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Weed management in groundnut under organic farming

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Abstract

An experiment on weed management in groundnut was conducted on loamy sand of Agricultural Research Station, S. D. Agricultural University, Aseda during *kharif* seasons of three consecutive years from 2022-25. There were total eight treatments of weed management were tested in randomized complete block design and replicated thrice. Among the different treatments, significantly lower weed density and weed dry weight (g) at 45 DAS, 60 DAS and at harvest as well as significantly higher number of branch per plant, pods per plant, pod yield (g) per plant, 100 kernel weight (g), pod yield (kg/ha) and haulm yield (kg/ha) were recorded under weed free treatments which is statistically at par with the treatment receiving interculturing at 25 DAS and two HW at 25 and 40 DAS (T₈). Higher net return (₹/ha) and benefit cost ratio was recorded under T₈ treatment due to higher cost of cultivation in the weed free treatment.

Keywords: Groundnut, weed density, weed dry weight, pod yield, haulm yield

Introduction

Groundnut (*Arachis hypogaea* L.) is one of the important oilseed crops. India is world's second largest producer of groundnut and Gujarat is almost 40-50% contributions to the total groundnut production of groundnut in India. It is predominantly grown during *kharif* season. Groundnut production reaches 118.96 lakh tonnes from 17.73 lakh hectares in 2024-25 and in Gujarat in *kharif* season, it had been cultivated in 1.9 Mha area with 5.0 MT production with productivity of 2665 kg/ha ^[1] Heavy weed infestation appears to be the most serious menace in groundnut production causing extensive losses. Because of its short stature and initial slow growth in comparison to fast growing weeds, weeds smother this crop at every stage by sharing water, nutrients, space, solar radiation and other resources. Weeds problem is dominant in the rainy season as compared to summer due to constant moisture availability. It has been estimated that yield-loss may reach up to 80% due to weed infestation ^[2] It is also crucial to control weeds under organically cultivated groundnut due to non use of synthetic chemicals. So to find out the effective way to control weeds means of various crop mulch, stale seed bed and mechanical means this experiment is formulated.

Materials and Methods

The field experiment was conducted at Agricultural Research Station, S. D. Agricultural University, Aseda during *kharif* seasons of three consecutive years 2023 to 2025. The experimental soil was sandy loam with low water holding capacity, Low in available nitrogen (224 kg N/ha), high in available phosphorus (78 kg P₂O₅/ha) and high in available potash (294 kg K₂O/ha). The variety used in this experiment was GG 37. Total eight treatment viz; T₁: Weed free, T₂: Weedy check, T₃: Stale seed bed fb HW at 25 DAS

T₄: Castor shell mulch @ 5t/ha fb HW at 25 DAS, T₅: Mustard straw mulch @ 5t/ha fb HW at 25 DAS, T₆: Fennel straw mulch @ 5t/ha fb HW at 25 DAS, T₇: Interculturing fb HW at 25 DAS, T₈: Interculturing at 25 DAS and two HW at 25 and 40 DAS are framed in randomized complete block design which replicated thrice. The weed free treatment was imposed by weeding carried out up to 45 days after sowing with weekly removal of all weeds. Rain fall and rainy days were recorded 1005.9 mm & 35 rainy days, 668.6 mm & 29 rainy days and 1179 mm & 45 rainy days respectively. The analysis of data was done using the Fisher's method of analysis of variance technique as described by Gomez and Gomez (1984) ^[3]. The differences of

means were identified by Duncan's univariate test at $p \geq 0.05$ ^[4].

Results

Effect on weeds

Major weeds of the experimental field were *Amaranthus spinosus* L., *Digera arvensis* Forsk, *Physalis minima*, *Tribulus terrestris* L., *Portulaca oleracea* L., *Trianthema portulacastrum*, *Cyperus rotundus* L., *Cenchrus biflorus* L., *Eleusine indica* L., and *Dactyloctenium aegyptium*

Effect on growth and yield parameters of groundnut

Plant population: The results revealed that plant population per meter row length was found non-significant due to different weed control treatments at 20 DAS during individual years as well as in pooled analysis. However, at harvest, plant population per meter row length was found significantly higher under treatment T₁: weed free (8.64) which was at par with T₇ (Interculturing fb HW at 25 DAS) and T₈ (Interculturing at 25 DAS and two HW at 25 and 40 DAS). The reduction in plant population was due to heavy infestation of weeds in the plots which spreads collar rot and root rot disease to crop and plant going to die.

The result indicated that plant height of 46.18 cm at 45 DAS and of 65.47 cm at harvest were found significantly higher under treatment T₁ (weedy check), However lowest plant height at 45 DAS of 30.58 cm and at harvest of 44.93 cm observed under treatment T₁ (weed free) which followed by treatment T₈ (Interculturing at 25 DAS and two HW at 25 and 40 DAS). The higher plant height of weedy plots due to vertical development of plant height without less branching only vertical stem like development observed and it indicated higher plant height.

