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INTEGRATED WEED MANAGEMENT IN PEANUT (*Arachis hypogaea* L.) WITH SOWING METHODS AND HERBICIDES COMBINATIONS UNDER SPRINKLER IRRIGATION CONDITIONS

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ABSTRACT

Two field experiments were conducted in the Agricultural Research Station of Ismailia, Agricultural Research Center, Egypt in sandy soils heavily infested with weeds, during 2013 and 2014 successive summer seasons under sprinkler irrigation system. The objectives of study was to evaluate the effect of sowing and weed control methods and the interaction between them on associated weeds, growth, yield as well as yield components of peanut with economic study feasibility. Treatments were arranged in split plot design. Two sowing methods being afir1 (without pre-sowing irrigation) and afir2 (with pre-sowing irrigation) were allocated in the main plots and nine weed control treatments (pendimethalin at the rate of 684g/fed. applied post sowing, pendimethalin + clethodim at the rate of 125g/fed. applied post emergence, pendimethalin + imazapic at the rate of 2.04g/fed. applied post emergence, pendimethalin + clethodim + imazapic, clethodim, clethodim + imazapic, imazapic, two hand hoeing and weedy check) were arranged in sub plots. The predominant troublesome weed species in the experimental fields through the two seasons were *Portulaca oleracea* and *Euphorbia geniculata* as annual broad leaf weeds, *Digitaria samgunalis and Dactyloctenium aegyptium* as annual grasses, and *Cyperus rotundus* as sedges and *Panicum repens* as perennial grasses.

Results indicated that afir2 sowing method (stale bed preparation) significantly reduced the fresh weight of total weeds by 30.1 and 28.6% in 2013 and 2014 seasons, respectively, than afir1 sowing method and significantly increased pod yield of peanut by 13.5 and 15.5% in 2013 and 2014 seasons, respectively, as compared with afir1 sowing method. Net income for peanut significantly increased by 20.4 and 23.0% in 2013 and 2014 seasons, respectively, as compared with afir1 sowing method. Applying (pendimethalin at the rate of 684g/fed. applied post sowing + clethodim at the rate of 125g/fed. applied post emergence + imazapic at the rate of 2.04g/fed. applied post emergence) herbicide combinations significantly reduced the fresh weight of total weeds by 95.8 and 95.4% in 2013 and 2014 seasons, respectively, as compared with weedy check treatment and significantly increased pod yield by 64.9 and 63.6% and net income by 99.3 and 98.0% in 2013 and 2014 seasons, respectively as compared with weedy check treatment. Oil % was not affected significantly by either sowing or weed control methods in both seasons.

Thus, the best integration for weed control including annual or perennial troublesome weeds are by using afir 2 sowing method accompanied with applying the combination herbicides of pendimethalin at the rate of 684g/fed. applied post sowing + clethodim at the rate of 125g/fed. applied post emergence at 30 days from sowing + imazapic at the rate of 2.04g/fed. applied post emergence at 30 days from sowing under sprinkler irrigation system in Ismailia area.

Key words: *peanut, sowing methods, weed management, Ismailia, Egypt.*

1. INTRODUCTION

Peanut (*Arachis hypogaea* L.) is one of the most important leguminous oil crops all over the world. In Egypt, it is usually cultivated in light soils especially in reclaimed areas. In 2014 season the cultivated area in Egypt is computed to 134.000[1] faddans where, the total cultivated area in Ismailia Governorate has been estimated by 10.216 faddan (9.24%) of the total peanut area cultivated in Egypt.

[1] Arab Republic of Egypt, Ministry of Agric. And Reclamation, Economic AFFAIRS Sector.

Weeds are the main problem which faces peanut production in Egypt, especially under sprinkler irrigation conditions in new lands, Weeds germinate with frequent irrigation in short periods causing a major weed problem for farmers growing this crop. *Portulaca oleracea*, *Euphorbia geniculata* and grasses as *Digitaria sangunalis*, *Dactyloctenium aegyptium* and *Panicum repens are* annual weed species and nutsedge and *Cynodon dactylon* as main troublesome perennial weed species. Thus, planning weed control strategy in this crop should be containing herbicide combinations to overcome the kinds of weeds by widening weed control spectrum.

Such problem appeared in Romania where Sarpe *et al*. (1989) found that peanut crop located in sandy soils, was heavily infested with *Agropyron repens*, *Cynodon dactylon* and other annual species as *Setaria verticilata Digitaria sangunalis*, *Chnopodium album* and *Amaranthus retroflexus*. They also found that some dinitroaniline herbicides such as trifluralin and others (fluazifop – p – butyl and haloxyfop–ethoxy–ethyl) combinations enabled farmers to establish strategies for the control of annual and perennial weeds. Wilcut *et al*. (1994) in Texas, found that yellow and purple nutsedge infestations continued to increase in peanut fields because the use of dinitroaniline herbicides can control most grasses and small seeded broad leaf weeds allowing the sedges to thrive; and spread of tubers by field equipment and its high reproductive capacity. Grichar and Boswell (1986) found that fluazifop applied at 280 and 410 g /ha and haloxyfop at 140 g/ha gave better results when applied to control annual grasses in the 2-4 leaf stage and peanut yield was usually higher following the early application.

Selective control of yellow nutsedge species in peanut was registered by Wilcut and Richburg (1992). Grichar and Nester (1997) evaluated AC 263, 222 and imazethapyr for yellow and purple nutsedge control in peanut and found that AC 263, 222 at 0.05 to 0.07 kg/ha controlled purple nutsedge 88 to 99%. Bridges *et al*. (1984) found that herbicides or two cultivation alone failed to provide acceptable weed control or net return, however adding two cultivations to herbicide treatments produced acceptable weed control peanut and net return. Hauser *et al*. (1973), Hauser *et al*. (1974) and Hauser and Parham (1969) tried to separate and evaluate the role of cultivation and herbicides in a total weed control program in peanut. They found that intensive herbicide treatments produced higher yields and gross profits per hectare than did intensive cultivation treatments.

Objectives of this research were to evaluate the contribution of early cultivation after applying pre sowing irrigation, hand hoeing and pre and post herbicide combinations on weed control, yield and net return of peanut under sprinkler irrigation conditions in sandy soil in Ismailia Governorate.

2. MATERIALS AND METHODS

Two field experiments were established in sandy soil (Table A) in Ismailia Agricultural Research Station, Agricultural Research Center, Egypt, during 2013 and 2014 successive summer seasons to study the response of peanut to eighteen treatments which were the combinations of two sowing methods and nine weed control treatments on weeds and peanut productivity in split plot design. The soil texture was sandy texture. Table (A) shows mechanical and chemical analysis of the soil.

Table (A): Mechanical and chemical analysis of the soil at the experimental site.

	Analysis	Season	
		2013	2014
Mechanical analysis	Coarse sand	25.32%	28.03%
	Fine sand	69.37%	66.18%
	Silt	3.82%	3.94%
	Clay	1.49%	1.85%
Soil texture		Sandy	Sandy
Chemical analysis	$Caco_3$ content	1.39%	1.54%
	Organic matter	0.21%	0.25%
	PH	7.80	7.86
	EC dm/m (1:5 ext.)	0.35	0.38

2.1.Main plots were sowing methods

A1. Afir 1 (without pre-sowing irrigation).

