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Effect of Weed Control and N, K Fertilizers on Productivity of Onion (*Allium cepa* L.) and Associated Weeds under New Land Soils

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Abstract: Two field experiments were carried out at El-Ismailia Agricultural Research Station, Agricultural Research Center, Giza, Egypt during 2013/14 and 2014/15 seasons in the sandy soil under sprinkler irrigation system to study the effect of weed management and plant nutrition practices on weed biomass, growth characters and bulb yield of onion (*Allium cepa* L.). Weed management practices included eight weed control treatments i.e. (Pendimethalin, pyraflufen-ethyl, tepraloxydim, fluazifop-p-butyl) alone application of herbicides or combinations (pyraflufen-ethyl + tepraloxydim or + fluazifop-p-butyl), hand hoeing twice and unweeded check. The crop was fertilized with four levels of N, K fertilizers as follows (75 kg N + 25kg K, 75kg N+50 kg K, 150kg N+25 kg K and 150 kg N+50 kg K) and without fertilization by N and K under the recommended rate of super phosphate fertilizer (150 kg/faddan). The results indicated that weed management and N, K fertilizer levels had a significantly effect on dry weight of weeds and onion bulb yield. The best reduction of total dry weight of weed and bulb yield increase was obtained with spraying pendimethalin at 2 L/faddan (one faddan = 0.42ha) and Pyraflufen at 200 cm^3/faddan + Tepraloxydim at 600 cm^3/faddan. The best reduction percentage of total weeds was 81.7% and 75.9% resulted from pendimethalin in 2013/14 and 2014/15, respectively, compared to unweeded check. The highest bulb yield/faddan (9.51 and 12.98 t/faddan) was obtained from weed control by pyraflufen-ethyl +tepraloxydim in the first and second season, respectively. Increasing level of fertilizer applications increased the dry weight of total weeds. Application of 150 kg N + 50 or 25 kg K/faddan significantly increased bulb yield by 88.6% in the first season and 57% in the second season. The interaction effect between the combination of pyraflufen–ethyl+ tepraloxydim or + fluazfop-p-butyl and 150 kg N + 50 kg K was most productive (13.73, 13.36 and 14.6, 14.1 t/faddan compared with unweeded check and without N, K fertilizer was 2.73 and 3.1 t/faddan in the 1st and 2nd seasons, respectively.

Key words: Tepraloxydim · Pyraflufen-ethyl · Pendimethalin · Fluazifop-p-butyl · Herbicides · Onion · Weed control treatments

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most important crops all over the world belonging to family Alliaceae. It is most widely grown and popular crop among the alliums. Onion is considered to be the second most important vegetable crop grown in the world after tomato. This crop is usually grown in light soils especially in reclaimed areas. The importance of onion is rising from its high nutritional value for human. In 2014 season, the area grown of onion in Egypt was about 129083 faddan (Bulletin for Statistics Winter Field Crop (2014), Arab Republic of Egypt, Ministry of Agriculture and Reclamation, Economic AFFAIRS Sector (EAS) February 2014, with an average yield of 14.347 tons per faddan. Notably, the total cultivated area in Ismailia Governorate has been estimated by 306 faddan, represent about 2.37% of the total onion area cultivated in Egypt, where, the average yield was estimated at 10.412 tons per faddan. Onion has very poor competitive ability with weeds at all growing season due to inherent characteristics shortest plant, non-branching, slow growing initial stage and shallow root system. Yield losses due to weeds infestation as high between 70 to 84% [1, 2, 3]. The

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conventional method hand hoeing or hand weeding is high expensive and sometimes causes damage to the crop [3].

In onion transplant can be used pre or post emergence herbicides alone or combination to overcome of weed problem in onion field. Pendimethalin at 1kg/ha alone or combination with one hand weeding or oxyflurofen at 0.24 kg/ha + one hand weeding and different combinations of hand weeding or fluazifop-p-butyl with application of pendimethalin (pre-planting) and oxyfluorfen (post-emergence) recorded significantly reduce in weight of weeds and higher weed control efficiency, growth characters of onion plants and highest bulb yields [3, 4-9]. Onion crop requires higher levels of N, P and K fertilizer for develop vegetable growth and maximum bulb yield as well as, its need to develop the most effective and economical weed control. Increase level of fertilizer application caused increase total biomass of weeds [3, 10]. The highest bulb yield was obtained with 250 kg/ha potassium, 150 kg N and the 4 weed after transplanting (WAT) weeding regime [11]. Soil application of potassium sulphate at 200 kg/faddan produced the best plant growth (length and number of leaves/plant and fresh weight of leaves), as well as highest bulb yield and bulb quality [12, 13]. Oxyfluorfen at 0.24kg/ha pre-emergence + fluazifop-p-butyl at 0.25 kg/ha post-emergence and 125% recommended dose fertilizer (RDF) (125:62.5: 62.5) N: P: K fertilizer give the highest bulb yield followed by pendimethalin at 1kg / ha +one hand weeding and 100 % RDF (100: 50: 50 kg/ha N: P: K) [3]. The objective of this investigation was to study the effect of different levels of (N and K) fertilizers, some weed control treatments and their combined interactions on onion transplant productivity and associated weeds.

