	1.335	1.358	13.864	4.526	2.714	1.770	18.932	7.380

Table 6. Effect of herbicide combinations treatments on broadleaf and narrow leaved weeds density (m^2) at 30 and 60 DAT during 2015/2016 season.

Weed species	Oxyfluorfen + Clethodim (270+93.75) (a.i g/fed)		Oxyfluorfen + Clethodim (180+62.5) (a.i g/fed)		Oxyfluorfen + Clethodim (90+31.25) (a.i g/fed)		H.hoeing		Control %	
	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT	30 DAT	60 DAT
A. fatua	0.33	3.67	0.33	6.67	11.67	16.33	1.67	6.00	21.66	44.66
L. temulentum	0.00	2.67	0.33	8.00	7.00	10.33	1.33	5.67	6.66	31.33
P. monspeliensis	0.00	2.67	0.33	7.67	10.67	13.67	0.67	5.33	10.33	41.66
C. dactylm	0.67	2.00	0.33	6.67	8.00	9.00	1.00	5.33	9.33	30.66
C. rotundus	0.67	4.00	0.33	8.33	15	19.67	1.67	5.33	35.00	53.00
A. viridis	0.00	2.33	0.00	8.33	8.33	19.67	1.67	7.33	17.00	50.00
A. majus	0.00	2.67	0.33	7.33	12.67	17.33	1.67	7.00	27.00	43.33
C. ambrosioides	0.00	2.33	0.67	6.33	6.00	16.33	1.33	5.33	8.33	36.33
C. endivia	0.00	1.67	0.00	5.67	5.67	12.67	1.33	5.67	8.00	39.00
M. parviflora	0.00	2.33	0.33	6.00	15.00	20.67	2.33	6.33	26.66	45.33
P. major	0.00	3.00	0.00	5.33	5.67	17.33	0.67	5.33	8.00	28.33
R. dentatus	0.00	4.00	0.33	5.67	13.33	18.00	2.00	6.33	18.00	40.33
S. marianumt	0.33	2.33	0.33	6.33	5.00	13.00	0.67	4.67	8.00	30.33
S. oleraceus	0.00	4.33	0.33	9.33	14.67	22.67	2.67	7.33	27.33	46.66
C. arvensis	0.33	2.67	0.33	4.00	4.00	10.00	0.67	4.33	7.00	24.00
LSD 0.05	0.234	0.335	3.731	1.320	7.521	23.527	0.329	1.821	22.328	7.328

Total dry weight of weeds:

Data in Table 7 and 8 showed total dry weight per one meter square area of onion recorded at 30 and 60 DAT was significantly affected by different weed control treatments; all treatments caused significant reduction in dry matter of weeds as compared to control.

Effect of herbicides on total dry weight broadleaf weeds:

At 30 days after treatment in season 2014/2015 the minimum dry weight recorded in (1.86) was under oxyfluorfen (270 a.i g/fed) treatment and followed with (2.22) by oxyfluorfen (180 a.i g/fed) treatment compared with control (37.95). While in season 2015/2016 the minimum dry weight recorded in (2.1) was under oxyfluorfen (270 a.i g/fed) treatment and followed with (2.62) by oxyfluorfen (180 a.i g/fed) treatment compared with control (37.08) at all herbicides used for controlling broad leaves weed. At 60 days treatments in season 2014/2015 the minimum dry weight recorded in (15.99) was under hand hoeing treatment and followed with (20.57) by oxyfluorfen (270 a.i g/fed) treatment compared with control (142.03). While in season 2015/2016 the minimum dry weight recorded in (23.66) was under hand hoeing treatment and followed with (29.43) by oxyfluorfen (270 a.i g/fed) treatment compared with control (156.49). at all herbicides used for controlling broad leaves weed *Amaranthus viridis*, *Ammi majus*, *Chenopodium ambrosioides*, *C. endivia*, *M. parviflora*, *P. major*, *R. dentatus*, *Silybium marianumt*, *S. oleraceus*, and *C. arvensis*. Treatment of Oxyfluorfen herbicide caused to the

highest percent of reduction in weeds dry weight and there were no significant differences between treatments of oxadiazon herbicide (Mirshekari and Karimi, 2015).

Table 7. Effect of herbicides and their combinations on total means of dry weight during 2014/2015 and 2015/2016 seasons.