A2. Afir2 (with pre-sowing irrigation two weeks before seeding and after 10-15 day soil were plowed immediately after first weed germination). Both sowing methods were applied in the same day as a main plots.

2.2.Sub plots were herbicide treatments

B1- Stomp 46 % CS (pendimethalin) applied at the rate of 1.5L/faddan post sowing (pre-emergence).

B2- Select 12.5 % EC (clethodim) applied at the rate of1L/faddan post emergence at 30 days from sowing.

B3- Kadri 24 % SL (imazapic) applied at the

rate of 85 cm/faddan post emergence at 30 days from sowing.

B4- Stomp applied at the rate of 1.5 l/faddan post sowing + Select applied at the rate of 1 l/faddan post emergence at 30 days from sowing.

B5- Stomp applied at the rate of 1.5 l/faddan post sowing + Kadri applied at the rate of 85 cm/faddan post emergence at 30 days from sowing.

B6- Select applied at the rate of 1 l/faddan post emergence at 30 days from sowing + Kadri applied at the rate of 85 cm/faddan post emergence at 30 days from sowing.

B7- Stomp applied at the rate of 1.5 l/faddan post sowing + Select applied at the rate of 1 l/faddan post emergence at 30 days from sowing + Kadri applied at the rate of 85 cm/faddan post emergence at 30 days from sowing.

B8- Hand-hoeing twice.

B9- Weedy check (control).

Trade name, common name, chemical group and chemical name of the herbicides used in this study are shown in Table (B).

Treatments were arranged in split plot design in three replications. The plot area was 10.5 m². Peanut seeds (cv. Giza 6) were planted at the rate (40kg seed/faddan) in rows (60 cm apart and 10 cm between hills). Irrigation was done by sprinkler irrigation system at 3 day intervals. The preceding winter crop in both seasons was wheat. Phosphorus fertilizer was applied in the form of calcium super phosphate (15.5% P_2O_5) at the rate of 200 kg/faddan during soil preparation and incorporated into the soil before planting. Nitrogen fertilizer was added in the form of ammonium nitrate (33.5% N) at the rate of 150kg/faddan splitted into five equal doses, the first dose was added with peanut planting whereas other doses were added at 10, 20, 30, and 40 days from planting. Potassium fertilizer was added in the form of potassium sulphate (48% K_2O) at the rate of 100kg/faddan in two equal doses, the first dose was added after one month from planting and the second dose was added after one month from the first dose. Herbicides were sprayed by using knapsack sprayer with 200 l of water/faddan.

All other cultural practices were applied as recommended for peanut production in the region. Sowing was done in the 18th and the 25th May in 2013 and 2014 seasons, respectively and harvest was done in the 20th and the 30th September in 2013 and 2014 seasons, respectively.

2.3. Data recorded

2.3.1. Weed assessment

Weeds were hand pulled from one square meter chosen randomly from each plot at 60 days after planting and the fresh weight of weeds (g/m^2) was recorded. Weeds were identified according to Tackholm (1974), classified into the following groups:

1- Broad leaf weeds (*Portulaca oleracea* and *Euphorbia geniculata*).

2- Grassy weeds (*Digitaria samgunalis*, *Dactyloctenium aegyptium* and *Panicum repens*). and 3- Total weeds.

Table (B): Trade name, common name, chemical group and chemical name of the herbicides used in this study.

Trade name	Common name	Chemical group	Chemical name
Stomp 45.6% CS	**Pendimethalin**	**Dinitroaniline**	**N-(1-ethyleprople)-3,4-di-methyl-2,6-dinitrobenzen-amine)**
Select 12.5% EC	**Clethodim**	**Cyclohexanedione oxime**	**(3- chloro-2- propenyl) oxy-liminolpropil-5- (12- (ethylio) propyl-3- hydroxyl- 2- cyclohexen-1- one)**
Kadri 24% SL	**Imazapic**	**Imidazolinone**	**2-[4, 5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H* imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid**

2.3.2. Crop characters

At harvest a samples of ten peanut plants were taken off at random from each plot to determine:

2.3.2.1. Growth characters

1- Plant height (cm).

2- Number of branches/plant.

2.3.2.2.Yield components

1-Number of pods/plant.

2-Weight of pods(g)/plant.

3- Weight of seeds (g)/plant.

4- Weight of 100 pod (g).

5- Shelling%= Weight of seeds/plant/ Weight

of pods/plant ×100

2.3.2.3. Peanut yield

The middle three rows from each plot were taken off and air dried for 15 days to determine pod yield as ardab/faddan (Ardab = 75kg of pods).

Oil % in the seeds was determined by using the methods of the A.O.A.C (1955) by using Soxhlet apparatus.

2.3.3. Economic feasibility

Economic analysis was done to investigate the variances between the different studied factors to get the highest profitability by using some economic criteria such as, gross income, net income and profitability. Economic criteria were used according to the methods described by (Buckett, 1981) and were estimated from the following formulas:

1- Gross income (GI) = Total revenue (LE) from selling peanut production (pod + straw yield).
2- Net income (NI) = Gross income (LE) – Total costs (LE).
3- Profitability (P) = Net income (LE) / Total costs (LE) × 100.

2.4. Statistical analysis

Obtained data were subjected to statistical analysis according to Snedecor and Cochran (1980) and the least significant differences (LSD) at 5% level were calculated.

3. RESULTS AND DISCUSSION

3.1. Effect of sowing methods

3.1.1. On weeds

The predominant weed species in the experimental fields during 2013 and 2014 seasons were *Portulaca oleracea* and *Euphorbia geniculata* as annual broad leaf weeds, *Digitaria sangunalis and Dactyloctenium aegyptium* as annual grasses. *Cyperus rotundus* and *Panicum repens* as perennial weeds, according to Tackholm (1974). Results in Table (1) indicated that the fresh weight of these species tended to decrease significantly under afir2 sowing method and their total biomass were decreased by 30.14 and 28.6% as compared with afir1 sowing method in 2013 and 2014 seasons, respectively. These results were due to the role of pre planting irrigation which enhanced weeds to germinate and were killed immediately with plowing and consequently decreased weed seeds which will be germinated during the growing season of peanut. These results agree with those obtained by Bridges *et al*. (1984). who reported that two cultivations plus two hand hoeing without herbicides produced good results with an average 3-yr yield of 3380 kg/ha.

