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Effect of Planting Date, Rhizobia Inoculation and Some Weed Control Treatments on Productivity of Peanut (*Arachis hypogaea* L.) and its Associated Weeds

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Abstract: Two field experiments were carried out at Shandaweel Agricultural Research Station, Sohag Governorate, Egypt during the two successive growing seasons of 2018 and 2019 to study the effect of planting dates, rhizobium bacteria inoculation and some weed control treatments on growth, yield of peanut and its associated weeds. A split-split plot distribution in randomized complete block design with four replications was used.Peanut planting dates (1st May, 15th May and 1st June) were allocated to the main plots, rhizobium bacteria inoculation and uninoculation control in the sub-plots, while weed control treatments (Sheto at rate of100 cm^3 /fed., Cougar at rate of120cm^3/fed., Stomp extra at rate of 1.7 L/fed and Capital at 2L/fed., hand hoeing twice at 15 and 30 days after planting) and unweeded (check) were randomly distributed in the sub-subplots. Results revealed that planting peanut at the first of May significantly decreased the dry weight of broad-leaved weeds and total annual weeds (g/m^2) compared with planting peanut at the first of June in both seasons. Planting peanut at the first of May increased significantly plant height, number of branches/ plant, number of seeds/ pod, number of pods/ plant, weight of pods/ plant, 100-seed weight, seed and pods yield (kg/fed), compared with planting peanut at the first of June. Rhizobium bacteria had no significant effect on the dry weight of grassy, broad-leaved and total annual weeds (g/m^2) in both seasons. Rhizobia inoculation had a significant effect on plant height (cm), number of branches/plant, pods weight/plant, 100 pod weight, 100-seed weight (g) in both seasons and pods yield (kg/fed) in the second season. Weed control treatments decreased significantly dry weight of grassy, broad-leaved and total annual weeds (g/m^2) in both seasons. All weed control treatments significantly increased number of branches/plant, number of pods/plant, pods weight/plant, number of pods/plant, 100-pod weight, 100-seed weight (g), pods and seed yield (kg/fed) in 2018 and 2019 seasons. Interaction between planting date and Rhizobia inoculation had no significant effect on weeds dry weight and significantly affected plant height and 100 seed weight in both seasons and number of branches/plant, pods weight/plant, 100-pod weight in the second season only. The interaction between planting datesand weed control treatments had significant effect on broad-leaved weeds in both seasons and total annual weeds in the second season only. Whereas, the interaction between rhizobia inoculation and weed control treatmentsand planting date, Rhizobia inoculation and weed control treatments had no significant effect on dry weight of grassy, broad, total weeds, yield and yield attributes of peanut in both seasons.

Key words: Planting date · Weed control · Herbicides · Hand hoeing · Rhizobacteria and Peanut

INTRODUCTION

Peanut (*Arachis hypogaea* L.) is one of the most important oil cropswhich is successfully cultivated in the newly reclaimed sandy soils and commonly suffers from the deficiency or unavailability of most micronutrients. It ranks the 13th among the food crops and annual oil seed crops in the world. It has a good ability for improving the physical structure of such soils. Most nutrients in these soils are deficient due to the low organic matter content, high $CaCO_3$ content and high soil pH. To overcome the problems of these soils and improve the fertility levels, soil amendments, such as clays and organic materials, as well as chemical fertilizers should be applied to these soils [1].

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Peanut is an important summer oil seed crop and food grain legume. It contains about 50% oil, 25-30% protein, 20% carbohydrate and 5% fiber and ash which make it a substantial contribution to human nutrition. Numerous publications have indicated the necessity of legume inoculation with effective and efficient rhizobia strains, especially when the soil is void of the specific Rhizobium agents [2-3].