MATERIALS AND METHODS

Two field experiments were carried out at El-Ismailia Agricultural Research Station during 2013/14 and 2014/15 seasons to study the effect of the integration between chemical weed control and fertilizer treatments on growth, yield, as well as yield components of onion *(Allium cepa* L) and its associated weeds. Onion cv. Giza red was sown in rows 30 cm apart with hills spaced apart 10 cm. Plot area was $21m^2$ (4.2 m width × 5 m long). Each plot consisted of 7 rows. Transplanting took place on 12 of December and harvest on 10 of April in both seasons. Treatments could be summarized as follows:

Fertilization Levels:

- Without N or K Fertilizer (control).
- 75 kg N + 25 kg K/faddan (one faddan= 042ha).
- 75 kg N + 50 kg K/faddan.
- 150 kg N + 25 kg K/faddan.
- 150 kg N + 50 kg K/faddan.

Ammonium nitrate (33.5%N), potassium sulphate (48% K_2O) were used as sources of nitrogen and potassium, respectively.

Weed Control Treatments:

- Pendimethalin (Omega 33% EC) 2 L/faddan applied as pre-emergence method.
- Pyraflufen-ethyl (Ecopart 2% SC) applied at the rate of 200 cm^3 a.i./faddan as post-emergence at 25 days after transplanting (DAT).
- Tepraloxydim (Aramo 5% EC) was applied at the rate of 600 cm^3 a.i./faddan as post– emergence at 25 DAT.
- Pyraflufen-ethyl 200 cm^3 a.i./faddan + Tepraloxydim 600 cm^3 a.i./faddan as post–emergence at 25 DAT.
- Fluazifop-p-butyl (Fusilade forte 15% EC).1.25 L a.i./faddan as post–emergence at 25 DAT.
- Pyraflufen-ethyl 200 cm^3 a.i/faddan + Fluazifop-p-butyl at the rate of 1.25 L a.i./faddan as post–emergence at 25 DAT.
- Hand hoeing twice after 30 and 45 DAT.
- Unweeded (check).

Herbicides were sprayed with a knapsack sprayer (CP 3) at a volume rate of water 200 L/faddan. Treatments were arranged in a split plot design with four replicates. Fertilization treatments were arranged in the main plots and weed control treatments randomly arranged in the sub plots. Irrigation was carried out at 3-day intervals by sprinkler irrigation system. Other cultural practices were carried out as recommended, mechanical and chemical analyses were done at the site of soil and water in the experimental field as shown in Tables 1 and 2.

Data Recorded

Weed Assessments: At 60 and 75 days after transplanting all of annual weeds were uprooted from a quadrate of one square meter chosen randomly from the middle row of each sub plot to estimated dry weight of total annual weeds (g/m^2). Weeds were air dried for 3 days and then dried in the oven at 70°C to constant weight.

Table 1: Physical and chemical properties of the soil site in 2013/14 and 2014/15 winter seasons

Soil properties	2013/14	2014/15
Physical properties		
Coarse sand %	60.8	61.2
Fine sand %	33.7	34.1
Silt and clay %	5.5	4.7
Soil texture	Sandy	Sandy
Chemical properties		
pH	7.51	7.32
EC (mmohs/cm) at 25°C	0.24	0.37
Organic matter (OM %)	0.38	0.32
Calcium carbonate ($CaCO_3$ %)	1.62	1.75
Available macronutrients (ppm)		
Nitrogen (N)	22.7	27.53
Phosphorus (P)	5.48	6.45
Potassium (K)	56.30	59.20

Table 2: Chemical analyses of the irrigation water in 2013/14 and 2014/15 winter seasons

Water analysis	2013/14	2014/15
pH	7.9	7.7
EC	0.41	0.43
Soluble cations (ppm)		
Na^+	1.70	1.69
K^+	0.35	0.37
Ca^{++}	1.25	1.24
Mg^{++}	0.93	0.92
Soluble anions (ppm)		
HCO_3^-	1.30	1.29
Cl^-	1.85	1.82
SO_4^{--}	0.95	0.92
SAR	1.63	1.61

Growth Characters: After 90 days from transplanting, 10 plants were taken randomly from half line of middle rows of each plot to determine the plant height (cm) and dry weight/plant (g).

Yield and its Components: At harvest, ten bulbs were taken randomly from the middle rows from each plot to determine the bulb diameter (cm) and bulb weight (g), while the total bulb yield (ton/faddan) was determined from the sub-plots.

Statistical Analysis: Data obtained were subjected to statistical analysis of split-plot design calculated according to Snedecor and Cochran [14] and the least significant differences (LSD) to compare between treatment means at 5% level was used.

RESULTS AND DISCUSSION

Weed assessment revealed that dominant weed species in the experimental site were (wild mustered) *Sinapis arvensis* L., *Euphorbia peplus* L. *Lamium amplexicaula* L., *Plantago lagopus* L. and *Emex spinosus* L. as annual broad-leaved weeds and *Lolium* spp. as grassy weed in both seasons.