Herbicide treatments	Rate (a.i g/fed)	2014/2015		2015/2016	
		30 DAT	60 DAT	30 DAT	60 DAT
Oxyfluorfen	270	1.86	20.57	2.1	29.43
Oxyfluorfen	180	2.22	36.42	2.62	53.11
Hand hoeing	-	3.26	15.99	3.41	23.66
Control	-	37.95	142.03	37.08	156.49
Clethodim	93.75	4.56	8.98	4.73	10.23
Clethodim	62.5	3.97	12.38	4.24	15.16
Hand hoeing	-	0.97	8.08	1.16	10.04
Control	-	19.63	53.43	20.36	60.88
Oxyfluorfen + Clethodim	270+93.75	0.11	9.79	0.14	13.7
Oxyfluorfen + Clethodim	180+62.5	0.29	26.56	0.80	38.75
Hand hoeing	-	4.23	24.07	4.57	33.7
Control	-	57.58	195.46	57.44	217.37

Effect of herbicides on total dry weight narrow leaves weeds:

At 30 days treatment in season 2014/2015 the minimum dry weight recorded in (0.97) was under hand hoeing treatment and followed with (3.97) by clethodim (62.5 a.i g/fed) treatment compared with control (19.63). While in season 2015/2016 the minimum dry weight recorded in (1.16) was under hand hoeing treatment and followed with (4.24) by clethodim (62.5 a.i g/fed) treatment compared with control (20.36) at all herbicides used for controlling broad leaves weed. At 60 days treatment in season 2014/2015 the minimum dry weight recorded in (8.08) was under hand hoeing treatment and followed with (8.98) by clethodim (93.75 a.i g/fed) treatment compared with control (53.43). While in season 2015/2016 the minimum dry weight recorded in (10.04) was under hand hoeing treatment and followed with (10.23) by clethodim (93.75 a.i g/fed) treatment compared with control (60.88) at all herbicides used for controlling narrow leaves weed *A. fatua*, *L. temulentum*, *P. monspeliensis*, *C. dactylm* and *C. rotundus*.

Table 8. Effect of herbicides and their combinations on total weed control efficiency during 2014/2015 and 2015/2016 seasons.

Herbicide treatments	Rate (a.i g/fed)	2014/2015		2015/2016	
		30 DAT	60 DAT	30 DAT	60 DAT
Oxyfluorfen	270	90.19	87.89	90.73	84.87
Oxyfluorfen	180	88.92	77.4	89.45	76.03
Hand hoeing	-	94.57	84.68	89.55	84.24
Clethodim	93.75	64.28	77.09	65.01	76.64
Clethodim	62.5	59.75	68.46	55.7	67.57
Hand hoeing	-	91.06	86.37	90.07	85.65
Oxyfluorfen + Clethodim	270+93.75	98.51	94.24	98.70	92.5
Oxyfluorfen + Clethodim	180+62.5	97.98	84.34	97.57	82.3
Hand hoeing	-	93.4	85.24	89.72	84.71

Effect of herbicides combinations on total dry weight weeds

At 30 days treatment in season 2014/2015 the minimum dry weight recorded in (0.11) was under oxyfluorfen+clethodim (270+93.75 a.i g/fed) treatment and followed with (0.29) by oxyfluorfen+clethodim (180+62.5 a.i g/fed) treatment compared with control (57.58). While in season 2015/2016 the minimum dry weight recorded in (0.14) was under oxyfluorfen+clethodim (270+93.75 a.i g/fed) treatment and followed with (0.8) by oxyfluorfen+clethodim (180+62.5 a.i g/fed) treatment compared with control (57.44) at all herbicides used for controlling onion weeds. At 60 days treatment in season 2014/2015 the minimum dry weight recorded in (9.79) was under oxyfluorfen+clethodim (270+93.75 a.i g/fed) treatment and followed with (24.07) by hand hoeing treatment compared with control (195.46). While in season 2015/2016 the minimum dry weight recorded in (13.7) was under oxyfluorfen+ clethodim (270+93.75 a.i g/fed) treatment and followed with (33.7) by hand hoeing treatment compared with control (217.37) at all herbicides used for controlling onion weeds *Avena fatua*, *Lolium temulentum*, *Polypogon monspeliensis*, *Cynodon dactylm*, *Cyperus rotundus, Amaranthus viridis*, *Ammi majus*, *Chenopodium ambrosioides*, *Cichorium endivia*, *Malva parviflora*, *Plantago major*, *Rumex dentatus*, *Silybium marianumt*, *Sonchus oleraceus* and *Convonvulus arvensis*.