3.1.2. On growth, peanut yield, yield components and oil content

Data in Table (2) indicated that the effect of sowing methods was not statistically significant on the number of branches/plant in both seasons, but it was significant on plant height, the number and weight of pods/plant, weight of seeds/plant, weight of 100 pod and shelling %. Afir2 method which significantly increased all previous characters except plant height which significantly decreased as compared with afir1 method in 2013 and 2014 season. These results agree with those obtained by Brar and Mehra (1989). They reported that very good control of weed was achieved with the application of pre-emergence herbicides such as pendimethalin in peanut yield (ardab/faddan) was significantly with afir 2 sowing method by 1.88 and 2.36 (ardab/faddan) or by 15.6 and 18.4% in 2013 and 2014 season, respectively, as compared with afir1 sowing method. This increase in pod yield may be attributed to the increase in yield components of peanut namely no. of branches / plant, no. of pods / plant, weight of pods / plant, weight of seeds / plant and weight of 100 pod, which gave the highest values with afir2 sowing method as a result of decreasing weed biomass g/m^2 under afir2 method. These results are in harmony with those obtained by Bridges *et al*. (1984). Results also indicated that sowing methods had no significant effect on oil (%) in peanut seeds in both seasons.

3.1.3. On economic evaluation

Data in Table (3) indicated that afir 2 sowing method significantly increased gross income, net income and profitability by 14.2, 20.4 and 15.7% in 2013 season and by 16.3, 23.0 and 18.5% in 2014 season, respectively as compared with afir1 sowing method.

3.2. Effect of weed control methods

3.2.1. On weeds

Results in Table (4) and Fig. (1) show that all herbicide treatments significantly reduced the fresh weight of all weed species to variant extents than untreated check and arrived to the level of significant in 2013 and 2014 seasons.

The highest control values of *Portulaca oleracea* at 60 days from sowing were achieved with pendimethalin+ clethodim+ imazapic, pendimethalin + imazapic combination, hand hoeing and pendimethalin+ clethodim combinations to 92.3, 91.2, 86.5 and 84.6% in 2103 season and 91.1, 89.5, 85.5 and 83.7% in

Table (1): Effect of sowing methods on fresh weight of weed species (g/m^2) in 2013 and 2014 seasons.

Sowing methods	*Portulaca oleracea* g/m^2	*Euphorbia geniculata* g/m^2	Total weight g/m^2	*Digitaria samgunalis* g/m^2	*Dactyloctenium aegyptium* g/m^2	*Cyperus rotundus* g/m^2	*Panicum repens* g/m^2	Total weight g/m^2	Total weight of weeds g/m^2
	2013 season								
Afir 1	**167.6**	**486.7**	**654.4**	**373.4**	**116.0**	**159.6**	**90.9**	**739.9**	**1394.3**
Afir 2	**113.9**	**384.9**	**498.8**	**228.4**	**67.0**	**114.2**	**65.6**	**475.2**	**974.0**
LSD 0.05	*	*	*	*	*	NS	*	*	*
2014 season									
Afir 1	**178.1**	**513.0**	**691.1**	**390.4**	**122.9**	**171.3**	**98.7**	**783.3**	**1474.4**
Afir 2	**123.1**	**403.9**	**527.0**	**257.6**	**72.8**	**122.4**	**72.3**	**525.1**	**1052.1**
LSD 0.05	*	*	*	*	*	*	*	*	*

Table (2): Effect of sowing methods on growth, yield components, pod yield and oil % of peanut in 2013 and 2014 seasons.

Sowing methods	2013 season								
	Plant height (cm)	No. of branches/ plant	No. of pods / plant	Weight of pods / plant (g)	Weight of seeds / plant (g)	Weight of 100 pod (g)	Shelling %	Pod yield (ardab/ fed.)	Oil %
Afir1	**57.80**	**7.93**	**13.54**	**18.99**	**11.97**	**161.27**	**62.04**	**12.06**	**48.88**
Afir 2	**52.35**	**8.55**	**15.06**	**21.95**	**14.37**	**165.83**	**64.95**	**13.94**	**49.38**
LSD 0.05%	*	NS	*	*	*	*	*	*	NS
2014 season									
Afir 1	**58.47**	**8.26**	**13.99**	**19.54**	**12.65**	**163.21**	**63.77**	**12.83**	**48.94**
Afir 2	**53.56**	**9.02**	**15.86**	**22.96**	**15.45**	**167.17**	**66.65**	**15.19**	**49.52**
LSD (0.05)	*	NS	*	*	*	*	*	*	NS

Table (3): Effect of sowing methods on economic criteria for peanut in 2013 and 2014 summer seasons.

	2013 season			2014 season		
Sowing methods	**Gross income LE**	**Net income LE**	**Profitability**	**Gross income LE**	**Net income LE**	**Profitability**
Afir 1	**7626**	**4126**	**1.18**	**8112**	**4612**	**1.32**
Afir 1	**8884**	**5184**	**1.40**	**9690**	**5990**	**1.62**
LSD(0.05)	*	*	*	*	*	*

Table (4): Effect of weed control methods on fresh weight (gm/m2) of broad, narrow and total weeds of peanut in 2013 and 2014 seasons.

Weed control methods	*Portulaca oleracea* g/m^2	*Euphorbia geniculata* g/m^2	Total weight g/m^2	*Digitaria samgunalis* g/m^2	*Dactyloctenium aegyptium* g/m^2	*Cyperus rotunds* g/m^2	*Panicum repens* g/m^2	Total weight g/m^2	Total weight of weeds g/m^2
2013 season									
Pendimethalin	56.9	799.0	855.9	71.8	33.3	392.2	255.5	752.8	1608.7
Pendimethalin + Clethodim	36.4	749.2	785.6	2.7	1.7	272.7	16.7	293.8	1079.4
Pendimethalin +Imazapic	20.7	156.0	176.7	48.8	32.5	19.5	135.4	236.2	412.9
Pendimethalin + Clethodim + Imazapic	18.2	110.5	128.7	0.0	4.2	9.7	11.7	25.6	154.3
Clethodim	265.4	883.5	1148.9	5.3	9.3	146.7	4.7	166.0	1314.9
Clethodim + Imazapic	311.4	69.2	380.6	0.7	8.3	17.3	1.7	28.0	408.6
Imazapic	290.7	42.9	333.6	903.8	286.5	17.9	103.8	1312.0	1645.6
Two hand hoeing	31.9	37.5	69.4	178.9	38.5	85.3	10.3	313.0	382.4
Weedy check	236.0	1074.3	1310.3	1495.9	408.7	270.9	165.2	2340.7	3650.9
LSD(0.05)	30.2	88.2	88.0	133.3	29.5	31.4	22.4	139.2	140.8
2014 season									
Pendimethalin	65.1	818.	883.9	75.6	41.1	408.3	262.6	787.6	1671.5
Pendimethalin + Clethodim	41.9	776.9	818.8	5.4	3.3	285.8	19.5	314.0	1132.8
Pendimethalin + Imazapic	27.0	162.9	189.9	54.2	38.3	26.2	144.0	262.7	452.6
Pendimethalin + Clethodim + Imazapic	23.0	120.5	143.5	1.1	6.1	13.6	15.3	36.1	179.6
Clethodim	278.8	920.3	119.1	8.4	11.4	157.9	8.9	186.6	1385.7
Clethodim + Imazapic	320.8	76.0	396.8	2.9	9.9	26.1	7.9	46.8	443.6
Imazapic	304.7	49.4	354.1	958.9	301.4	21.8	113.9	1396.0	1750.1
Two hand hoeing	37.2	42.9	80.1	190.3	44.0	93.8	14.5	342.6	422.7
Weedy check	257.2	1158.3	1415.5	1619.6	425.5	288.4	186.0	2519.6	3935.1
LSD(0.05)	28.5	81.4	88.5	112.3	32.1	36.4	25.3		151.3

