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Effect of weed management on nutrient content, uptake and yield of summer groundnut (*Arachis hypogaea* L.)

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Abstract

An experiment was conducted to assess the effect of weed management on growth attributes and yield of summer groundnut (*Arachis hypogaea* L.) during summer, 2015 at the Department of Agronomy, College of Agriculture, JAU, Junagadh. The results of experiment indicated that content and uptake of N, P and K by crop were significantly higher under weed free. Significantly the highest content and uptake of N, P and K by weeds was recorded under weedy check (T₁). Significantly higher pod yield, haulm yield and biological yield under weed free.

Keywords: Herbicide, groundnut, nutrient, uptake and yield

1. Introduction

Groundnut (*Arachis hypogaea* L.) is an important oilseed crop of India, occupying about 24 M ha of land in about 120 countries under different agro-climatic zones between 40°S and 40°N (DGR, 2013) [2]. Indian has a diverse climate, as such groundnut is grown throughout the year in *kharif*, *rabi*, *summer* and *spring* seasons in one or other part of the country. The productivity of crops under irrigated condition is not stable due to various reasons. Among them weed infestation is considered to be one of the major problems. Yield loss due to weed infestation amounts to 80 per cent in groundnut (Murthy *et al.*, 1994) [6]. Weeds are potential competitors with crops for nutrients, moisture, light and space. Control of weeds particularly in cropping system is vitally important not only to check the loss caused by them, but also to increase the efficiency of the applied fertilizers. Nutrient availability to crop can be increased by controlling the weeds (Devakumar and Gajendra Giri, 1999) [3]. The present investigation was therefore carried out to assess the losses caused by weeds and the extent to which these losses would be minimised by use of herbicides alone or in combination with cultural methods and their effect on crop yield.

2. Materials and Methods

The field experiment entitled “effect of weed management on growth attributes and yield of summer groundnut (*Arachis hypogaea* L.)” was conducted during summer 2015 at Instructional Farm, Department of Agronomy, Junagadh Agricultural University, Junagadh (Gujarat), which is situated in South Saurashtra Agro-climatic region of Gujarat state and enjoys a typically subtropical climate characterized by fairly cold and dry winter, hot and dry summer as well as warm and moderately humid monsoon. Which is situated at 221.5° N latitude and 70.5° E longitudes with an altitude of 60 m above the mean sea level. The soil was clayey in texture and slightly alkaline in reaction with pH 7.9 and EC 0.33 dS m⁻¹. The soil was low in available nitrogen (237.0 kg ha⁻¹), medium in available phosphorus (22.5 kg ha⁻¹) and high in potassium (284.0 kg ha⁻¹). Total ten treatment combinations *viz.*, weedy check (T₁), hand weeding twice at 20 and 45 DAS (T₂), weed free (T₃), pendimethalin @ 0.9 kg ha⁻¹ as pre-emergence (T₄), oxyfluorfen @ 0.24 kg ha⁻¹ as pre-emergence (T₅), imazethapyr @ 0.07 kg ha⁻¹ as post-emergence at 20 DAS (T₆), premix sodium acifluorfen + clodinafop propargyl @ 0.25 kg ha⁻¹ as post-emergence at 20 DAS (T₇), premix imazethapyr + imazamox @ 0.100 kg ha⁻¹ as post-emergence at 20 DAS (T₈), quizalofop-*p*-ethyl @ 0.04 kg ha⁻¹ as post-emergence at 20 DAS +1 hand weeding at 45 DAS (T₉) oxyfluorfen @ 0.24 kg ha⁻¹ as pre-emergence followed by imazethapyr @ 0.07 kg ha⁻¹ as post-emergence at 20 DAS + 1 hand weeding at 45 DAS (T₁₀) were tested in a randomized block design (RBD) with three repetitions. The crop was sown in 30 cm × 10 cm spacing with seed rate of 120 kg/ha. The variety GJG-31 was shown on 7th February and recommended dose of fertilizer was 25-50-50 N-P-K kg ha⁻¹ and all other recommended practices were adopted according to as per needed

of crop requirement. Statistical analysis of the individual data of various characters studied in the experiment was carried out using standard statistical procedures as described by Panse and Sukhatme (1985) [7]. Standard error of mean, critical difference (C.D.) at 5 per cent level of probability and coefficient of variance were worked out for the interpretation of the results.