Weed control efficiency (WCE %)

The total broad leaved weed density was significantly altered by different weed control treatments are presented in (Table 9). At 30 DAT during 2014/2015 season, among the different herbicide treatments of weed control efficiency was found the highest weed control efficiency (94.57%) was registered under hand hoeing treatment followed by (90.19%) under oxyfluorfen (270 a.i g/fed) treatment. At 60 DAT, the highest weed control efficiency (87.89%) was registered under oxyfluorfen (270 a.i g/fed) treatment followed by (84.68%) under hand hoeing treatment. The most effective treatments against broad leaf weeds were oxyfluorfen and hand hoeing (Ghalwash et al. 2008**).** Oxyfluorfen at the 3-4 leaf stage resulted in the best effect against weed infestation and led to high yields (Qasem, 2005). Oxyfluorfen herbicide caused to the highest percent of reduction in weeds dry weight (Mirshekari and Karimi, 2015). In 2015/2016 season at 30 DAT, the highest weed control efficiency (90.73 %) was registered under oxyfluorfen (270 a.i g/fed) treatment followed by (89.55%) under hand hoeing treatment. At 60 DAT, the highest weed control efficiency (84.87%) was registered under oxyfluorfen (270 a.i g/fed) treatment followed by (84.24%) under hand hoeing treatment. Soil structure is important; in rough soil weeds may continue to grow in the lumps of soil lifted by the hoe (Mattsson et al. 1990).

Table 9. Effect of herbicides and their combinations on total weed control efficiency (WCE %) in 2014/2015 and 2015/2016 seasons

Herbicide treatments	Rate (g a.i /fed)	2014/2015		2015/2016	
		30 DAT	60 DAT	30 DAT	60 DAT
Oxyfluorfen	270	90.19	87.89	90.73	84.87
Oxyfluorfen	180	88.92	77.4	89.45	76.03
Hand hoeing	-	94.57	84.68	89.55	84.24
Clethodim	93.75	64.28	77.09	65.01	76.64
Clethodim	62.5	59.75	68.46	55.7	67.57
Hand hoeing	-	91.06	86.37	90.07	85.65
Oxyfluorfen + Clethodim	270+93.75	98.51	94.24	98.7	92.5
Oxyfluorfen + Clethodim	180+62.5	97.98	84.34	97.57	82.3
Hand hoeing	-	93.4	85.24	89.72	84.71

Desiccation on the soil surface is a critical factor in preventing weed regeneration, and wet conditions after hoeing can decrease the level of control (Böhrnsen, 1993). Weed control efficiency of different herbicide treatments were more at 30 DAP than 60 and 90 DAP. The per cent weed control efficiency was significantly more in pre emergence application of oxyfluorfen 0.25 kg a.i. ha^{-1} at 30, 60 and 90 days after planting (Kolse et al. 2010). The weed control efficiency was also significantly higher when coupled with hand weeding at 30 DAP by the same treatments at 60 and 90 days after planting (Kolhe, 2001). The per cent of weed control efficiency was more at early stage of weed growth by the application of herbicides alone; the weed control efficiency was more at early stage (Kolse et al.2010). The total narrow leaved weed density was significantly altered by different weed control treatments at 30 DAT during 2014/2015 season, among the different herbicide treatments of weed control efficiency was found the highest weed control efficiency (91.06%) was registered under hand hoeing treatment followed by (64.28 %) under clethodim (93.75 a.i g/fed) treatment. At 60 DAT the highest weed control efficiency (86.37%) was registered under hand hoeing treatment followed by (77.09%) under clethodim (93.75 a.i g/fed) treatment. At 30 DAT during 2015/2016 season, among the different herbicide treatments of weed control efficiency was found the highest weed control efficiency (90.07%) was registered under hand hoeing treatment followed by (65.01%) under clethodim (93.75 a.i g/fed) treatment. At 60 DAT, the highest weed control efficiency (85.65%) was registered under hand hoeing treatment followed by (76.64%) under clethodim (93.75 a.i g/fed) treatment. All the chemical treatments and two hand weeding at 20 and 40 days after sowing had Recorded significantly lower weed population as compared to weedy check. Application of clethodim 24 % EC 60 g a. i. ha-1 along with NIS + AMS recorded the lowest monocot, sedge, dicot and total weed population (0.6, 7.4, 10.1 and 18.1 /0.25 m2) respectively, and was on par with the application of clethodim 24 % EC 48 g a. i. ha-1 along with NIS + AMS monocot, sedge, dicot and total weeds (1.5, 7.7, 10.2 and 19.4 /0.25 m2), respectively, at all the stages of the crop growth (Sudhakara et al. 2014). The total broad and