El-Deek, *et al*. [4] stated thatplanting date is one of the most important component of integrated weed management. Agostinho *et al*. [5] Canavar and Kaynak [6] reported that planting date had a statistically significant effect on pod yield, days to maturity, days to 50% flowering, number of pods per plant, plant height, shelling percentages, pod yield/plant and 100- seed weight. Shaban *et al.* [7] reported that planting peanut on May 8 recorded the highest values of number of pods, weight of pods and weight of seeds per plant, as well as shelling percentage, pod and seed index.

Potentiality for improving plant yield by combining rhizobacteria with rhizobia has been reported by many workers [3-10].

The Rhizobium-legume symbioses have received most attention and have been examined extensively. Atta *et al*. [11] reported that Rhizobium inoculation significantly increased number of pods/plant, seed number/pod, seeds weight/pod, seeds weight/plant, 100-seed weight as well as seed and straw yield, N, P, K, Mn and Zn uptake of legume.

Weed interference resulted in a yield loss between 74 and 92% [5]. Moshtohry *et al.* [12] reported that butralin was considered as alternative for oxyfluorfen and pendimethalin against annual weeds which decreased in dry weight by 85-92%. Clethodim or fluazifop butyl was effective against grasses which decreased in dry weight by 84-99%. Many researchers studied the effect of some herbicides on yield and yield components. Nepomuceno *et al.* [13] reported that the weed community and the peanut crop were influenced by planting time and modifying their interference relations. Blackshaw *et al.* [14] and El-Deek *et al.* [4] mentioned that one hand hoeing combined to all chemical weed control treatments decreased the dry weight of annual weeds at 75 and 105 days after planting (DAP) and increased all growth characters, yield components, pod and straw yield of peanut as compared with chemical weed control treatments alone. Munakamwe *et al.* [15] reported that herbicide use can enhance yield but could be replaced by other effective cultural methods e.g. early planting, appropriate pea genotype and high planting rates. They added that early planting of peas can successfully control late weeds without the use of herbicides. The aim of this study is to determine the effect of planting date, Rhizobia inoculation and some weed control treatments on productivity of peanut (*Arachis hypogaea* L.) and its associated weeds.

MATERIALS AND METHODS

Two field experiments were carried out at Shandaweel Agricultural Research Station, Sohag Governorate in 2018 and 2019 seasons to study the effect of planting dates, rhizobium bacteria inoculation and some weed control treatments on Peanut (*Arachis hypogaea* L.) productivity and associated weeds.

The preceding winter crop was onion (*Allium cepea* L.) in both seasons. Peanut seeds (cv. Giza 5) at the rate of 35 kg/fed were sown in rows (60 cm apart and 10 cm between hills) with Afir method (dry method). The experiment was laid out in a split split plot arrangement in randomized complete blocks design with four replications. Plot area was 10.5 m^2 (3.0 m width x 3.5 m length). Each experiment included thirty-six treatments, which were the combination of three planting dates, two inoculation and six weed control treatments.

A split-split plot distribution in randomized complete blocks design with four replicates was used and the treatments was arranged randomly as follows.

Main Plots (Planting Date):

- First of May.
- Mid of May.
- First of June.

Sub Plots (Inoculation with Rhizobium Bacteria):

- Inoculation.
- Uninoculation.

Sub-Sub Plot: Weed Control Treatments:

- Sheto 24% SL at the rate of 100 cm^3 /fed. at 30 days after planting.
- Cougar 40% EC at the rate of 2.0 Lfed at 30 days after planting.
- Stomp extra 46 % CS at rate of 1.5 L/fad applied pre-emergence.
- Capital 32.5% EC at the rate of 2 L /fed applied pre-emergence.
- Hand hoeing twice 30 and 45 days after planting.
- Un-weeded control.

Table 1: Trade, common and chemical names of the used herbicides.