Among the different weed control treatments significantly higher number of branches per plant (7.40), no. of pods per plant (33.09), Pod yield per plant (32.49 g), 100 kernel weight (44.33 g) and shelling percentage (66.18%) were recorded under treatment T₁ (weed free) on pooled results and remained statistically at par with T₈ treatment, while lower values of branches per plant (3.73), no. of pods per plant (7.42), Pod yield per plant (8.69 g), 100 kernel weight (40.33 g) and shelling percentage (57.08%) were observed under un weeded check. This higher yield attributes of plant is might be due to very less crop completion of weeds for solar, nutrient and water which leads to healthy plant growth and development.

Pod yield of groundnut significantly affected by different treatments of weed control during all three years and in pooled analysis. Significantly higher pod yield (4145, 2858, 3213 and 3405 kg/ha, respectively) recorded under treatment T₁ (weed free) and remained statistically at par with treatment T₈ (Interculturing at 25 DAS and two HW at 25 and 40 DAS) while the lower yield was observed under un weeded control of 230,157,226 and 204 kg/ha respectively. Among the different weed control treatments significantly higher haulm yield of 6895,4537,5552 and 5662 kg/ha were recorded under treatment T₁ (weed free) during 2023,2024,2025 and on pooled results respectively. The higher pod and haulm yield might be resulted due to higher no. of pods per plant pod yield per plant and shelling percentage^[5-14].

Effect on weed dynamics

The effect of different weed control treatments significantly affected on weed density per m². Significantly higher weed

density/m² 15.17, 16.03 and 18.51 and weed dry weight of 19.96 g., 23.27 g. and 21.05 g. at 45, 60 DAS and at harvest were recorded under the treatment of un weeded control while lower weed density/m² and weed dry weight observed under treatment T₁ (weed free) which was consistently followed by treatment T₈ (Interculturing at 25 DAS and two HW at 25 and 40 DAS). The result revealed that among the different weed control treatments numerically lowest weed index (9.38, 8.54, 11.53 and 9.82%) were observed under treatment T₈ (Interculturing at 25 DAS and two HW at 25 and 40 DAS). The result indicated that weed control efficiency (%) recorded maximum under the treatment T₈ (Interculturing at 25 DAS and two HW at 25 and 40 DAS) as per compared to others treatment. During the *khari*f seasons there is ample availability of soil moisture which leads to weed plant to germinate and make completion to plant.

Economics

The gross return and net return were found maximum under treatment T₁(weed free) (249592 ₹/ha and 173333 ₹/ha, respectively) which was followed by treatment T₈ (Interculturing at 25 DAS and two HW at 25 and 40 DAS) and T₇ (Interculturing fb HW at 25 DAS). However, maximum B: C ratio (3.11) was recorded under T₈ (Interculturing at 25 DAS and two HW at 25 and 40 DAS) which was followed by treatment T₇ (Interculturing fb HW at 25 DAS) and T₁ (weed free).

Table 1: Plant population and growth parameters of groundnut as influenced by different treatments (Pooled data of three years)

Treatments	Plant population (per metre row length)		Plant height (cm)		Number of branch per plant
	25 DAS	At harvest	45 DAS	At harvest	
T ₁	8.89	8.64	30.58	44.93	7.40
T ₂	9.22	1.84	46.18	65.67	3.73
T ₃	9.56	1.93	37.89	57.42	4.20
T ₄	9.20	1.98	39.58	55.96	3.87
T ₅	9.36	1.84	36.96	55.31	4.24
T ₆	9.16	1.82	38.60	55.42	4.09
T ₇	9.40	8.47	34.91	51.07	5.11
T ₈	9.33	8.47	33.27	46.07	6.67
S.E.m. ±	0.166	0.093	1.231	1.284	0.180
CD (P=0.05)	NS	0.27	3.51	3.67	0.51
Y x T	NS	NS	NS	NS	NS
CV (%)	5.39	6.38	9.92	7.17	11.0

Table 2: Yield and quality parameters of groundnut as influenced by different treatments (Pooled data of three years)

Treatments	Number of pods per plant	Pod yield (g) per plant	100 kernel weight (g)	Shelling (%)	Oil content (%)
T ₁	33.09	32.49	44.33	66.18	49.20
T ₂	7.42	8.69	40.33	57.08	48.79
T ₃	9.62	9.62	41.44	58.44	48.82
T ₄	9.11	9.29	41.00	59.66	48.84
T ₅	9.27	9.44	41.33	57.69	49.12
T ₆	8.80	10.67	41.78	58.62	48.93
T ₇	22.71	27.22	42.33	61.80	49.05
T ₈	28.22	29.84	43.11	63.69	48.96
S.E.m. ±	0.608	0.523	0.825	2.838	0.794
CD (P=0.05)	1.73	1.49	2.35	4.22	NS
Y x T	NS	NS	NS	NS	NS
CV (%)	11.36	9.12	5.9	8.14	2.11