Effect of Weed Control Treatments on Dry Weight of Total Weeds (g/m^2): The statistical analysis of the data indicated that weed management treatments under investigation caused significant reduced on dry weight of total weeds at 60 and 75 days after transplanting (Table 3). Application of pendimethalin at the rate of 2L/faddan as pre emergence reduced dry weight of total weeds by 80 and 74.5% and 77.3% and 73.5 in the first & second survey in both seasons, respectively, compared to unweeded check followed by hand weeding, Pyraflufen–ethyl +tepraloxydim pyraflufen – ethyl + fluazifop-p-butyl, tepraloxydim, fluazifop-p-butyl and pyraflufen–ethyl in both seasons. These results due to effectively kill most of the weed community were more effective in reducing the weed density as the field was infested by all kinds of weeds. These results are in agreement with those obtained by Patel *et al.* [3], Bhutia *et al.* [4] and Kalhapure *et al.* [9].

Table 3: Effect of weed control treatments and N, K fertilizer levels on dry weight of total weeds (g/m^2) after 60 and 75 day from transplant in 2014 and 2015 winter seasons

	2013/2014		2014/2015	
	Dry weight (g)			
Character	Days after transplanting (DAT)			
Weed control treatments	60	75	60	75
Pyraflufen-ethyl	193.22	474.43	216.38	504.60
Pendimethalin	59.62	187.86	80.26	212.10
Tepraloxydim	172.04	480.84	190.41	515.08
Pyraflufen-ethyl+ Tepraloxydim	110.80	343.30	130.07	372.56
Fluazifop-p-butyl	194.72	536.80	218.64	567.00
Pyraflufen-ethyl+ Fluazifop-butyl	129.89	419.66	152.48	450.86
Hand hoeing twice	86.08	275.92	115.66	313.02
Unweeded (check)	306.65	734.48	353.26	801.54
LSD 0.05	43.96	17.18	50.62	25.20
N, K fertilization levels				
Without N, K fertilization	110.49	373.83	151.83	346.94
150kgN + 50kgK//faddan	205.55	411.27	171.03	580.38
150kgN+25kgK/faddan	188.07	511.90	217.83	553.38
75kgN+50kgK/faddan	144.76	545.55	239.33	450.42
75kgN+25kgK/faddan	134.27	315.64	130.41	405.00
LSD 0.05	36.84	16.13	44.81	20.15

Effect of N, K Fertilizer Levels on Dry Weight of Total Weeds (g/m^2): Concerning the results in Table 3 showed that the different levels of (N, K) fertilizer had significant effect on dry weight of total weeds in both seasons. The lowest dry weight of total weeds at 60 DAT was obtained from control (without N, K fertilizer) followed by application of 75 kg N + 25 kg K in the first season, but, the second season the lowest dry weight of total weeds was resulted from application of 75 kg N + 25 kg K followed by without application (N and K) fertilizers. At 75 DAT the lowest dry weight of total weeds was resulted from 75 kg N+ 25 kg K fertilizer, followed by without application (N, K) in the first season. The fertilizer by 75 kg N + 25 kg K give the best reduced in dry weight of total weeds without any significantly in estimated reduced in without fertilizer treatments in both seasons. The highest dry weight of total weeds result at 150 kg N + 50 kg K or 75 kg N +50 kg K at 60 and 75 DAT in both seasons. The results clearly indicated that increasing K fertilizer rate increased availability of nutrients for growth and development and dry weight of total weeds. These results are in agreement with those reported by Patel *et al.* [3] and Qasem [10].

Effect of Weed Control Treatments on Onion Growth Characters: All weed control treatments was significantly effect on plant height and dry weight (g/plant) at 90 days from transplanting (Table 4). Unweeded check recorded the highest plants, but the shortest plant resulted from hand hoeing twice. The plant height is the function of photosynthetic activity of the plant and their number of plants/unit to utilize available of sunlight. The increased weed biomass increase plant height of onion plant due to increasing weed competition with onion plant on sun light. Pyraflufen-ethyle +Tepraloxydin gave the best increase on dry weight of plant followed by the other weed control treatments. Whereas, the lowest Pyraflufen-ethyl + Tepraloxydim or + fluzifop-p-butyl, pendimethalin alone and hand hoeing twice for weed control recorded the best increase on dry weight of plant, but the lowest value of dry weight/plant resulted from unweeded check in both seasons. These results due to reduce weed competition for onion plants during initial stage and later stage as well as killed two groups of annual weed (broad and grassy weeds) by combination of two specific herbicides or hand hoeing twice which ultimately provided weeds free environment to onion. These results are in conformity with those reported Patel *et al.* [7] and Qasem [10].