3. Result and Discussion

3.1 Effect on nutrient content and uptake

The content of nutrient in pods, haulm and weeds, and uptake of nutrient by pods, haulm and weeds were significantly influenced by different weed management treatments. Significantly higher value of N, P and K content in pods and haulm were recorded under weed free (T₃), which remained statistically at par with HW twice at 20 & 45 DAS (T₂), oxyfluorfen @ 0.24 kg ha⁻¹ as pre-emergence *fb* imazethapyr @ 0.07 kg ha⁻¹ as post-emergence at 20 DAS + 1 HW at 45 DAS (T₁₀) and quizalofop-*p*-ethyl @ 0.04 kg ha⁻¹ as post-emergence at 20 DAS + 1 HW at 45 DAS (T₉). Significantly lower content of N, P and K in pods and haulm under weedy check (T₁).

N, P and K uptake by pods and haulm was significantly higher under weed free (T₃), which remained statistically at par with HW twice at 20 & 45 DAS (T₂) and oxyfluorfen @ 0.24 kg ha⁻¹ as pre-emergence *fb* imazethapyr @ 0.07 kg ha⁻¹ as post-emergence at 20 DAS + 1 HW at 45 DAS (T₁₀). Significantly the lower uptake of N, P and K in pods and

haulm was recorded under weedy check (T₁).

The weedy check (T₁) recorded significantly higher N, P and K content and uptake in weeds. Whereas, significantly the lower content and uptake of N, P and K in weeds were recorded under HW twice at 20 & 45 DAS (T₂), which remained statistically at par with oxyfluorfen @ 0.24 kg ha⁻¹ as pre-emergence *fb* imazethapyr @ 0.07 kg ha⁻¹ as post-emergence at 20 DAS + 1 HW at 45 DAS (T₁₀) and quizalofop-*p*-ethyl @ 0.04 kg ha⁻¹ as post-emergence at 20 DAS + 1 HW at 45 DAS (T₉). The results of present investigation are in close agreements with the findings of Kumar and Rana (2004) [4] and Chaudhari *et al.* (2007) [1].

3.2 Effect on yield

The data indicated that different weed management treatments exerted significant effect on pod, haulm and biological yield. Significantly higher pod (1768 kg ha⁻¹), haulm (2606 kg ha⁻¹) and biological yield (4374 kg ha⁻¹) were registered under weed free (T₃), which remained statistically at par with HW twice at 20 & 45 DAS (T₂), pendimethalin @ 0.9 kg ha⁻¹ as pre-emergence (T₄), quizalofop-*p*-ethyl @ 0.04 kg ha⁻¹ as post-emergence at 20 DAS + 1 HW at 45 DAS (T₉) and oxyfluorfen @ 0.24 kg ha⁻¹ as pre-emergence *fb* imazethapyr @ 0.07 kg ha⁻¹ as post-emergence at 20 DAS + 1 HW at 45 DAS (T₁₀). However, significantly lowest yield were recorded under treatment weedy check (T₁). Analogous findings have been reported by Patel *et al.* (2013) [8] and Mahatale *et al.* (2014) [5].

Table 1: Effect of different treatments on nutrient contents in pods and haulm of groundnut

Treatment	Pods (%)			Haulm (%)		
	N	P	K	N	P	K
T ₁ - Weedy check	0.72	0.17	0.52	0.83	0.16	0.44
T ₂ - Hand weeding twice (20 and 45 DAS)	1.84	0.27	0.73	1.14	0.26	0.59
T ₃ - Weed free	1.93	0.29	0.79	1.15	0.28	0.63
T ₄ - Pendimethalin @ 0.9 kg ha ⁻¹ as PE	1.65	0.20	0.67	1.07	0.22	0.54
T ₅ - Oxyfluorfen @ 0.24 kg ha ⁻¹ as PE	1.58	0.23	0.65	1.01	0.20	0.52
T ₆ - Imazethapyr @ 0.07 kg ha ⁻¹ as POE at 20 DAS	1.54	0.24	0.67	1.04	0.21	0.53
T ₇ - Premix Sodium Acifluorfen + Clodinofof Propriaryl @ 0.25 kg ha ⁻¹ as POE at 20 DAS	1.39	0.20	0.63	0.99	0.19	0.50
T ₈ - Premix Imazethapyr + Imazamox @ 0.100 kg ha ⁻¹ as POE at 20 DAS	1.57	0.21	0.64	1.04	0.20	0.53
T ₉ - Quizalofop- <i>p</i> -ethyl @ 0.04 kg ha ⁻¹ as POE at 20 DAS + 1 HW at 45 DAS	1.73	0.24	0.70	1.08	0.25	0.56
T ₁₀ - Oxyfluorfen @ 0.24 kg ha ⁻¹ as PE <i>fb</i> Imazethapyr @ 0.07 kg ha ⁻¹ as POE at 20 DAS + 1 HW at 45 DAS	1.81	0.27	0.73	1.10	0.26	0.58
S.Em.±	0.10	0.01	0.04	0.03	0.01	0.04
C. D. at 5%	0.21	0.02	0.09	0.08	0.03	0.08
C. V.%	7.75	7.48	7.87	4.29	8.11	8.74