Trade name	Common name	Chemical name
Sheto 24% SL	Imazapic	5-methyl-2-[4-methyl-5-oxo-4-(propan-2-yl)-4, 5-dihydro-1H-imidazol-2-yl]pyridine-3-carboxylic acid
Cougar 40% EC	Acetanilid - Dinitro anilin	N-Phenylacetamide 103-84-4 C6H5N3O4.
Stomp Extra 45% CS	pendamethalin	N-(1-ethylpropyl)-2, 6-dintro-3.4-xylidine
Capital 32.5% EC	pendamethalin	N-(1-ethylpropyl)-2, 6-dintro-3.4-xylidine

The herbicidal treatmentswere sprayed uniformly using Knapsack sprayer with spray volume of 200 L/fed.

Trade, common and chemical name of the used herbicides are shown in Table (1).

The biofertilizer Rhizobia were used at the rate of 10g/ kg seeds. Seed inoculation was performed by adding an adequate amount of distilled water and Arabic glue and mixed thoroughly with the seeds just before planting.

Rhizobia (*Bradyrhizobium japonicum*) were obtained from biofertilizer production unit, Soils, Water and Environment Research Institute, Agriculture Research Center (ARC), Giza, Egypt. *Rhizobium* was cultured in yeast mannitol broth medium [16].

Soil chemical and mechanical analyses of the experimental site showed that the upper 30-cm of the soil was sandy loam, which consisted of (56.34 and 51.57 %) sand, (28.44 and 26.30 % silt) and (15.22 and 22.13 % clay) and contained (24.0 and 21), (11.7 and 12.2) and (210 and 186) ppm N, P, K with pH of (7.5 and 7.6) in the 1st and 2nd season, respectively. Phosphorus fertilizer, as mono-super phosphate (15.5% P_2O_5) was added during the seed bed preparation at a rate of 150 kg/fed. Potassium sulphate (48% K_2O) at the rate of 50 kg/fed was applied at planting. Nitrogen fertilizer was added at a r ate of 30 kg N/fed as ammonium sulfate (20.6 %N) in two equal portions, the first half at planting and the second after 30 days later. All other agricultural practices were done as recommended for peanut production in the region.

Data Recorded

Peanut Crop: At harvest, a random sample of 10 plants was taken from each sub-sub plot to determine the following traits: Plant height (cm), no. of branches/plant, plant weight (g), no. of pods/plant, weight of pods /plant (g), 100-pods weight (g), 100-seeds weight (g), (seed index) and pod yield/plot (kg). The pod yield and seed yield (kg/fed) was calculated from the pod yield/plot.

Weed Survey: Weeds were hand pulled from 1.0 m^2 from each plot 75 days after planting. Weeds were identified according Täckholm [17] and classified to annual grassy, annual broad-leaved weeds and total annual weeds to record the following traits: Dry weight of annual grassy weeds (*Echinochola colonum* L.), annual broad leaved (*Xanthium strumarium* L., *Portulaca oleracea* L., *Euphorbia geneculata* L., *Corchorus olitorius* L. and *Amaranthus hybridus* L.) and total annual weeds g/m^2.Weeds were air-dried for seven days and then were oven-dried at 70°C for 24 hours until a constant weight was reached and weed control efficiency was calculated as follow:

Weed control efficiency (WCE %): WCE was calculated with the following formula:

$$\text{WCE (\%)} = \frac{\text{DMC - DMT}}{\text{DMC}} x100$$

where:

DMC = Weed dry matter in un-weeded treatment.

DMT = Weed dry matter in weed control treatment.

Statistical Analysis: The collected data were statistically analyzed according to the method of Snedecor and Cochran [18]. Least significant differences (LSD) test was used for treatment meanscomparison.

RESULTS AND DISCUSSION

The infestation of peanut with different species of weeds has created a hard competition with crop. This, in turn, reflects unfavorable effect on crop yield.

Effect of Planting Dates On

Dry Weight of Weeds (g/ m^2): The results in Table (2) indicated that the dry weight of grassy, broad-leavedand total annual weeds (g/m^2) were significantly affected by the three planting dates in all seasons.