narrow leaved weed density was significantly altered by different weed control treatments are presented in Tables at 30 DAT during 2014/2015 season, among the different herbicide combinations treatments of weed control efficiency was found the highest weed control efficiency (98.51%) was registered under oxyfluorfen + clethodim (270+93.75 a.i g/fed) treatment followed by (97.98%) under oxyfluorfen+clethodim (180+62.5 a.i g/fed) treatment.

Table 10. Effect of herbicides and their combinations treatments on plant height (cm), Number of leaves, bulb diameter and total yield at harvesting in 2014/2015 and 2015/2016 seasons.

Herbicide treatments	Rate (g a.i /fed)	plant height (cm)				Number of leaves				Bulb Diameter (cm)		Total yield Ton/fed	
		2014/2015		2015/2016		2014/2015		2015/2016		2014/2015	2015/2016	2014/2015	2015/2016
		70 DAT	120 DAT	70 DAT	120 DAT	70 DAT	120 DAT	70 DAT	120 DAT				
Oxyfluorfen	270	31.7	60.9	33.8	63.6	4.33	5	4.67	5	6.8	6.93	10.594	10.8
Oxyfluorfen	180	34.8	73.9	37.5	72.4	4.67	7.33	4.67	7.6	7.7	7.6	11.405	11.8
Clethodim	93.75	34.2	52.3	36.5	55.5	3.33	3.67	3.67	4.3	5	4.93	10.137	10.3
Clethodim	62.5	40	58.1	38.5	58.7	3.67	4.67	4.33	4.6	6.2	6.1	11.209	11.5
Oxyfluorfen + Clethodim	270+93.75	32.9	65.3	33.8	68.2	4.33	3.67	3.33	3.6	6.2	6.1	10.8	10.8
Oxyfluorfen + Clethodim	180+62.5	37.7	71.2	38.7	75.7	3.67	5.00	3.67	4.6	7.8	7.77	11.656	11.7
Hand hoeing	------	33.9	63.4	36.3	64.9	4.67	7.67	4.67	7.3	6.2	6.2	11.802	12
Control	--------	23	47.8	24.1	51.4	3.33	4.67	3.67	4.6	4.9	4.57	4.989	5.1

While at 60 DAT, the highest weed control efficiency (94.24%) was registered under oxyfluorfen + clethodim (270+93.75 a.i g/fed) treatment followed by (85.24%) under hand hoeing treatment. At 30 DAT during 2015/2016 season, among the different herbicide combinations treatments of weed control efficiency was found the highest weed control efficiency (98.7%) was registered under oxyfluorfen + clethodim (270+93.75 a.i g/fed) treatment followed by (97.57%) under oxyfluorfen+clethodim (180+62.5 a.i g/fed) treatment. While at 60 DAT, the highest weed control efficiency (92.5%) was registered under oxyfluorfen+ clethodim (270+93.75 a.i g/fed) treatment followed by (84.71%) under hand hoeing treatment. Evaluate the efficacy of grass killers in different crop ecosystems. It is also necessary to work out the efficacy of newer herbicides whenever developed in terms of their effect on weed flora, phytotoxicity to the main crop as well as on the succeeding crops under varied agro-climatic situations before recommending them to the farming community (Sudhakara et al. 2014).

Effect of herbicides and their combinations on plant height (cm):

As showed in Table 10, in season 2014/2015 refer to significant among the different treatments and showed that mean plant height under different treatments of herbicides is given the highest plant at 70 day was recorded at Clethodim (62.5 a.i g/fed) with (40.03) cm followed by Oxyfluorfen+Clethodim (180+62.5 a.i g/fed) with (37.73) cm compared with control (23.07) cm. The highest plant at 120 day was recorded at Oxyfluorfen (180 a.i g/fed) with (73.97) cm

followed by Oxyfluorfen+Clethodim (180+62.5 a.i g/fed) with (71.2) cm compared with control (47.8) cm**.** In season 2015/2016 refer to significant among the different treatments and showed that mean plant height under different treatments of herbicides is given the highest Plant at 70 day was recorded at Oxyfluorfen+Clethodim (180+62.5 a.i g/fed) with (38.77) cm followed by Clethodim (62.5 a.i g/fed) with (38.57) cm. The highest Plant at 120 day was recorded at Oxyfluorfen +Clethodim (180+62.5 a.i g/fed) with (75.73) cm followed by Oxyfluorfen +Clethodim (90+31.25 a.i g/fed) with (72.53) cm compared with control (51.47).