Table 2: Effect of different treatments on nutrient uptake by pods and haulm of groundnut

Treatment	Pods (kg ha ⁻¹)			Haulm (kg ha ⁻¹)		
	N	P	K	N	P	K
T ₁ - Weedy check	5.64	1.32	4.04	8.88	1.67	4.61
T ₂ - Hand weeding twice (20 and 45 DAS)	31.61	4.59	12.55	28.60	6.58	14.80
T ₃ - Weed free	34.17	5.04	13.92	30.04	7.16	16.40
T ₄ - Pendimethalin @ 0.9 kg ha ⁻¹ as PE	25.14	3.08	10.18	26.05	4.99	13.20
T ₅ - Oxyfluorfen @ 0.24 kg ha ⁻¹ as PE	24.54	3.48	10.02	22.07	4.37	11.29
T ₆ - Imazethapyr @ 0.07 kg ha ⁻¹ as POE at 20 DAS	22.09	3.39	9.63	22.99	4.64	11.64
T ₇ - Premix Sodium Acifluorfen + Clodinofof Propriaryl @ 0.25 kg ha ⁻¹ as POE at 20 DAS	18.69	2.72	8.51	21.28	4.13	10.81
T ₈ - Premix Imazethapyr + Imazamox @ 0.100 kg ha ⁻¹ as POE at 20 DAS	21.59	2.88	8.73	23.34	4.53	11.90
T ₉ - Quizalofop- <i>p</i> -ethyl @ 0.04 kg ha ⁻¹ as POE at 20 DAS + 1 HW at 45 DAS	27.61	3.87	11.18	24.99	6.01	12.88
T ₁₀ - Oxyfluorfen @ 0.24 kg ha ⁻¹ as PE <i>fb</i> Imazethapyr @ 0.07 kg ha ⁻¹ as POE at 20 DAS + 1 HW at 45 DAS	30.29	4.44	12.16	26.25	6.27	13.71
S.Em.±	2.00	0.33	0.82	1.62	0.44	1.18
C. D. at 5%	4.21	0.70	1.73	3.41	0.94	2.49
C. V.%	10.16	11.85	10.00	8.47	10.92	12.00

Table 3: Effect of different treatments on nutrient content in weed

Treatment	Nutrient content (%)		
	N	P	K
T ₁ - Weedy check	3.45	1.01	2.47
T ₂ - Hand weeding twice (20 and 45 DAS)	1.09	0.68	1.12
T ₃ - Weed free	0.00	0.00	0.00
T ₄ - Pendimethalin @ 0.9 kg ha ⁻¹ as PE	1.50	0.88	1.51
T ₅ - Oxyfluorfen @ 0.24 kg ha ⁻¹ as PE	1.52	0.94	1.54
T ₆ - Imazethapyr @ 0.07 kg ha ⁻¹ as POE at 20 DAS	1.40	0.92	1.51
T ₇ - Premix Sodium Acifluorfen + Clodinofof Propripryl @ 0.25 kg ha ⁻¹ as POE at 20 DAS	1.58	0.96	1.57
T ₈ - Premix Imazethapyr + Imazamox @ 0.100 kg ha ⁻¹ as POE at 20 DAS	1.42	0.93	1.42
T ₉ - Quizalofop- <i>p</i> -ethyl @ 0.04 kg ha ⁻¹ as POE at 20 DAS + 1 HW at 45 DAS	1.33	0.91	1.38
T ₁₀ - Oxyfluorfen @ 0.24 kg ha ⁻¹ as PE <i>fb</i> Imazethapyr @ 0.07 kg ha ⁻¹ as POE at 20 DAS + 1 HW at 45 DAS	1.23	0.81	1.25
S.Em.±	0.12	0.07	0.10
C. D. at 5%	0.25	0.16	0.23
C. V.%	10.22	11.70	9.74