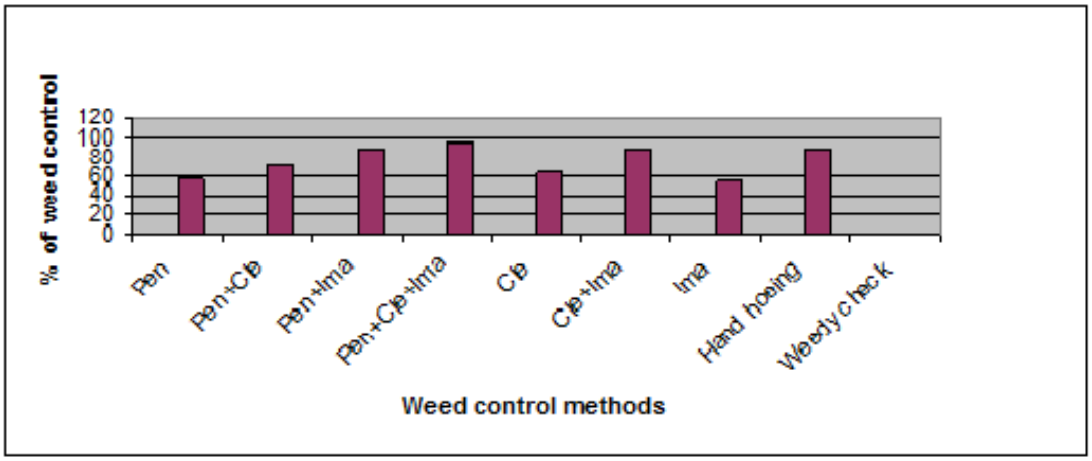

Fig. (1): Effect of weed control methods on % of weed control.

2014 season, respectively. This weed species had been controlled easily by applying post emergence herbicides because it had fibrous shallow root system which can absorb these herbicides from the soil surface and killing weeds until two months. These results are in agreement with Fayed *et al*. (1992) and Nassar and Osman (2008). Who reported that pendimethalin and clethodim at 125g/faddan decreased the dry weight (g/m^2) of grassy weed by 92.3% at 105 day after sowing as compared with weedy check**.**

Euphorbia geniculata is very hard to kill by pendimethalin or clethodim herbicides because it had deep-rooted system. Imazapic is the only herbicide single or combined with other herbicides can kill it, but not significant differences with hand hoeing treatment in both seasons. These results are in agreement with Grichar and Nester (1993).

Data in Table (4) show that the total fresh weight of all weed species namely *Digitaria samgunalis, Dactyloctenium aegyptium, Cyperus rotundus and Panicum repens* at 60 days from sowing was significantly decreased when used pendimethalin+clethodim+imazapic, clethodim+ imazapic, clethodim and pendimethalin+ imazapic herbicide combinations by 98.9, 98.8, 92.9 and 89.9% in 2013 season and by 98.6, 98.1, 92.6 and 89.6% in 2014 season, respectively, as compared with unweeded treatment. These high % control efficiencies may be due to the absorption of these herbicides from leaf surface, then moved inside the xylem tubes and kill weeds. Similar results were obtained by using fluazifop-p-butyl on annual and perennial grassy weed in peanut (Sarpe *et al*. (1989). These results are in agreement with Farag (2007) who found that clethodim and fluazifop-p-butyl were more effective against annual grassy weed, in peanut.

Referring to the fresh weight of the total broad and narrow weeds, data indicated that using pendimethalin+clethodim+imazapic, hand hoeing, clethodim+imazapic and pendimethalin+ imazapic combinations significantly controlled the total fresh weight of all species of weeds by 95.8, 89.5, 88.8 and 88.6% in 2013 season and by 95.4, 89.3, 88.7 and 88.5% in 2014 season, respectively, as compared with weedy check treatment. These results agree with those obtained by Sarpe *et al*. (1989). They found that under sprinkler irrigation patterns a weed infestation occurs in several stages and weeds cannot be controlled by one treatment with herbicides applied post owing as pendimethalin and need one or two herbicides should be combined with Boil acting.

3.2.2. On growth, yield components, peanut yield and oil % of peanut

Data in Table (5) and Fig. (2) refer that plant height of peanut was significantly increased in weedy check treatment in 2013 and 2014 seasons as compared with all weed control methods. The increase in plant height may be due to the competition between peanut plants and weeds for light and other environmental conditions. Concerning the effect of weed control methods on growth, yield components of peanut, results indicated that the number of branches/plant, the number and weight of pods/plant, weight of seeds/plant, weight of 100 pod and shelling (%) significantly increased with applying single or combinations of herbicides or hand hoeing treatments in both seasons as compared with weedy check treatment. The best treatment was applying the combination of herbicides pendimethalin+ clethodim+imazapic which gave the highest values of all previous characters. These increases may be due to the reduction in the number and weight of weeds which compete with peanut plants on space, water, light,…..etc in several growth stages of peanut.

These results agree with those obtained by Ducar *et al*. (2009) who reported that pod yield of peanut was generally higher when herbicides were applied.

Pod yield (ardab/faddan) was significantly increased with weed control methods in 2013 and 2014 seasons as compared with weedy check treatment. The treatments of pendimethalin+ clethodim+ imazapic, pendimethalin+ clethodim, pendimethalin+ imazapic and two hand hoeing gave the highest values of pods yield (15.82, 14.68, 14.25 and 14.18 ardab/faddan in 2013 season and 17.17, 15.85, 15.35 and 15.31 ardab/faddan in 2013 season, respectively) which were surpassed on the weedy check treatment by 62.9, 62.1, 61.1 and 60.9% in 2013 season and 63.6, 60.6, 59.3 and 59.2% in 2014 season, respectively. These increases may be due to the increases in yield components(no. of branches / plant, no. of pods / plant, weight of pods / plant, weight of seeds/ plant and weight of 100pod) with the same weed control treatment.

Table (5): Effect of weed control methods on growth, yield components, pod yield and oil % of peanut in 2013 and 2014 seasons.