Generally, planting peanut on the first of May andmid of May reduced the dry weight of broad-leaved weeds and total annual weeds (g/m^2) by(28.17 and 22.12%) and (27.9 and 19.41%) in first season and by (32.38 and 13.11%) and (32.19 and 11.02%) in second season, respectively compared with planting peanut at first of June. These results might be due to the decrease in temperature, which encourages the earlier germination (first and Mid of May) of weeds seeds than the late of planting date at first June.

Table 2: Effect of peanut planting dates on dry weight of weeds (g/m^2) in 2018 and 2019 seasons

	Dry weight of grassy weeds (g/m^2)		Dry weight of broad-leaved weeds (g/m^2)		Dry weight of total annual weeds (g/m^2)	
Planting dates	2018	2019	2018	2019	2018	2019
1st May	24.69	19.98	78.06	79.54	102.75	99.52
15th May	30.27	28.38	84.63	102.21	114.90	130.59
1st June	33.92	29.13	108.67	117.63	142.59	146.76
$LSD_{0.05}$	NS	NS	13.07	16.56	16.83	16.88

NS = not significant

Table 3: Effect of peanut planting dates on peanut yield and its components in 2018 and 2019 seasons

Planting dates	Plant height (cm)	No. of branches /plant	Plant weight (g)	No. of pods/ plant.	Pods weight (g/plant)	Weight of 100 pods (g).	100-seed weight (g)	Pods yield (kg/fed)	Seed yield (kg/fed)
					2018				
1st May	50.27	15.69	224.21	14.25	42.22	187.04	59.02	1884.78	1539.15
15th May	44.98	14.67	217.23	12.83	39.71	183.29	55.96	1845.83	1530.96
1st June	42.00	13.37	201.52	12.10	38.50	178.70	54.19	1766.54	1495.60
$LSD_{0.05}$	3.40	0.37	7.84	0.66	1.03	2.88	1.24	35.40	31.25
					2019				
1st May	52.02	16.77	239.65	14.37	43.27	190.52	60.44	1831.22	1533.64
15th May	42.50	16.58	225.39	12.73	40.69	186.19	57.67	1926.85	1534.33
1st June	41.44	13.67	218.81	11.19	39.54	178.19	55.56	1803.94	1495.85
$LSD_{0.05}$	3.40	0.82	7.59	0.99	1.02	2.93	0.92	21.72	NS

Table 4: Effect of peanut seeds inoculation on dry weight weeds (g/m^2) in 2018 and 2019 seasons

	Dry weight of grassy weeds (g/m^2)		Dry weight of broad-leaved weeds (g/m^2)		Dry weight of total annual weeds (g/m^2)	
Inoculation	2018	2019	2018	2019	2018	2019
Inoculated	33.861	28.31	91.01	100.74	124.87	129.05
Uninoculated	23.38	23.33	89.88	98.85	113.26	122.18
F-test	NS	NS	NS	NS	NS	NS

Yield and Yield Components: Data in Table (3) revealed that planting dates highly significant influence the yield and yield attributes of peanut.

Data revealed that early planting dates at first May and mid of May increased plant height (cm), no. of branches/plant, plant weight (g), no. of pods/plant, weight of pods /plant (g), 100-pods weight (g), 100-seeds weight (g), pods and seed yields (kg/fed) in the first season only by (19.7 and 7.1), (17.35 and 9.72), (10.78 and 7.68), (17.77 and 6.03), (9, 66 and 3.14), (4.67 and 2.57%), (8.91 and 3.27%), (1.5 and 0.1%) and (2.9and 2.4%) in 2018 and 2019 seasons and by (25.5 and 2.56), (22.67 and 21.3), (9.52 and 3.01), (28.41 and 13.76), (9.43 and 2.91), (6.90 and 4.48%), (8.78 and 3.80%) and (6.8 and 1.5%) in 2019 season, respectively compared with late planting (first of June).