Table 4: Effect of different treatments on nutrient uptake by weed

Treatment	Nutrient uptake (kg ha ⁻¹)		
	N	P	K
T ₁ - Weedy check	7.24 (52.27)	3.97 (15.31)	6.13 (37.36)
T ₂ - Hand weeding twice (20 and 45 DAS)	1.62 (2.13)	1.36 (1.34)	1.64 (2.19)
T ₃ - Weed free	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)
T ₄ - Pendimethalin @ 0.9 kg ha ⁻¹ as PE	2.72 (6.89)	2.12 (3.98)	2.72 (6.89)
T ₅ - Oxyfluorfen @ 0.24 kg ha ⁻¹ as PE	2.61 (6.31)	2.10 (3.92)	2.63 (6.43)
T ₆ - Imazethapyr @ 0.07 kg ha ⁻¹ as POE at 20 DAS	2.57 (6.11)	2.12 (4.02)	2.66 (6.58)
T ₇ - Premix Sodium Acifluorfen + Clodinofof Propripryl @ 0.25 kg ha ⁻¹ as POE at 20 DAS	2.84 (7.57)	2.26 (4.62)	2.83 (7.49)
T ₈ - Premix Imazethapyr + Imazamox @ 0.100 kg ha ⁻¹ as POE at 20 DAS	2.60 (6.26)	2.15 (4.14)	2.60 (6.28)
T ₉ - Quizalofop- <i>p</i> -ethyl @ 0.04 kg ha ⁻¹ as POE at 20 DAS + 1 HW at 45 DAS	1.99 (3.46)	1.69 (2.36)	2.02 (3.62)
T ₁₀ - Oxyfluorfen @ 0.24 kg ha ⁻¹ as PE <i>fb</i> Imazethapyr @ 0.07 kg ha ⁻¹ as POE at 20 DAS + 1 HW at 45 DAS	1.84 (2.89)	1.55 (1.91)	1.86 (2.95)
S.Em.±	0.21	0.09	0.18
C. D. at 5%	0.44	0.19	0.38
C. V.%	9.76	5.70	8.76

Note: $\sqrt{x+0.5}$ transformation (Figure in parenthesis are original values)

Table 5: Effect of different treatments on pod, haulm and biological yield of groundnut

Treatment	Pod yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)	Biological Yield (kg ha ⁻¹)
T ₁ - Weedy check	778	1063	1841
T ₂ - Hand weeding twice (20 and 45 DAS)	1593	2434	4027
T ₃ - Weed free	1768	2606	4374
T ₄ - Pendimethalin @ 0.9 kg ha ⁻¹ as PE	1518	2313	3831
T ₅ - Oxyfluorfen @ 0.24 kg ha ⁻¹ as PE	1545	2179	3725
T ₆ - Imazethapyr @ 0.07 kg ha ⁻¹ as POE at 20 DAS	1437	2215	3652
T ₇ - Premix Sodium Acifluorfen + Clodinofof Propripryl @ 0.25 kg ha ⁻¹ as POE at 20 DAS	1347	2165	3513
T ₈ - Premix Imazethapyr + Imazamox @ 0.100 kg ha ⁻¹ as POE at 20 DAS	1366	2236	3602
T ₉ - Quizalofop- <i>p</i> -ethyl @ 0.04 kg ha ⁻¹ as POE at 20 DAS + 1 HW at 45 DAS	1675	2377	4053
T ₁₀ - Oxyfluorfen @ 0.24 kg ha ⁻¹ as PE <i>fb</i> Imazethapyr @ 0.07 kg ha ⁻¹ as POE at 20 DAS + 1 HW at 45 DAS	1716	2504	4220
S.Em.±	110	132	161
C. D. at 5%	230	276	338
C. V.%	9.10	7.29	5.35

4. Conclusion

Based on the results of one year experimentation, it seems quite logical to conclude that potential production, profit and effective weed management in summer groundnut under South Saurashtra Agro-climatic Zone can be achieved by conventional methods *i.e.* weed free condition where farm labours are easily available. Alternatively integrated weed management method including quizalofop-*p*-ethyl @ 0.04 kg ha⁻¹ as post emergence at 20 DAS + 1 HW at 45 DAS and

oxyfluorfen @ 0.24 kg ha⁻¹ as pre-emergence *fb* imazethapyr @ 0.07 kg ha⁻¹ as post emergence at 20 DAS + 1 HW at 45 DAS.

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