Weed control methods	Plant height (cm)	No. of tillers / plant	No. of pods / plant	Weight of pods / plant (gm)	Weight of seeds / plant (gm)	Weight of 100 pod (gm)	Shelling (%)	Pod yield (ardab /fed.)	Oil %
2013 season									
Pendimethalin	60.93	7.28	12.98	20.47	13.40	165.15	65.28	13.90	49.13
Pendimethalin + Clethodim	49.53	9.25	17.92	23.62	15.52	166.95	65.66	14.68	49.60
Pendimethalin +Imazapic	51.68	8.33	15.28	23.90	15.07	166.27	63.00	14.25	49.32
Pendimethalin + Clethodim + Imazapic	41.92	10.78	20.12	26.43	18.27	169.67	69.06	15.82	49.68
Clethodim	56.80	7.20	12.52	17.72	12.02	162.53	67.74	13.53	48.77
Clethodim + Imazapic	46.43	10.30	1.98	22.18	13.80	163.12	62.14	13.63	48.60
Imazapic	62.82	6.47	11.40	16.93	9.83	160.63	58.02	11.38	49.02
Two hand hoeing	55.32	10.08	16.73	22.68	15.03	167.00	66.24	14.18	49.65
Weedy check	70.27	4.45	5.75	10.28	5.63	150.67	54.38	5.55	48.38
LSD(0.05)	3.64	0.46	0.55	0.69	0.61	1.38	2.86	0.78	NS
2014 season									
Pendimethalin	62.03	7.57	13.50	21.08	14.09	166.99	66.55	14.79	49.29
Pendimethalin + Clethodim	50.04	9.56	18.65	24.46	16.39	168.88	66.94	15.85	49.72
Pendimethalin + Imazapic	52.10	8.78	15.81	24.47	15.96	167.78	65.11	15.35	49.35
Pendimethalin + Clethodim + Imazapic	43.45	11.56	20.81	27.28	19.23	171.30	70.39	17.17	49.82
Clethodim	57.65	7.46	12.95	18.76	12.98	163.84	69.08	14.11	48.90
Clethodim + Imazapic	47.84	10.51	16.57	22.77	14.79	164.71	64.88	14.59	48.67
Imazapic	63.64	7.01	12.13	17.73	1073	161.78	60.49	12.68	49.09
Two hand hoeing	55.94	10.40	17.58	23.71	16.22	169.23	68.43	15.31	49.77
Weedy check	71.46	4.89	6.33	10.99	6.10	152.19	55.02	6.25	48.48
LSD(0.05)	4.20	0.85	0.76	0.89	0.75	1.57	2.92	0.88	NS

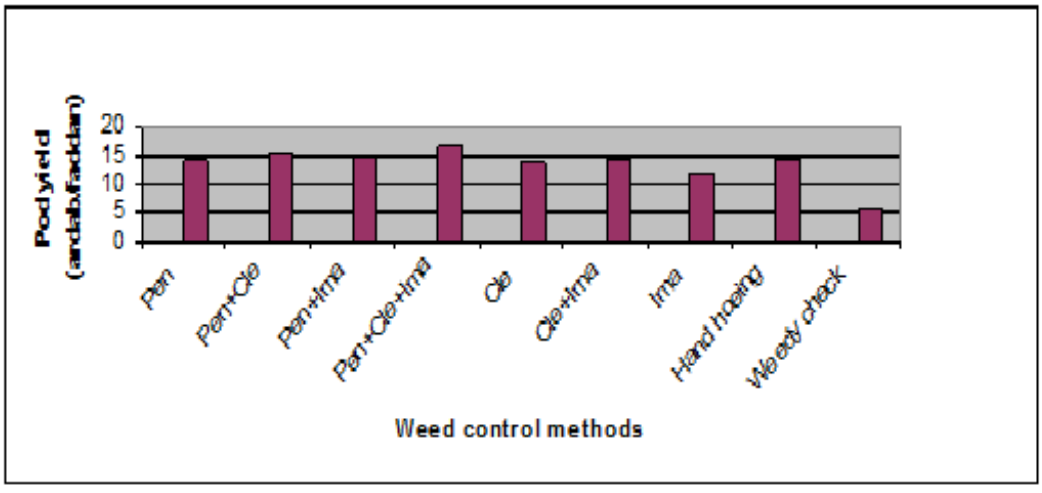

Fig. (2): Effect of weed control methods on pod yield (ardab/faddan).

3.2.3. On economic evaluation

Data in Table (6) and Fig. (3) showed that the treatment of applying pendimethalin+ clethodim+ imazapic herbicide combination significantly increased gross income, net income and profitability by 64.5, 99.3 and 99.4% in 2013 season and by 63.1, 98.0 and 97.5% in 2014 season, respectively as compared with weedy check treatment. These results agree with those obtained by Wilcut *et al*. (1987) who

Table (6): Effect of weed control methods on economic criteria of peanut in 2013 and 2014 seasons.

Weed control methods	2013 season			2014 season		
	Gross income LE	Net income LE	Profitability	Gross income LE	Net income LE	Profitability
Pendimethalin	8828	5033	1.32	9378	5553	1.45
Pendimethalin + Clethodim	9330	5245	1.28	10060	5975	1.46
Pendimethalin +Imazapic	9070	5095	1.28	9682	5707	1.43
Pendimethalin + Clethodim + Imazapic	10028	5793	1.37	10886	6551	1.57
Clethodim	8522	4662	1.21	8908	5048	1.31
Clethodim + Imazapic	8628	4618	1.1	9214	5204	1.30
Imazapic	7080	3330	0.88	7906	4156	1.11
Two hand hoeing	8982	4682	1.09	9676	5376	1.25
Weedy check	3558	42	0.01	4014	134	0.04
LSD(0.05)	166.8	140.7	0.08	178.5	156.2	0.14

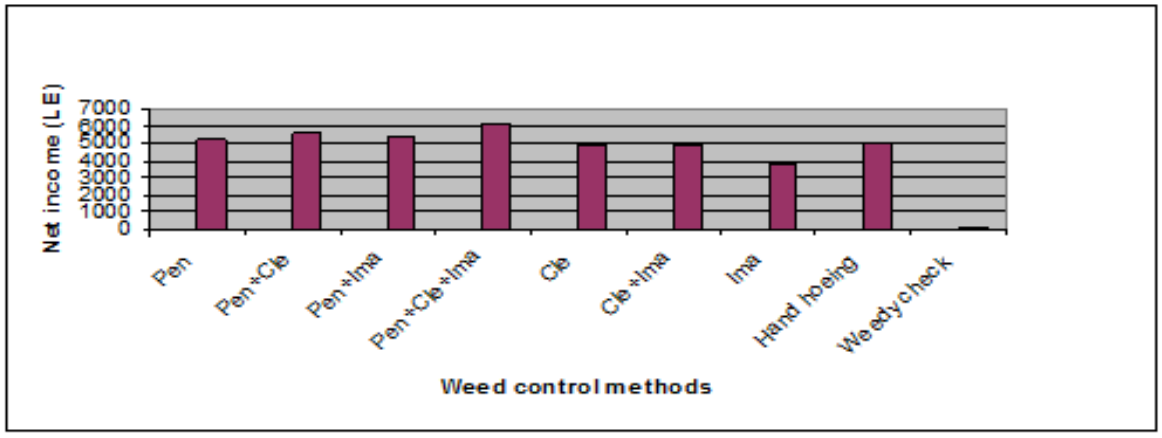

Fig. (3): Effect of weed control methods on net income (LE).

reported that the maximum net return was obtained with applying both herbicides and cultivation.