These results are in harmony with those obtained by Naab *et al.* [19] and Canavar and Kaynak [20] who found that early sowing produced 32 and 43% greater biomass yields and 20 to 50% greater pod yield than mid and late sowing, respectively. Delaying planting to mid-May decreased the plant weight, number and weight of pods/plant and seed yield/fed by 18.0, 20.1, 19.5 and 18.7%, respectively, compared to early sowing.

Effect of Rhizobia Inoculation On

Dry Weight of Weeds/m^2: Effects of Rhizobia inoculation on dry weight of grassy, broad-leaved and total annual weeds (g/m^2) were not significant in both seasons Table(4).

Yield and Yield Components: Data in Table (5) revealed that Rhizobia inoculation had a significant effect on number of branches/plant, pods weight/plant, 100-pod weights, 100-seed weight (g) in both seasons, plant weight (g) in the first season only and buds yield in the second season only compared with none inoculated in 2018 and 2019 seasons.

Table 5: Effect of peanut seeds inoculation on peanut yield and its components in 2018 and 2019 seasons

Planting dates	Plant height (cm)	No. of branches /plant	Plant weight (g)	No. of pods / plant.	Pods weight (g/plant)	Weight of 100 pods (g).	100-seed weight (g)	Pods yield (kg/fed)	Seed yield (kg/fed)
					2018				
Inoculated	45.58	14.04	212.37	13.04	38.17	181.25	55.43	1843.5	1514.5
Uninoculated	45.92	15.11	216.26	13.08	42.12	184.78	57.35	1821.3	1529.3
F-test	NS	**	**	NS	**	**	**	NS	NS
					2019				
Inoculated	44.11	15.39	213.03	12.61	39.17	183.69	56.35	1826.1	1521.1
Uninoculated	46.53	15.96	217.69	12.92	43.17	186.24	59.43	1881.9	1521.5
F-test	NS	**	NS	NS	**	**	**	**	NS

Table 6: Effect of weed control treatments on dry weight of weeds (g/m^2) in 2018 and 2019 seasons

		Dry weight of grassy weeds (g/m^2)				Dry weight of broad-leaved weeds (g/m^2)				Dry weight of total annual weeds (g/m^2)			
		2018		2019		2018		2019		2018		2019	
Weed control treatments	Rate/fed.	Weight g/m^2	% control	Weight g/m^2	% control	Weight g/m^2	% control	Weight g/m^2	% control	Weight g/m^2	% control	Weight g/m^2	% control
Sheto	100 cm^3	8.67	92.8	7.58	92.6	16.62	95.9	16.46	96.3	25.29	95.2	25.25	95.4
Stomp	2.0 L	17.87	85.1	15.83	84.5	49.75	87.8	58.08	87.0	47.62	91.0	78.17	85.6
Kugar	1.5 L	15.79	86.8	13.95	86.4	34.33	91.6	38.54	91.4	50.12	90.5	54.75	89.9
Capital	2.0 L	9.75	91.9	9.5	90.7	21.7	94.7	24.71	94.5	31.45	94.0	36.42	93.3
Hand weeding twice		5.92	95.1	5.87	94.3	13.2	96.8	12.92	97.1	19.12	96.4	18.79	96.5
Untreated		119.75	0.0	102.2	0.0	407.08	0.0	448.04	0.0	526.83	0.0	543.37	0.0
$LSD_{0.05}$		16.92		11.68		23.4		22.51		30.45		25.35	

Table 7: Effect of weed control treatments on peanut yield and its components in 2018 and 2019 seasons