Effect of N, K Fertilizer Levels on Onion Growth Characters: Different levels of N, K fertilizer under study had significant effect on plant height after 90 days and dry weight of onion plant (Table 4). The increase of N and K fertilizer level reflected on increased plant height (cm) and weight (g) compared with the unfertilized plants in both seasons. These resulted due to increase the nutrient element in soil and decreased weed/onion competition. This result is in agreement with those obtained by Ibraheim [12] and El-Bassiony [13].

The Effect of Weed Control Treatments on Onion Yield and its Components: Results in Table 5 presents treatments under study was significantly effect on diameter and weight of bulb onion and total bulb yield/faddan. The combination of pyraflufen-ethyl with tepraloxydim or with fluzifop-p-butyl, pendimethalin alone and hand hoeing twice for weed control recorded the best increase on diameter and weight of onion bulb and bulb yield/faddan without any different significantly between these treatments, but the lowest value of dry weight/plant, diameter and weight of bulb and bulb yield resulted from unweeded check in both seasons. These results due to lower weed population and reduce dry matter production of weeds during initial and later stage as well as killed the two groups of annual weed (broad and grassy weeds) by combination of two specific herbicides or hand hoeing twice which ultimately provided weeds free environment to onion. These results are in conformity with those reported by Patel *et al.* [7], Qasem [10] and Ibraheim [12]. All weed control treatments caused significantly increase in onion bulb yield (ton/faddan) in both seasons. The highest increase percentage was 38.3 and 19.2% resulted from pyraflufen- ethyl + tepraloxydim in 2013/14 season and pendimethalin in 2014/15 season compared to unweeded check (Table 5). Hand hoeing twice produced an increase percentage 35.3 and 17% in 2013/14 and 2014/15 winter seasons, respectively, compared to unweeded check. These resulted attributed to increase in dry weight of onion bulb and bulb diameter due to prevent weed competition with onion plant.

The Effect of N, K Fertilizer Levels on Bulb Yield and its Components: Different levels of N, K fertilizer under study had significant effect on bulb weight (g) and bulb diameter (cm) in both seasons (Table 5). The increase of N, K fertilizer level reflected on increase bulb weight (g) and diameter in both seasons. These results due to increase the nutrient element in soil and decrease

Table 4: Effect of weed control treatments and N, K fertilizer levels on growth characters of onion after 90 days from transplanting in 2014 and 2015 winter seasons

Character	2013/2014		2014/2015	
Weed control treatments	Plant height (cm)	Dry weight (g/plant)	Plant height (cm)	Dry weight (g/plant))
Pyraflufen-ethyl	56.57	7.54	57.98	8.00
Pendimethalin	55.61	8.15	56.54	8.72
Tepraloxydim	56.81	7.96	57.98	8.42
Pyraflufen-ethyl+ Tepraloxydim	56.51	9.11	57.56	9.98
Fluazifop-p-butyl	56.63	7.78	57.96	8.01
Pyraflufen-ethyl+ Fluazifop-butyl	56.09	8.77	57.14	9.06
Hand hoeing twice	54.77	8.45	55.78	9.01
Unweeded (check)	57.57	6.71	59.36	6.96
LSD 0.05	0.27	0.22	0.28	0.21
N, K fertilization levels				
Without N, K fertilization	42.15	3.70	44.15	4.35
150kgN + 50kgK//faddan	65.37	12.26	66.71	12.52
150kgN+25kgK/faddan	62.86	11.05	63.23	12.22
75kgN+50kgK/faddan	58.44	7.50	59.51	7.73
75kgN+25kgK/faddan	52.81	5.81	54.07	6.21
LSD 0.05	0.25	0.12	0.29	0.13

Table 5: Effect of weed control treatments and N, K fertilizer levels on yield and its components of onion crop, in 2014 and 2015 winter seasons

Character	2013/2014			2014/2015		
Weed control treatments	Bulb weight (g)	Bulb diameter (cm)	Bulb yield (t/faddan)	Bulb weight (g)	Bulb diameter (cm)	Bulb yield (t/faddan)
Pyraflufen-ethyl	46.18	3.95	8.51	46.90	3.99	10.76
Pendimethalin	48.38	4.21	9.10	49.09	4.40	11.69
Tepraloxydim	47.32	4.09	8.83	48.28	4.11	10.73
Pyraflufen-ethyl+ Tepraloxydim	50.35	4.34	9.43	51.74	4.39	11.53
Fluazifop-p-butyl	47.10	4.03	8.81	48.56	4.06	10.16
Pyraflufen-ethyl+ Fluazifop-butyl	45.99	4.27	9.26	46.49	4.26	11.27
Hand hoeing twice	49.17	4.24	9.23	50.23	4.27	11.48
Unweeded (check)	42.45	3.67	6.82	43.77	3.73	9.81
LSD 0.05	3.57	0.05	0.18	6.62	0.08	0.20
N, K fertilization levels						
Without N, K fertilization	36.04	2.10	5.68	36.11	2.08	7.57
150kgN + 50kgK//faddan	56.10	5.32	10.77	50.04	5.32	11.89
150kgN+25kgK/faddan	53.06	4.93	10.39	53.81	4.98	12.19
75kgN+50kgK/faddan	50.61	4.32	8.93	47.26	4.35	11.61
75kgN+25kgK/faddan	44.82	3.95	8.81	45.44	4.02	11.39
LSD 0.05	3.07	0.03	0.09	4.15	0.02	0.07