Table 3: Weed density, weed dry weight, WI and WCE of groundnut as influenced by different treatments (Pooled data of three years)

Treatment	Weed density/m ²			Weed dry weight (g/m ²)			Weed index (%)	WCE (%)
	45 DAS	60 DAS	At harvest	45 DAS	60 DAS	At harvest		
T ₁	0.71 ^c (0.00)	0.71 ^c (0.00)	0.71 ^d (0.00)	0.71 ^d (0.00)	0.71 ^e (0.00)	0.71 ^e (0.00)	-	100.00
T ₂	15.17 ^a (242)	16.03 ^a (268)	18.51 ^a (348)	19.96 ^a (0.405)	23.27 ^a (0.571)	21.05 ^a (0.446)	93.97	0.00
T ₃	13.65 ^a (192)	15.69 ^{ab} (261)	14.26 ^b (210)	12.22 ^b (0.151)	19.44 ^{ab} (0.404)	15.13 ^b (0.235)	83.83	39.85
T ₄	12.64 ^a (165)	13.94 ^{ab} (201)	13.66 ^b (192)	13.55 ^b (0.187)	17.80 ^{bc} (0.341)	13.86 ^b (0.194)	89.62	38.81
T ₅	11.81 ^a (140)	12.83 ^{ab} (172)	13.16 ^b (178)	15.20 ^{ab} (0.236)	15.31 ^{bcd} (0.242)	14.28 ^b (0.204)	89.66	51.09
T ₆	14.45 ^a (219)	12.87 ^{ab} (171)	13.86 ^b (196)	13.94 ^b (0.201)	16.57 ^{bcd} (0.293)	14.43 ^b (0.212)	87.31	53.85
T ₇	12.66 ^a (171)	11.93 ^b (148)	13.16 ^b (178)	11.10 ^{bc} (0.128)	14.37 ^{cd} (0.210)	12.51 ^c (0.158)	26.76	58.69
T ₈	6.98 ^b (73)	12.17 ^b (151)	10.24 ^c (110)	6.66 ^c (0.064)	11.88 ^d (0.144)	10.56 ^d (0.114)	9.82	75.02
S.Em±	1.39	1.15	0.68	1.52	1.50	0.47		
Y	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.		
Y * T	4.70	3.97	NS	2.68	4.35	NS		
CV(%)	25.90	20.03	16.72	13.91	17.71	11.04		

Table 4: Yield of groundnut as influenced by different treatments (Pooled data of three ears)

Treatments	Pod yield (kg/ha)				Haulm yield (kg/ha)			
	2023	2024	2025	Pooled	2023	2024	2025	Pooled
T ₁	4145 ^a	2858 ^a	3213 ^a	3405 ^a	6895	4537	5552	5662
T ₂	230 ^c	157 ^d	226 ^e	204 ^c	392	219	423	345
T ₃	571 ^c	463 ^c	596 ^d	543 ^c	1003	715	1198	972
T ₄	336 ^c	321 ^{cd}	380 ^{de}	346 ^c	588	525	812	642
T ₅	318 ^c	302 ^{cd}	410 ^{de}	344 ^c	504	498	769	590
T ₆	537 ^c	336 ^{cd}	429 ^{de}	434 ^c	863	530	840	744
T ₇	2562 ^b	2361 ^b	2420 ^c	2448 ^b	4102	3673	4324	4033
T ₈	3756 ^a	2614 ^{ab}	2910 ^b	3094 ^a	6373	4130	5250	5251
S.Em. ±	157.98	89.75	68.31	158.95	274.6	90.8	114.7	288.9
Y	Sig.			Sig.				Sig.
Y x T				320				513
CV (%)	17.58	13.21	8.94	14.35	18.37	8.49	8.29	13.65

Table 5: Economics of groundnut as influenced by different treatments

Treatments	Pod yield (kg/ha)	Haulm yield (kg/ha)	Gross return (₹/ha)	Cost of cultivation (₹/ha)	Net return (₹/ha)	B:C ratio
T ₁	3405	5662	249592	76259	173333	2.27
T ₂	204	345	14997	44099	-29102	-0.66
T ₃	543	972	40355	48899	-8544	-0.17
T ₄	346	642	25893	53119	-27226	-0.51
T ₅	344	590	25359	50619	-25260	-0.50
T ₆	434	744	31992	50619	-18627	-0.37
T ₇	2448	4033	179143	51319	127824	2.49
T ₈	3094	5251	227648	55339	172309	3.11

Selling price (₹/kg): Pod selling price @ 60 and Haulm @ 6

Price of different inputs (₹/unit, kg)

Biofertilizers@300, Ghanjeevamrut@8, Jeevamrut@2, Fennel straw @0.5, Castor shell@1, Mustard straw@ 0.5

Conclusion

It can be concluded that for effective weed control, securing higher yield and net return under the organically cultivated groundnut are advisable to carry out Interculturing at 25 DAS and two HW at 25 and 40 DAS.

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