Effect of herbicides and their combinations on number of leaves:

As showed in Table 10, in season 2014/2015 number of leaves per plant increased significantly with the different herbicides and their combinations treatments and hand hoeing at 70 day, maximum number of leaves per plant was recorded with application of oxyfluorfen+clethodim (180+62.5 a.i g/fed) and hand hoeing with (4.67) compared with control (3.33). At 120 day, maximum number of leaves per plant was recorded with application of Oxyfluorfen+Clethodim (270+93.75 a.i g/fed) and hand hoeing with (7.67) compared with control (4.67). The number of leaves per plant and bulb diameter were highest in oxyfluorfen applied at 0.37 a.i. kg/ha and 0.25 a.i. kg/ha + hand weeding at 40 DAT, respectively (Singh et al. 2001). In season 2015/2016 number of leaves per plant at 70 DAT, at 70 day, maximum number of leaves per plant was recorded with application of Oxyfluorfen+Clethodim (270+93.75 a.i g/fed), oxyfluorfen+clethodim (180+62.5 a.i g/fed) and hand hoeing with (4.67) compared with control (3.67). At 120 day, maximum number of leaves per plant was recorded with application of Oxyfluorfen+Clethodim (270+93.75 a.i g/fed) and hand hoeing with (7.67) compared with control (4.67).

Effect of herbicides and their combinations on Bulb diameter (cm):

Data for various herbicide and their combinations treatments with respect to the bulb diameter are summarized in (Table 10) in season 2014/2015, the maximum bulb diameter (7.8) cm was recorded under the treatment Oxyfluorfen+Clethodim (180+62.5a.i g/fed), followed by Oxyfluorfen (180 a.i g/fed) treatment with (7.7) cm compared with control treatment (4.93) cm. In season 2015/2016, the maximum bulb diameter (7.77) cm was recorded under the treatment Oxyfluorfen+ Clethodim (180+62.5a.i g/fed), followed by Oxyfluorfen (180 a.i g/fed) treatment with (7.6) cm compared with control treatment (4.57) cm.

Effect of herbicides and their combinations on Total Yield ton/ fed:

Data in (Table 10) Shows the effect of different herbicides and their combinations treatments on the total yield (ton/fed) and the data depicted that the total yield increased significantly in response to applied herbicides and their combinations. In season 2014/2015, significantly highest bulb yield (11.802) ton/fed was observed in hand hoeing followed by

oxyfluorfen+clethodim (180+62.5 a.i g/fed) treatment with (11.656) ton/fed compared with control (4.989). While in season 2015/2016, significantly highest bulb yield (12.002) ton/fed was observed in hand hoeing followed by oxyfluorfen+clethodim (180+62.5 a.i g/fed) treatment with (11.803) ton/fed compared with control (5.109). Uncontrolled weed growth caused 49-86 percent reduction in bulb yield compared with the best herbicidal treatment (James and Harlen. 2010). The higher onion bulb yield of 38.3 t ha^{-1} due to lesser weed population and weed growth from initial crop growth (Patel et al. 2011). hand weeding throughout the growing season controlled all weeds and resulted in higher onion bulb yield (Rahman et al. 2011). Increase in bulb yield with these treatments was because of the fact that the weed population and weed growth remain low during the entire crop growth period, which leads to increase in various growth characters of crop (Kalhapure et al. 2013).

Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

References

Böhrnsen A. 1993. Several years results about mechanical weeding in cereals. Communications of the 4th International Conference I.F.O.A.M. Non Chemical Weed Control, Dijon, France, 95-101.

Bond W, Burston S. 1996. Timing the removal of weeds from drilled salad onions to prevent crop losses. Crop Prot. 15: 205–211.

Duncan D.B. 1955. Multiple ranged multiple F-test. Biometrics. 11:1- 47.

Fahad S, Nie L, Rahman A, Chen C, Wu1 C, Saud S, Huang J. 2013. Comparative Efficacy of Different Herbicides for Weed Management and Yield Attributes in Wheat. Amr J Plant Sci. 4: 1241-1245.