competition between the plants/units. Bulb yield (ton/faddan) increased by increasing N and K fertilizer level, the increase percentages of bulb yield/faddan was 89.6, 82.9, 57.2 and 55.1% in 2013/14 season and 57.1, 61.0, 53.4 and 50.5% in 2014/15 season by using N, K fertilizer levels 150 kg N + 50 kg K, 150 kg N + 25 kg K, 75 kg N + 50 kg K and 75 kg N + 25 kg K), respectively, compared to without N and K fertilizer. This fact due to increase and improved growth characters of onion plant and increased in bulb weight and diameters due to increase of nutrient element in soil. This finding is in line those reported by Qasem [10], Gambo *et al.* [11] and El-Bassiony [13].

The Interaction Effect between Weed Control Treatments and N, K Fertilizer Levels on Dry Weight of Total Weeds (g/m^2) at 60 and 75 DAT: Results in Table 6 indicated that the interaction effect between weed control treatments and N, K fertilizer levels were significantly on dry weight of total weeds at 60 and 75 DAT in both seasons. The highest reduction percentage of weed dry weight was 91.8 and 89.4% at 60 DAT, 89.0 and 87.4% at 75 DAT resulted from pendimethalin herbicide and without N, K fertilizer in the 1st and 2nd seasons, respectively compared with high level N, K fertilizer (150 kg N + 50 kg K) and unweeded check. The less total dry weight of

Table 6: The interaction effect between weed control treatments and N, K fertilizer levels on dry weight of total weeds (g/m^2) at 60 and 75 DAT in 2013/14 and 2014/15 winter seasons

	2013/2014					2014/2015				
Fertilization levels	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5
Weed control treatments	Dry weight of total weeds at 60 DAT									
Pyraflufen-ethyl	165.3	250.8	233.4	182.4	169.2	147.3	288.6	272.6	203.3	170.1
Pendimethalin	30.0	89.0	75.7	54.2	49.1	46.1	114.3	102.3	72.3	66.3
Tepraloxydim	127.7	220.7	204.4	157.8	149.6	146.3	242.6	217.3	181.3	166.3
Pyraflufen-ethyl+ Tepraloxydim	66.4	155.9	140.8	100.5	90.6	79.1	180.6	165.1	123.1	104.1
Fluazifop-p-butyl	143. 3	254.7	212.1	177.8	165.7	166.6	276.6	253.6	205.6	190.6
Pyraflufen-ethyl+ Fluazifop-butyl	89.4	176.6	159.6	119.6	104.4	106.6	212.1	184.1	141.3	118.3
Hand hoeing twice	43.6	128.6	118.7	72.5	66.9	71.1	166.6	149.1	105.1	87.1
Unweeded (check)	248.2	368.4	351.9	293.3	283.6	280.3	433.3	400.6	340.1	312.1
LSD 0.05			89.7					95.7		
	Dry weight of total weeds at 75 DAT									
Pyraflufen-ethyl	286.4	631.1	561.7	483.8	433.7	256.3	669.4	630.0	513.7	453.3
Pendimethalin	93.3	273.3	260.1	168.1	143.7	116.3	299.0	288.7	195.7	164.4
Tepraloxydim	368.6	591.3	563.2	458.0	423.2	404.6	619.7	602.7	490.0	458.4
Pyraflufen-ethyl+ Tepraloxydim	231.7	446.8	410.1	303.5	269.6	305.3	471.0	448.4	330.0	309.0
Fluazifop-p-butyl	420.9	659.6	613.5	516.6	473.5	445.4	691.0	651.6	546.6	501.3
Pyraflufen-ethyl+ Fluazifop-butyl	306.0	544.2	513.5	392.7	342.0	330.0	567.0	543.0	433.7	380.6
Hand hoeing twice	214.1	366.9	334.0	249.1	215.5	250.4	404.0	381.7	289.7	239.3
Unweeded (check)	604.1	851.4	809.1	718.5	689.3	667.3	921.7	881.0	804.0	733.7
LSD 0.05			38.7					50.7		

F1= Without N or K Fertilizer (control), F2 = 75 kg N + 25 kg K/faddan, F3= 75 kg N + 50 kg K/faddan, F4= 150 kg N + 25 kg K/faddan, F5= 150 kg N + 50 kg K/faddan.