3.3. Effect of the interaction between sowing methods and weed control methods

3.3.1. On weeds

Data in Tables (7 and 8) indicate that the effect of the interaction between sowing methods and weed control methods on fresh weight of weeds was significant in both seasons. The best treatment for weed control was applying pendimethalin+clethodim+imazapic with afir2 sowing method. Which controlled the total weeds by 96.1 and 96.0% in 2013 and 2014 season, respectively, while applying pendimethalin+ clethodim+ imazapic with afir1 sowing method controlled the total weeds by 95.6 and 95.0% in 2013 and 2014 season, respectively as compared with weedy check treatment.

Table (7): Effect of the interaction between sowing methods and weed control methods on fresh weight (gm/m2) of total weeds of peanut in 2013 season.

Sowing methods	Weed control methods	*Portulaca oleracea* g/m^2	*Euphorbia geneculata* g/m^2	Total weight of broad weeds g/m^2	*Digitaria samgunalis* g/m^2	*Dactyloctenium aegyptium* g/m^2	*Cyperus rotundus* g/m^2	*Panicum repens* g/m^2	Total weight of narrow weeds g/m^2	Weight of total weeds g/m^2
Afir 1	Pendimethalin	76.7	865.3	942.0	89.3	42.3	425.7	277.7	835.0	1777.0
	Pendimethalin + Clethodim	47.0	825.0	872.0	4.0	2.7	333.7	24.7	365.1	1237.1
	Pendimethalin +Imazapic	28.3	171.7	200.0	63.3	37.0	22.7	155.7	278.7	478.7
	Pendimethalin + Clethodim + Imazapic	23.7	132.0	155.7	0.0	5.0	12.7	19.7	37.4	193.1
	Clethodim	325.7	1080.7	1406.4	8.3	15.3	181.0	5.0	209.7	1616.1
	Clethodim + Imazapic	340.0	77.3	417.3	1.3	14.3	23.3	2.3	41.2	458.5
	Imazapic	339.0	58.0	397.0	1101.3	336.3	19.7	130.3	1587.6	1984.6
	Two hand hoeing	49.7	41.0	90.7	208.7	42.0	104.3	15.3	370.3	461.0
	Weedy check	279.3	1129.3	1408.7	1884.0	548.7	313.0	188.3	2934.0	4342.7
Afir 2	Pendimethalin	37.0	732.7	769.7	54.3	24.3	358.7	233.3	670.6	1440.3
	Pendimethalin + Clethodim	25.7	673.3	699.0	1.3	0.7	211.7	8.7	222.4	921.4
	Pendimethalin +Imazapic	13.0	140.3	153.3	34.3	28.0	16.3	115.0	193.6	346.9
	Pendimethalin + Clethodim + Imazapic	12.7	89.0	101.7	0.0	3.3	6.7	3.7	13.7	115.4
	Clethodim	205.0	686.3	891.3	2.3	3.3	112.3	4.3	122.3	1013.6
	Clethodim + Imazapic	282.7	61.0	343.7	0.0	2.3	11.3	1.0	14.6	358.3
	Imazapic	242.3	27.7	270.0	706.3	236.7	16.0	77.3	1036.3	1306.3
	Two hand hoeing	14.0	34.0	48.0	149.0	35.0	66.3	5.3	255.6	303.6
	Weedy check	192.7	1019.3	1212.0	1107.7	269.7	228.7	142.0	1748.1	2960.1
LSD (0.05)		42.8	124.8	124.4	188.7	41.8	44.4	NS	197.9	199.1

Table (8): Effect of the interaction between sowing methods and weed control methods on fresh weight (gm/m2) of total weeds of peanut in 2014 season.

Sowing methods	Weed control methods	*Portulaca oleracea*	*Euphorbia geneculata*	Total weight of broad weeds	*Digitaria samgunalis*	*Dactyloctenium aegyptium*	*Cyperus rotundus*	*Panicum repens*	Total weight of narrow weeds	Weight of total weeds
Afir 1	Pendimethalin	81.4	886.2	967.6	92.5	50.8	442.3	285.6	871.2	1838.8
	Pendimethalin + Clethodim	54.5	851.3	905.8	6.2	4.3	350.8	26.4	387.7	1293.5
	Pendimethalin +Imazapic	36.1	175.2	211.4	70.4	44.0	31.4	166.6	312.4	523.8
	Pendimethalin + Clethodim + Imazapic	30.8	145.4	176.2	2.1	7.5	18.2	24.9	52.7	228.9
	Clethodim	345.1	1130.3	1475.4	12.0	17.4	195.2	9.9	234.5	1709.9
	Clethodim + Imazapic	346.3	85.6	431.9	4.5	15.7	36.4	9.6	64.2	496.1
	Imazapic	348.2	65.0	413.2	1175.7	352.4	24.3	142.3	1694.2	2107.4
	Two hand hoeing	58.1	45.6	103.7	224.2	48.6	112.4	18.6	403.8	507.4
	Weedy check	302.4	1232.1	1534.5	1926.5	565.5	330.4	210.4	3032.8	456.3
Afir 2	Pendimethalin	48.7	751.3	800.0	58.6	31.4	374.2	239.5	703.7	1503.7
	Pendimethalin + Clethodim	29.3	702.5	731.8	4.6	2.2	220.8	12.6	240.2	972.0
	Pendimethalin +Imazapic	17.8	150.6	168.4	38.0	32.5	21.0	121.3	212.8	381.2
	Pendimethalin + Clethodim + Imazapic	15.2	95.6	110.8	0.0	4.6	8.9	5.7	19.2	130.0
	Clethodim	212.4	710.3	922.7	4.8	5.3	120.6	7.8	138.5	1061.2
	Clethodim + Imazapic	295.2	66.3	261.5	1.2	4.0	15.7	6.2	27.1	388.6
	Imazapic	261.1	33.7	294.8	742.5	250.4	19.2	85.4	1097.5	1392.3
	Two hand hoeing	16.3	40.2	56.5	157.4	39.3	75.1	10.3	281.1	337.6
	Weedy check	212.0	1084.5	1296.5	1312.6	285.4	246.3	161.7	206.0	3302.5
LSD(0.05)		44.6	135.2	126.5	165.4	44.7	48.6	NS	185.4	194.9

3.3.2. On growth, yield components, pod yield and oil % of peanut

Data in Tables (9 and 10) indicate that the effect of the interaction between sowing methods and weed control methods was not significant on the number of branches/plant and shelling (%) in 2013 and 2014 seasons. Plant height was significantly affected by the interaction between sowing and weed control methods and the treatment of afir1 with weedy check gave the highest values of plant height in 2013 and 2014 seasons. The characters of the number and weight of pods/plant, weight of seeds/plant and weight of 100 pod were significantly affected by the interaction between sowing methods and weed control methods. The highest values of these characters were obtained by afir2 sowing method with (pendimethalin+clethodim +imazapic) weed control method in both seasons. The least values were obtained by used afir1 sowing method with untreated treatment in 2013 and 2014 seasons.