Weed control treatments	Rate/fed.	Plant height (cm)	No. of branches /plant	Plant weight (g)	No. of pods per plant.	Pods weight (g/plant)	Weight of 100 pods (g).	100-seed weight (g)	Pods yield (Kg/fed)	Seed yield (Kg/fed)
						2018				
Sheto	100 cm^3	41.75	14.75	214.21	13.88	38.83	180.37	53.87	1942.1	1682. 5
Stomp	2.0 L	36.83	12.54	196.04	10.91	34.92	168.12	51.87	1592.9	1326.6
Kugar	1.5 L	45.95	15.33	205.62	12.33	38.50	187.29	57.92	1935.7	1592.6
Capital	2.0 L	54.67	15.79	235.17	16.75	46.00	200.50	60.56	2008.5	1748.5
Hand weeding		59.71	16.85	241.33	16.25	48.92	201.17	62.25	2025.6	1725.1
Untreated		35.58	12.45	193.54	13.88	38.83	160.62	51.46	1489.5	1056.1
LSD		3.34	0.86	12.06	1.01	1.70	5.38	1.85	35.24	50.67
						2019				
Sheto	100 cm^3	41.17	15.37	214.71	13.92	39.67	182.25	54.42	1943.4	1684.8
Stomp	2.0 L	35.25	13.67	195.75	11.46	36.12	169.96	52.92	1598.3	1320.4
Kugar	1.5 L	46.75	16.54	207.62	12.13	39.54	189.33	59.58	1997.5	1596.8
Capital	2.0 L	55.58	17.54	236.62	15.17	47.12	201.58	62.42	2024.1	1762.0
Hand weeding		61.17	18.12	242.87	15.83	49.87	204.62	65.54	2108.9	1742.1
Untreated		32.00	12.79	194.5	13.92	39.67	162.04	52.55	1451.8	1021.6
$LSD_{0.05}$		3.34	0.99	8.44	1.09	1.84	5.28	2.51	34.5	70.03

Rhizobia inoculation increased no. branches/plant, 100 pod weight, 100-seed weight (g) by (7.62 and 3.7%), (1.91 and 1.37%), (3.35 and 5.18%) in 2018 and 2019 seasons, respectively and plant weight in the first season by 1.83 and pods yield in the second season by 3.1 as compared with uninoculated. These results are in harmony with those obtained by Tilak *et al.* [10]; Abdel-Wahab *et al*. [21]; Yadav and Verma [22] and Verma *et al.* [3].

Effect of Weed Control Treatments On Dry Weight of Weeds/m^2: Data in Table (6) indicated that effects of weed control treatments on dry weight of annual grassy, broad-leaved and total annual weeds (g/m^2) was significant in 2018 and 2019 seasons.

Hand weeding twice at 30 and 45 days after planting, Sheto at rate of 100 cm^3/fed and Capital at rate of 2 L/fed decreased significantly the dry weight of grassy weeds, (g/m^2) by (95.1, 92.8 and 91.9%) and (94.3, 92.6 and 90.7%),

broad-leaved weeds by (96.8, 95.9 and 94.7%) and (97.1, 96.3 and 94.5%) and total annual weeds by (96.4, 95.2 and 94.0%) and (96.5, 95.4 and 93.3%) in 2018 and 2019 seasons, respectively compared with unweeded treatment. These results are in accordance with those reported by Moshtohry *et al.* [12].

Yield and Yield Components: Data in Table (7) revealed that weed control treatments significantly increasedall yield and yield components in 2018 and 2019 seasons.

Hand weeding twice at 30 and 45 days after planting, Capital at rate 2 L/fed and Kugar 2 L/fed increased significantly plant height (cm) (67.80, 53.70 and 29.10%) and (91.20, 73, .70 and 46.10%), no. of branches/plant by (35.30, 26.80 and 23.1%) and (41.70, 37.10 and 29.3%), no. of pods/ plant by (97.00, 103.00 and 49.5%) and (95.9, 87.7 and 50.10%) and pods weight (g/plant) by (45.10, 36.50 and 14.20%) and 43.80, 35, 90 and 14.00%)100-pods g/plant by (25.2, 24.8 and 16.6%) and (26.3, 24.4 and 16.8%), weight of 100-seeds g/plant by (21.0, 17.7and 12.6%) and (24.7, 18.8 and 13.4%), seed yield (kg/fed) by (63.4, 65.6 and 50.8%) and (70.5, 72.5 and 56.3%) and pod yield (kg/fed) by (36.0, 34.8 and 30.0) and (45.3, 39.4 and 37.6%) in 2018 and 2019 seasons, respectively compared withunweeded treatment. these resultsare in accordance with those reported by Olayinka and Etejere [22] and Moshtohry *et al*. [12].