Table 7: The interaction effect between weed control treatments and N, K fertilizer on plant height (cm) after 90 days of onion transplanting in 2013/14 and 2014/15 seasons

Fertilization levels	2013/2014					2014/2015				
Weed control treatments	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5
	Plant height (cm) at 90 DAT									
Pyraflufen-ethyl	42.26	65.70	63.20	58.36	53.33	44.10	68.10	64.10	59.30	54.40
Pendimethalin	41.56	65.30	62.36	57.63	51.23	43.20	66.40	62.40	58.20	52.50
Tepraloxydim	42.70	65.73	63.43	59.30	53.46	45.20	66.70	64.50	60.10	55.30
Pyraflufen-ethyl+ Tepraloxydim	42.50	65.60	63.13	58.50	52.63	44.40	66.40	63.50	59.40	53.30
Fluazifop-p-butyl	42.60	65.26	63.10	58.63	53.26	44.70	66.20	63.40	60.10	54.40
Pyraflufen-ethyl+ Fluazifop-butyl	41.50	65.33	62.66	58.36	52.60	43.20	66.70	63.10	59.20	53.50
Hand hoeing twice	40.33	63.30	61.50	57.20	51.53	42.20	64.10	62.10	57.60	53.10
Unweeded (check)	43.76	66.70	63.50	59.53	54.40	46.20	69.10	63.10	62.30	56.20
LSD 0.05			0.57					0.59		

F1= Without N or K Fertilizer (control), F2 = 75 kg N + 25 kg K/faddan, F3= 75 kg N + 50 kg K/faddan, F4= 150 kg N + 25 kg K/faddan, F5= 150 kg N + 50 kg K/faddan

weeds (g/m^2) was resulted from the interaction between less level of N and K fertilizer (0.0 kg N + 0.0 kg K followed by 75 kg N + 25 kg K, 75 kg N + 50 kg K) and weed control by pendimethalin or hand hoeing twice or pyraflufen-ethyl + tepraloxydim or pyraflufen-ethyl + fluazifop-p-butyl, respectively, without any different significantly between these treatments at 60 and 75 DAT in both seasons. The highest dry weight of total weeds was obtained from the interaction between 150 kg N +50 kg K and without any weed control treatments at 60 and 75 DAT in both seasons. These results attributed to increasing the fertilizer level increased availability of nutrients for growth and development of weed and increase number of weed plants/unit at unweeded check, but by using any weed control treatment dry weight of total weed decreased due to killed weed species plants.

Table 8: The interaction effect between weed control treatment and N, K fertilizer on dry weight of onion (g) after 90 days of onion in 2013/214 and 2014/15 seasons

Fertilization levels	2013/2014					2014/2015				
Weed control treatments	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5
	Dry weight (g) at 90 DAT									
Pyraflufen-ethyl	3.20	11.40	10.50	7.40	5.20	4.10	11.30	11.20	7.80	5.60
Pendimethalin	3.70	12.40	11.30	7.40	6.00	4.40	12.80	12.50	7.70	6.20
Tepraloxydim	3.60	12.20	11.10	7.30	5.70	4.40	12.40	12.10	7.40	5.80
Pyraflufen-ethyl+ Tepraloxydim	4. 60	13.70	12.20	8.30	6.80	5.10	14.60	14.10	8.70	7.40
Fluazifop-p-butyl	3.40	12.20	10.80	7.20	5.40	4.10	11.80	11.50	7.30	5.80
Pyraflufen-ethyl+ Fluazifop-butyl	4.20	13.40	11.70	8.20	6.40	4.80	14.10	13.60	8.50	7.10
Hand hoeing twice	4.30	12.60	11.40	7.80	6.20	4.80	13.10	12.70	8.20	6.70
Unweeded (check)	2.70	10.20	9.50	6.30	4.80	3.10	10.20	10.10	6.30	5.10
LSD 0.05			3.23					11.36		

F1= Without N or K Fertilizer (control), F2 = 75 kg N + 25 kg K/faddan, F3= 75 kg N + 50 kg K/faddan, F4= 150 kg N + 25 kg K/faddan, F5= 150 kg N + 50 kg K/faddan.

Table 9: The interaction effect between weed control treatment and N, K fertilizer on bulb diameter (cm) at harvest in 2013/14 and 2014/15 seasons

Fertilization levels	2013/2014					2014/2015				
Weed control treatments	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5
	Bulb diameter (cm) at harvest									
Pyraflufen-ethyl	1.85	5.18	4.72	4.26	3.75	1.92	5.23	4.74	4.32	3.78
Pendimethalin	2.05	5.35	5.18	4.45	4.04	2.38	5.40	5.23	4.51	4.36
Tepraloxydim	2.01	5.30	4.92	4.32	3.92	2.06	5.33	4.93	4.31	3.94
Pyraflufen-ethyl+ Tepraloxydim	2.24	5.51	5.20	4.47	4.30	2.30	5.55	5.37	4.52	4.37
Fluazifop-p-butyl	1.91	5.27	4.82	4.31	3.86	1.94	5.32	4.82	4.33	3.92
Pyraflufen-ethyl+ Fluazifop-butyl	2.16	5.46	5.12	4.43	4.22	2.20	5.17	5.21	4.48	4.24
Hand hoeing twice	2.33	5.43	5.04	4.32	4.12	2.34	5.47	5.07	4.33	4.15
Unweeded (check)	1.47	5.02	4.46	4.03	3.40	1.53	5.11	4.52	4.04	3.45
LSD 0.05			0.12					0.14		

F1= Without N or K Fertilizer (control), F2 = 75 kg N + 25 kg K/faddan, F3= 75 kg N + 50 kg K/faddan, F4= 150 kg N + 25 kg K/faddan, F5= 150 kg N + 50 kg K/faddan

The Interaction Effect between Weed Control Treatments and N, K Fertilizer Levels on Plant Height (cm) at 90 Days from Transplanting: Data presented in Table 7 showed that fertilizer by using 150 kg N + 50 kg K and without any treatments for weed control (unweeded check) give the heights onion plant due to increasing number of plant/unit area (weeds plants + onion plants) increase the competition between onion plant and weeds plant on sun light, moreover increase availability of nutrients due to increase N, K fertilizer level. This result is in agreement with those obtained by Patel *et al.* [3, 7].