Oil (%) was not affected significantly by the interaction between sowing methods and weed control methods in both seasons (Tables 9 and 10). These results agree with those obtained by Nassar and Osman (2008) who reported that clethodim at 125g/faddan decreased the dry weight (g/m^2) of grassy weeds by 92.3% at 105 days after sowing, as compared with weedy check.

Yield of pods/faddan was significantly affected by the interaction between sowing methods and weed control methods. Data in Tables (9 and 10) show that the best yield of peanut was obtained when peanut grown by afir2 sowing method and applying the combination of herbicides (pendimethalin+ clethodim+ imazapic) which gave 17.10 and 18.62 ardab/faddan in 2013 and 2014 seasons, respectively as compared with afir1 sowing method which gave 14.53 and 15.72 ardab/faddan in both seasons, respectively. These results agree with those obtained by Nassar and Osman (2008).

Table (9): Effect of the interaction between sowing methods and weed control methods on yield components of peanut in 2013 season.

Sowing methods	Weed control methods	Plant height (cm)	No. of branches / plant	No. of pods / plant	Weight of pods / plant (gm)	Weight of seeds / plant (gm)	Weight of 100 pod (gm)	Shelling (%)	Pod yield (ardab /fed.)	Oil %
Afir 1	Pendimethalin	66.20	6.90	12.33	18.87	11.87	162.93	62.90	13.00	49.10
	Pendimethalin + Clethodim	50.47	8.93	17.47	21.80	14.13	165.17	64.82	13.50	49.33
	Pendimethalin +Imazapic	52.67	7.90	14.87	22.77	14.03	164.20	61.62	13.47	49.30
	Pendimethalin + Clethodim + Imazapic	43.53	10.47	18.40	24.40	16.70	167.77	68.44	14.53	49.63
	Clethodim	58.80	7.04	11.60	16.23	10.83	160.33	66.72	12.77	48.50
	Clethodim + Imazapic	47.63	9.97	15.23	20.73	12.70	161.03	61.26	12.87	48.10
	Imazapic	67.73	6.27	11.07	15.80	9.00	158.50	56.96	10.60	48.57
	Two hand hoeing	56.93	9.70	15.77	21.20	13.97	165.10	65.90	13.23	49.27
	Weedy check	76.27	4.17	5.10	9.10	4.53	146.43	49.78	4.60	48.10
Afir 2	Pendimethalin	55.67	7.67	13.63	22.07	14.93	167.37	67.65	14.80	49.17
	Pendimethalin + Clethodim	48.60	9.57	18.37	25.43	16.90	168.73	66.46	15.87	49.87
	Pendimethalin +Imazapic	50.70	8.77	15.70	25.03	16.10	168.33	64.32	15.23	49.33
	Pendimethalin + Clethodim + Imazapic	40.30	11.10	21.83	28.47	19.83	171.57	69.65	17.10	49.73
	Clethodim	54.80	7.37	13.43	19.20	13.20	164.73	68.75	14.30	49.03
	Clethodim + Imazapic	45.23	10.63	16.73	23.63	14.90	165.20	63.06	14.40	49.40
	Imazapic	57.90	6.67	11.73	18.07	10.67	162.77	59.05	12.17	49.47
	Two hand hoeing	53.70	10.97	17.70	24.17	16.10	168.90	66.61	15.13	50.03
	Weedy check	64.27	7.73	6.40	11.47	6.73	154.90	58.67	6.50	48.67
LSD(0.05)		5.14	NS	0.78	1.25	1.02	1.96	NS	0.52	NS

Table (10): Effect of the interaction between sowing methods and weed control methods on yield components of peanut in 2014 season.

Sowing methods	Weed control methods	Plant height (cm)	No. of branches / plant	No. of pods / plant	Weight of pods / plant (gm)	Weight of seeds / plant (gm)	Weight of 100 pod (gm)	Shelling (%)	Pod yield (ardab/ fed.)	Oil %
Afir 1	Pendimethalin	67.65	7.18	12.72	19.06	12.15	165.42	63.75	13.56	49.22
	Pendimethalin + Clethodim	50.82	9.10	17.85	22.42	14.82	167.65	66.10	14.40	49.36
	Pendimethalin +Imazapic	53.02	8.32	15.22	23.16	14.66	165.96	63.30	14.25	49.28
	Pendimethalin + Clethodim + Imazapic	44.24	11.16	19.05	25.20	17.45	169.55	69.25	15.72	49.78
	Clethodim	59.30	7.26	11.84	16.7	11.43	161.80	68.24	13.12	48.00
	Clethodim + Imazapic	48.45	10.12	15.66	21.28	13.57	163.00	63.77	13.45	48.18
	Imazapic	68.17	6.85	11.60	16.14	9.70	160.06	60.10	11.35	48.52
	Two hand hoeing	57.42	9.95	16.35	22.05	15.10	167.30	68.48	14.40	49.35
	Weedy check	77.16	4.38	5.60	9.80	4.99	148.12	50.92	5.15	48.20
Afir 2	Pendimethalin	56.40	7.96	14.28	23.10	16.02	168.55	69.35	15.92	49.36
	Pendimethalin + Clethodim	49.25	10.02	19.44	26.50	17.96	170.11	67.77	17.30	50.08
	Pendimethalin +Imazapic	51.18	9.24	16.40	25.78	17.25	169.60	66.91	16.45	49.42
	Pendimethalin + Clethodim + Imazapic	42.65	11.95	22.56	29.36	21.00	173.05	71.53	18.62	49.85
	Clethodim	56.00	7.66	14.05	20.77	14.52	165.88	69.91	15.10	49.20
	Clethodim + Imazapic	47.22	10.90	17.48	24.25	16.00	166.42	65.98	15.72	49.16
	Imazapic	59.11	7.16	12.66	19.32	11.76	163.50	60.87	14.00	49.65
	Two hand hoeing	54.46	10.85	18.80	25.36	17.34	171.15	68.38	16.22	50.18
	Weedy check	65.75	5.40	7.06	12.18	7.20	156.26	59.11	7.35	48.75
LSD (0.05)		5.34	NS	0.91	1.40	1.18	2.40	NS	0.64	NS

3.3.3. On economic evaluation

Data in Table (11) indicate that using of Afir 2 sowing method and applying (pendimethalin+ clethodim+ imazapic) herbicide combination significantly increased gross income net income and profitability by 14.7, 21.4 and 17.3% in 2013 season and by 15.2, 21.3 and 17.5% in 2014 season, respectively as compared with Afir 1 sowing method with the same herbicid combinations. These results agree with those obtained by Wilcut *et al*. (1987) who reported that the maximum net return was obtained with applying both herbicides and cultivation.

Table (11): Effect of the interaction between sowing methods and weed control methods on Economic criteria of peanut in 2013 and 2014 seasons.