Effect of Interactions Between Planting Dates and Rhizobia Inoculation On

Dry Weight of Weeds: Data indicated that the effect ofinteractions between planting dates and Rhizobia inoculation on dry weight of grassy, broad-leaved and total weeds were not significant both seasons.

Yield and Yield Components: Data in Table (8) indicated that the effects of interactions between planting date and Rhizobia inoculation were significant on plant height and 100-seeds weight in both seasons, no. of branches/plant, pods weight (g)/plant, 100-pods weight in the second season only and pods yield in the first season. The highest valuesof these traits were obtained by Rhizobacteria inoculation with planting date at the first of May compared with uninoculation with Rizobacteria.

Effect of Interactions Between Planting Date and Weed Control Treatments on

Dry Weight of Weeds: Table (9) shows the effect of interaction between planting dates and weed control treatments on weeds dry weight (g/m^2).

Results indicated that the interaction between planting dates and weed control treatments had asignificant effect on dry weight of broad-leaved weeds (g/m^2) in both seasons and total annual leaved weeds in the second season. Sheto, Capital and hand weeding twice gave the highest reduction in weeds dry weight under early planting date at first of May compared with unweeded treatment and planting peanut at first June. These results are in agreement with those obtained by Nepomuceno *et al.* [7] who reported that the weed community and the peanut crop were influenced by sowing time, modifying their interference relations.

Yield and Yield Components: Table (10) showed that the effect of interaction between planting date and weed control treatments did not have any significant effecton yield and yield components of peanut in both seasons, except plant height and pods yield in both seasons and 100-seeds weight (g) in first season only. Hand weeding twice andthe application of Capital, Kugar and Sheto herbicides gave the highest values of these traits under planting peanut at 1st May in compared with unweeded treatment and planting date at first June. These results are in accordance with these reported by Shaban *et al.* [7].

Effect of Interactions Between Rhizobia Inoculation and Weed Control Treatments on

Dry Weight of Weeds: Data showed that the effect of interaction between Rhizobia inoculationand weed control treatments on dry weight of weeds (g/m^2) were not significant in both seasons.

Yield and Yield Components: Results revealed that the effect of interaction between Rhizobia inoculationand weed control treatments on yield and yield components were not significant in both seasons.

Effect of Interactions Between Planting Date, Rhizobia Inoculation and Weed Control Treatments on

Dry Weight of Weeds: Data revealed that the effect of second order interaction between planting dates, Rhizobia inoculation and weed control treatments was not significant on dry weight of grassy, broad-leaved and total weeds in 2017/18 and 2018/19 seasons.

Yield and Yield Components: The second order interaction between planting date, Rhizobia inoculation and weed control treatmentsdid not have any significant effect onpeanut yield and yield attributesin both seasons.

Table 8: Effect of interaction between peanut planting dates and seed inoculation on peanut yield and its components in 2018 and 2019 seasons

		Plant height (cm)		No. of branches /plant	Pods weight (g/plant)	Weight of 100 pods (g).	100-seed weight (g)		Pods yield (Kg/fed)
Planting dates	Seed inoculation	2018	2019	2019	2019	2019	2018	2019	2018
1st May	Inoculated	51.33	55.04	17.13	46.67	192.54	61.17	63.12	1881.29
	Uninoculated	49.21	49	16.42	39.87	188.5	56.87	57.75	1810.38
15th May	Inoculated	46.37	41.12	17.71	42.29	189.12	56.58	59.33	1885.04
	Uninoculated	43.58	41.75	15.46	39.08	183.25	55.33	56.12	1884.46
1st June	Inoculated	42.83	42.79	13.75	40.54	177.04	54.29	55.83	1764.08
	Uninoculated	41.17	42.21	13.58	38.54	179.33	54.08	55.29	1769
$LSD_{0.05}$		2.86	2.86	0.50	3.19	2.78	1.84	2.35	29.62