The Interaction Effect between Weed Control Treatments and N, K Fertilizer Levels on Weight of Onion Plant (g) at 90 Days from Transplanting: The interaction effect between weed control treatments and N, K fertilizer levels was significantly increase on dry weight of onion plant (g/plant) after 90 days from transplanting in both seasons (Table 8). The greatest weight of onion plant was obtained from fertilizer by 150 kg N + 50 kg K and weed control by combination from pyraflufen-p-ethyl + tepraloxyydim, followed by 150 kg N + 50 kg K and weed control by Pyraflufen-p-ethyl + fluazifop-p-butyl, 150 kg N + 50 kg K and hand hoeing twice, but, the lowest value of plant weight was resulted from weedy check and without N, K fertilizer in both seasons.

The Interaction Effect between Weed Control Treatments and N, K Fertilizer Levels on Bulb Diameter at Harvest: Results in Table 9 indicated that the interaction effect between weed control treatments and N, K fertilizer levels was significantly increase on bulb diameter (cm) at harvest in both seasons. The greatest bulb diameters was obtained from weed control by combination pyraflufen-p-ethyl + tepraloxyydim and fertilizer by 150 kg N + 50 kg K, followed by 150 kg N + 50 kg K and weed control by Pyraflufen-p-ethyl + fluazifop-p-butyl, 150 kg N + 50 kg K and hand hoeing twice, but, the lowest value of bulb diameters was resulted from unweeded check and without N and K fertilizer in both seasons.

Table 10: Effect of the integration between weed control treatment and N, K fertilizer on bulb weight (g) and total bulb yield (ton/faddan) 2013/14 and 2014/15 seasons

Fertilization levels	2013/2014					2014/2015				
Weed control treatments	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5
	Bulb weight (g)									
Pyraflufen-ethyl	35.10	54.20	52.30	46.20	43.10	33.70	55.50	54.00	46.60	44.80
Pendimethalin	36.50	56.60	53.60	49.40	45.80	34.70	57.90	54.60	52.40	45.10
Tepraloxydim	35.80	56.70	52.70	46.70	44.80	38.70	59.00	52.40	45.80	45.50
Pyraflufen-ethyl+ Tepraloxydim	38.30	58.60	55.40	51.50	47.90	38.80	62.30	56.30	53.30	48.80
Fluazifop-p-butyl	35.60	55.70	52.30	47.60	44.30	35.40	59.10	54.00	48.30	46.10
Pyraflufen-ethyl+ Fluazifop-butyl	38.10	58.30	55.10	31.30	47.20	38.60	59.10	55.20	33.70	45.10
Hand hoeing twice	37.70	57.50	54.30	50.20	46.10	37.50	58.50	55.00	53.30	46.90
Unweeded (check)	31.30	50.50	48.60	42.50	39.50	31.60	53.00	49.00	44.70	40.60
LSD 0.05			7.47					8.92		
	Total bulb yield (ton/faddan)									
Pyraflufen-ethyl	4.91	10.65	10.26	9.17	7.59	5.82	11.42	10.59	11.04	11.94
Pendimethalin	5.93	11.32	10.73	9.06	8.19	6.85	11.51	14.08	11.86	11.93
Tepraloxydim	5.60	10.76	10.56	9.20	8.05	6.40	11.54	14.08	11.58	10.08
Pyraflufen-ethyl+ Tepraloxydim	6.37	11.60	11.07	9.35	9.19	9.90	13.99	14.33	14.03	12.67
Fluazifop-p-butyl	5.74	10.67	10.68	9.17	7.80	8.60	11.99	11.75	8.74	10.27
Pyraflufen-ethyl+ Fluazifop-butyl	6.22	11.47	10.96	9.13	8.40	8.95	11.65	11.31	11.68	12.79
Hand hoeing twice	6.30	11.49	10.98	9.18	8.24	8.01	12.19	11.48	12.90	10.87
Unweeded (check)	4.39	8.17	7.88	7.18	6.49	6.62	10.84	9.97	11.06	10.58
LSD 0.05			3.38					0.42		

F1= Without N or K Fertilizer (control), F2 = 75 kg N + 25 kg K/faddan, F3= 75 kg N + 50 kg K/faddan, F4= 150 kg N + 25 kg K/faddan, F5= 150 kg N + 50 kg K/faddan.