Sowing methods	Weed control methods	2013 season			2014 season		
		Gross income LE	Net income LE	Profitability	Gross income LE	Net income LE	Profitability
Afir 1	Pendimethalin	8244	4519	1.21	8650	4925	1.32
	Pendimethalin + Clethodim	8602	4617	1.16	912	5167	1.30
	Pendimethalin +Imazapic	8566	4691	1.21	9050	5175	1.34
	Pendimethalin + Clethodim + Imazapic	9258	5123	1.24	9998	5863	1.42
	Clethodim	8082	4322	1.15	8304	4544	1.21
	Clethodim + Imazapic	8158	4248	1.09	8528	4618	1.18
	Imazapic	6752	3102	0.85	7218	3568	0.98
	Two hand hoeing	8408	4208	1.00	9134	4934	1.18
	Weedy check	2936	- 564	- 0.16	3296	- 204	-0.06
LSD (0.05)		210.3	124.3	0.08	232.6	133.4	0.10
Afir 2	Pendimethalin	9416	5491	1.40	10106	6181	1.59
	Pendimethalin + Clethodim	10082	5897	1.41	10962	6777	1.62
	Pendimethalin +Imazapic	9688	5613	1.38	10434	6359	1.56
	Pendimethalin + Clethodim + Imazapic	10850	6515	1.50	11786	7451	1.72
	Clethodim	9068	5108	1.29	9562	5602	1.42
	Clethodim + Imazapic	9140	5030	1.22	9956	5846	1.42
	Imazapic	7764	3914	1.02	8872	5022	1.30
	Two hand hoeing	9622	5222	1.19	10690	6290	1.43
	Weedy check	4152	452	0.12	4674	974	0.26
LSD (0.05)		266.4	133.8	0.07	270.3	149.0	0.11

Conclusion

On sandy soils, in Ismailia area, Egypt, under sprinkler irrigation system when growing Egypt, peanut crop, weed infestation occurs in several growth stages and weeds cannot be controlled by one treatment with herbicides applied pre emergence. The best results to control annual weeds species *(Portulaca oleracea* and *Euphorbia geniculata)* as annual broad leaf weeds, (*Digitaria samgunalis and Dactyloctenium aegyptium*) as annual grasses could be obtained by pendimethalin + clethodim treatment with hand hoeing. Perennial species *i.e. Cynodon dactylon* and sedges as *Cyperus spp.* were controlled with clethodim + imazapic treatment. The highest peanut yields and more economic feasible were obtained by irrigation the soil two weeks before seeding and applying (pendimethalin + clethodim + imazapic) herbicide combination. Such treatments can solve the weed problem in peanut fields under the area irrigated by sprinkler irrigation in sandy soils all over Egypt. Such treatment increased pod yield by 15.3 % and net income by 21.3 % as an average of both seasons.

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ادارة مكافحة الحشائش فى الفول السودانى باستخدام طرق الزراعة وتوليفات من مبيدات الحشائش تحت ظروف الرى بالرش

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ملخص

أجريت تجربتان حقليتان بمحطة البحوث الزراعية بالإسماعيلية التابعة لمركز البحوث الزراعية فى تربة رملية معروف عنها انتشار الحشائش الحولية والمعمرة بكثافة عالية وهى حشائش الرجلة وام اللبن والدفيرة ونعيم الصليب وحشيشة ابوركبة والسعد خلال موسمى الزراعة 2013 و 2014 وذلك لدراسة تأثير طرق الزراعة وطرق مكافحة الحشائش والتفاعل بينهما على الحشائش المصاحبة ونمو ومحصول الفول السودانى مع دراسة الجدوى الإقتصادية لهذه المعاملات. وزعت 18 معاملة وهى التوليفات بين طريقتى الزراعة وطرق مكافحة الحشائش فى تصميم القطع المنشقة مرة واحدة، حيث وزعت معاملات طرق الزراعة وهى العفير بعد رى الأرض قبل الزراعة والعفير بدون رى الأرض قبل الزراعة عشوائيا فى القطع الرئيسية، بينما وزعت معاملات طرق مكافحة الحشائش وهى بنداميثيلين بمعدل 684 جم/فدان بعد الزراعة وقبل الرى و بنداميثيلين + كلوثوديم بمعدل 125جم/فدان بعد شهرمن الزراعة و بنداميثيلين + ايمازبيك بمعدل 2.04جم/فدان بعد شهرمن الزراعة و بنداميثيلين + كلوثوديم + ايمازبيك وكلوثوديم وكلوثوديم + ايمازبيك وايمازبيك والنقاوة اليدوية ومعاملة المقارنة (بدون معاملة) عشوائيا فى القطع الشقية.

أظهرت النتائج أن إستخدام طريقة الزراعة العفير بعد رى الأرض قبل الزراعة (خدمة مرقد البذرة) أدت إلى نقص معنوى للوزن الغض للحشائش الكلية وهى الرجلة وام اللبن والدفيرة ونعيم الصليب وحشيشة ابوركبة بمقدار 30.1 و28.6 % فى موسمى الزراعة 2013 و2014 على الترتيب مقارنة بطريقة الزراعة العفير بدون رى الأرض قبل الزراعة وزيادة محصول القرون (أردب/فدان) بمقدار 13.5 و15.5% فى موسمى الزراعة 2013 و2014 على الترتيب مقارنة بطريقة الزراعة العفير بدون رى الأرض قبل الزراعة. كذلك زاد صافى الدخل بمقدار 20.4 و23.0% فى موسمى الزراعة 2013 و2014 على الترتيب مقارنة بطريقة الزراعة العفير بدون رى الأرض قبل الزراعة.

أدى إستخدام توليفات من مبيد بنداميثيلين بمعدل 684 جم/فدان رشا بعد الزراعة وقبل الرى + كلوثوديم بمعدل 125جم/فدان رشا بعد شهر من الزراعة + ايمازبيك بمعدل 2.04 جم/فدان رشا بعد شهر من الزراعة) إلى نقص معنوى للوزن الغض للحشائش الكلية قدر ب 95.8 و 95.4% فى موسمى الزراعة 2013 و2014 على الترتيب مقارنة بمعاملة المقارنة (بدون معاملة) وزيادة محصول القرون (أردب/فدان) بمقدار 64.9 و63.6 % وصافى الدخل بمقدار 99.3 و98.0% فى موسمى الزراعة 2013 و2014 على الترتيب مقارنة بمعاملة المقارنة (بدون معاملة) ، ولم تتأثر معنويا نسبة الزيت فى البذرة بطرق الزراعة أو طرق مقاومة الحشائش فى كلا الموسمين.

أشارت دراسة الجدوى الاقتصادية الى أن إستخدام طريقة الزراعة العفير بعد رى الأرض قبل الزراعة مع إضافة توليفات من مبيدات (بنداميثيلين بمعدل 684جم/فدان رشا بعد الزراعة وقبل الرى + كلوثوديم بمعدل 125جم/فدان رشا بعد شهر من الزراعة + ايمازبيك بمعدل 2.04جم/فدان رشا بعد شهر من الزراعة) أدت للحصول على أعلى مكافحة للحشائش وأعلى زيادة فى محصول الفول السودانى ومكوناته تحت ظروف أراضى محافظة الإسماعيلية بمصرمما يمكن أن يوصى بهذه المعاملات تحت ظروف الرى بالرش فى الاراضى الرملية خصوصا فى الزراعات الموسعة بهذه المناطق.

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