Table 9: Effect of interaction between peanut planting dates and weed control treatments on weeds dry weight (g/m^2) in 2018 and 2019 seasons

			Dry weight of broad-leaved weeds (g/m^2)		Dry weight of total annual weeds (g/m^2)
Planting dates	Weed control treatments	Rate/fed.	2018	2019	2019
1st May	Sheto	100 cm^3	17.62	16.50	24.75
	Stomp	2.0 L	35.87	53.37	71.50
	Kugar	1.5 L	29.50	40.37	54.37
	Capital	2.0 L	23.37	24.37	33.75
	Hand weeding		15.12	15.37	23.25
	Untreated		346.9	463.3	580.4
15th May	Sheto	100 cm^3	20.37	17.12	25.00
	Stomp	2.0 L	61.75	86.87	108.0
	Kugar	1.5 L	42.37	53.75	72.12
	Capital	2.0 L	28.25	29.75	41.25
	Hand weeding		13.37	15.25	21.25
	Untreated		485.85	503.0	607.8
1st June	Sheto	100 cm^3	11.87	15.75	26.00
	Stomp	2.0 L	51.62	34.00	55.00
	Kugar	1.5 L	31.12	21.50	37.75
	Capital	2.0 L	13.50	20.00	34.25
	Hand weeding		11.12	8.12	11.25
	Untreated		388.50	377.9	442.00
$LSD_{0.05}$			40.52	38.99	43.91

Table 10: Effect of interaction between planting date and weed control treatments on peanut yield and its components in 2018 and 2019 seasons

			Plant height (cm)		100-seed weight (g)	Pods yield (kg/fed)	
Planting dates	Weed control treatments	Rate/fed.	2018	2019	2018	2018	2019
1st May	Sheto	100 cm^3	42.12	41.25	53.62	1936.8	1907.1
	Stomp	2.0 L	36.75	35.87	51.5	1632.1	1590.5
	Kugar	1.5 L	45.5	44.75	58.25	1886.1	2003.9
	Capital	2.0 L	52.12	44.37	59.12	1981.3	1967.0
	Hand weeding		57.5	49.62	61.62	1996.9	2058.3
	Untreated		35.87	32.75	51.62	1641.9	1460.6
15th May	Sheto	100 cm^3	43.62	44.25	55.75	1984.6	1978.0
	Stomp	2.0 L	39.37	38.00	53.12	1591.0	1643.1
	Kugar	1.5 L	47.5	54.25	59.87	2027.1	2079.8
	Capital	2.0 L	63.0	67.62	65.87	2060.4	2112.9
	Hand weeding		69.87	73.3	67.25	2127.0	2230.3
	Untreated		38.25	34.62	52.25	1518.4	1517.1
1st June	Sheto	100 cm^3	39.5	38.00	52.25	1904.9	1945.1
	Stomp	2.0 L	34.37	31.87	51.00	1555.5	1561.4
	Kugar	1.5 L	44.87	41.25	55.62	1893.8	1909.0
	Capital	2.0 L	48.87	54.75	57.87	1984.0	1992.5
	Hand weeding		51.75	60.5	57.87	1953.0	2038.1
	Untreated		32.62	28.62	50.5	1308.1	2038.1
$LSD_{0.05}$			11.56	5.78	3.18	61.03	61.0

CONCLUSION

From this study it could be concluded that to maximize the weed control and obtaining the highest values of peanut yield and its attributes to plant peanut from 1st to 15th May, inoculate peanut seeds with Rhizobacteria and control weeds by hand weeding twice or using Capital, Kugar and Sheto herbicides.

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