The Interaction Effect between Weed Control Treatments and N, K Fertilizer Levels on Weight of Bulb (g) and Bulb Yield (ton/faddan): Data presented in Table 10 showed that the interactions between weed control treatments and different levels of N and K fertilizer caused increased significantly on bulb weight (g/bulb) and bulb yield of onion (ton/faddan). The highest bulb weight (g/bulb) and bulb yield (ton/faddan) resulted from the interaction between application (150 kg N+50 kg K) and weed control by Pyraflufen-ethyl + tepraloxydim in 2013/14 but the highest bulb yield in 2014/15 season was resulted from the interaction between (150 kg N+25 kg K) weed control by Pyraflufen-ethyl + tepraloxydim. The lowest value of bulb weight (g/bulb) and bulb yield (ton/faddan) was obtained at weedy check and without N, K fertilizer in both seasons. The highest increase of bulb yield was 164% in the first season resulted from Pyradlfen-ethyl + tepraloxydim and application 150kg N+50 kg K), but the second season was 116.5% resulted from the interaction between (150kg N+25kg K) and weed control by Pyraflufen-ethyl + tepraloxydim, compared to unweeded check and without N, K fertilizer. These results due to increased bulb diameter and bulb weight due to reduce dry weight of weed and increased nutrients availability for onion growth and development. These results are in agreement with obtained by Patel *et al.* [3, 7].

CONCLUSION

This study produced useful information about some effective weed control treatments and the rate of N, K fertilizer to need of onion plants under new land to produce the highest bulb yield by using the effective weed control treatments and increased the rental for weed control practices. From these results, for the best quantity and quality of onion bulb yield, it can be recommended by using 150 kg N +50 kg K with weed control by combination grassy weed herbicide such as Tepraloxydim or Fluazifop-p-butyl with specific broad leaves herbicide (Pyraflufen-ethyl) or hand hoeing twice. Moreover, reduced the rate of K fertilizer by using the effective weed control treatments such as using the combination of pyraflufen–ethyl + tepraloxydim herbicides can be compensate for the loss 25 kg K fertilizer than the recommended K fertilizer level (50 kg).

REFERENCES

1. Tewari, A.N., S.N. Tewari, J.P.S. Rathi, B. Singh and A.K. Tripathi, 2003. Studies on crop – weed competition in kharif onion (*Allium cepa* L.). Indian Journal of Weed Science, 35(2): 156-158.

2. Swaify, N.G., 2009. Studies on weed control in onion. Ph.D. Theses, Fac. Agric., Al-Azhar Univ., Cairo.
3. Patel, T.U., C.L. Patel, D.D. Patel, J.D. Thanki, P.S. Patel and A.J. Ram, 2011. Effect of weed and fertilizer management on weed control and productivity of onion (*Allium cepa* L.). Indian J. Agronomy, 56(3): 267-272.
4. Bhutia, D.T., T.K. Maity and R.K. Ghosh, 2005. Integrated weed management in onion. Journal of Crop and Weed, 1(1): 61-64.
5. Jilani, M.S., M. Ramzan and K. Waseem, 2007. Impact of weed management practices on growth and yield of some local genotypes of onion. Pak. J. Weed Sci. Res., 13(3-4): 191-198.
6. Hussain, Z., K.B. Marwat, A. Shah, S.A. Arifullah and N.M. Khan, 2008. Evaluation of different herbicides for weed control in onion. Sarbad. J. Agric., 24(3): 453-456.
7. Patel, T.U., C.L. Patel, D.D. Patel, J.D. Thanki, M.K. Arvadia and H.B. Vaidya, 2012. Performance of onion under weed and fertilizer management. Indian Journal of weed Science, 44(3): 151-158.
8. Kalhapure, A.H. and B.T. Shete, 2012. Integrated weed management in onion. Indian Journal of Weed Science, 44(2): 88-91.
9. Kalhapure, A.H., B.T. Shete and D. Madhukar, 2014. Weed management in onion by pre-planting and post-emergence herbicides for seed production. Indian of Weed Science, 46(2): 142-145.
10. Qasem, J.R., 2006. Chemical weed control in seedbed sown onion (*Allium cepa* L.). Crop Protect, 25(6): 618-22.
11. Gambo, B.A., M.D. Magaji, A.I. Yakubu and A.U. Dikko, 2008. Effects of nitrogen, potassium and weed Interference on yield of onion (*Allium cepa* L.) at the Sokoto Rima Vally. Nigerian Journal of Basic and Applied Sciences, 16(2): 275-279.
12. Ibraheim, S.K.A., 2004. Effect of fertilization on onion under sandy soil conditions. M. Sc. Thesis, Fac. Agric., Zagazig, Univ., Egypt.
13. El-Bassiony, A.M., 2006. Effect of potassium fertilization on growth, yield and quality of onion plants. Journal of Applied Sciences Research, 2(10): 780-785.
14. Snedecor, G.W. and W.G. Cochran, 1972. Statistical Methods. 6th Ed. Iowa St., Univ., Press Ames.