Fahad S, Nie L, Rahman A, Chen C, Wu1 C, Saud S, Huang J. 2013. Comparative Efficacy of Different Herbicides for Weed Management and Yield Attributes in Wheat. Amr J Plant Sci. 4: 1241-1245.

Ghalwash A.M, Soliman I.E, Khaffagy A.E. 2008. Effect of some weed control treatments on transplanted onion (*Allium cepa*, L.) Yield and its associated weeds. J Plant Protec Path Mansoura Uni. 33: 941-952.

Gomez K.A, Gomez A.A. 1984. Statistical procedures for agricultural research . John Wiley & Sons, Inc. New York, USA.

Kolhe S.S. 2001. Integrated weed management in onion (*Allium cepa* L.). Ind J. Weed Sci. 33: 26-29.

Kolse R.H, Gaikwad C.B, Jadhav J.D, Yadav S.T. 2010. Efficiency of chemical weed control methods in onion seed production for controlling weeds and its effect on yield. Int J Plant Protec. 3: 55-59.

Kumar U. 2014. Weed management studies in onion (*Allium cepa* L.). Asian J Hort. 9: 426-430.

Mani V.S, Mail M.L, Gautam K.C, Bhagwanda S. 1973. Chemical weed control is effective and economical. Ind. Forming. 22: 21-22.

Mattsson B, Nylander C, Ascard J. 1990. Comparison of seven inter-row weeders. Proceedings 3rd International Conference on Non-chemical Weed Control, Linz, Austria, 91-107.

Mirshekari B, Karimi S.Y. 2015. Evaluation of weeds control methods in form of mechanical and chemical on onion yield. J Biol Environ Sci. 6: 573-579.

Panse R, Gupta A, Jain P.K, Sasode D.S, Sharma S. 2014. Efficacy of different herbicides against weed flora in Onion (*Allium cepa* Lindeman). J Crop Weed. 10: 163-166.

Patel T.U, Patel C.L, Patel D.D, Thanki J.D, Patel P.S, Jat R.A. 2011. Effect of weed and Fertilizer management on weed control and productivity of onion (*Allium cepa*). Ind J Agron. 56: 267-272.

Prakash V, Pandey A.K, Singh R.D, Mani V.P. 2000. Integrated weed management in winter onion (*Allium cepa*) under mid-hill conditions of north western Himalayas. Ind J Agron. 45:816-821.

Qasem J.R. 2005. Chemical control of weeds in onion (*Allium cepa* L.). J Hort Sci Biotech. 80: 721-726.

Ramalingam S.P, Chinnagounder C, Perumal M, Palanisamy M.A. 2013. Evaluation of New Formulation of Oxyfluorfen (23.5% EC) for Weed Control Efficacy and Bulb Yield in Onion. Amr J Plant Sci. 4: 890-895.

Sathyapriya R, Chinnusamy C, Maniksundram P, Murali A.P. 2013. Evaluation of new formulation of oxyfluorfen (23. 5% EC) for weed control efficacy and bulb yield in onion. Amr J Plant Sci. 4: 890-895.

Singh R, Nandal T.R, Shukla Y.R. 2001. Weed intensity and onion bulb yield as influenced by different weed management practices. Crop Res Hisar. 22: 32-37.

Sudhakara T.M.S, Sridhara V.R, Kishore M.J, Ragothuman G. 2014. Bioefficacy of clethodim in soybean and their residual effect on succeeding green gram. Ind J Plant Protec. 42:169-174.

Tadeo J.L, Sanchez-Brunete C, Perez R.A, Fernandez M.D. 2000. Analysis of herbicide residues in cereals, fruits and vegetables. J Chromatography A. 882: 175–191.

Uygur S, Gürbüz R, Uygur F.N. 2010. Weeds of onion fields and effects of some herbicides on weeds in Cukurova region, Turkey. Afr J Biotechnol. 9: 7037-7042.

Cite this article as: Soliman El-Sagheer, Taha Yossef Hilal, Sobhy Ahmed Hassan Temerak, Sherif Abou elkassem. 2020. Performance of different herbicides and their combinations on weed control, growth and yield parameters of onion (*Allium cep*a L.). *Journal of Research in Weed Science*, 3(3), 344-362. DOI: 10.26655/JRWEEDSCI.2020.3.7