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Efficacy of pre and post emergence herbicide in kharif groundnut (*Arachis hypogaea* L.)

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ABSTRACT

A field experiment was conducted during kharif season, 2025 at Experimental Farm, Oilseeds Research Station, Latur (Maharashtra), to evaluate pre- and post-emergence herbicides in groundnut (*Arachis hypogaea* L.). The experiment was laid out in a Randomized Block Design with three replications and seven treatments, namely T_1 - Diclosulam 84% WDG a.i. @ 26 g ha⁻¹ as pre-emergence followed by one hoeing at 30 DAS; T_2 - Propaquizafop 2.5% + Imazethapyr 3.75% w/w @ 50 + 75 g ha⁻¹ as post-emergence followed by one hoeing at 30 DAS; T_3 - Imazethapyr 10% SL a.i. @ 100 g ha⁻¹ as post-emergence followed by one hoeing at 30 DAS; T_4 - Imazamox 35% + Imazethapyr 35% a.i. @ 70 g ha⁻¹ as post-emergence followed by one hoeing at 30 DAS; T_5 - farmers practice; T_6 - weed-free treatment; and T_7 - weedy-check. Weed-free treatment (T_6) recorded the highest plant height (52.60 cm), functional leaves plant⁻¹ (89.33), leaf area plant⁻¹ (16.53 dm²), branches plant⁻¹ (11.00), total dry matter plant⁻¹ (38.00 g), dry pod yield plant⁻¹ (10.70 g), dry pod yield (1900 kg ha⁻¹) and haulm yield (3800 kg ha⁻¹). Diclosulam treatment (T_1) remained statistically at par with T_6 for the major growth and yield characters and recorded 1700 kg ha⁻¹ dry pod yield. At harvest, T_6 recorded the lowest weed dry weight (14.00 g m⁻²), the highest weed control efficiency (88.52%) and zero weed index. Among herbicidal treatments, T_1 recorded 28.47 g m⁻² weed dry weight, 74.20% weed control efficiency, 10.05% weed index and the highest benefit:cost ratio (2.92).

Keywords: Groundnut, Diclosulam, Imazethapyr, Weed management, Weed control efficiency, Dry pod yield

Introduction

Groundnut (*Arachis hypogaea* L.) is an important oilseed crop cultivated extensively in India and contributes substantially to edible-oil production. The kernels contain about 49.24% oil, 25.80% protein, 16.13% carbohydrate and 8.50% dietary fibre, besides minerals and vitamins, making the crop important for human nutrition and livestock feed. Groundnut oil cake is also used as a valuable feed and organic nutrient source Arya *et al.*, 2016 [1]

Among the biotic constraints affecting groundnut production, weed infestation is one of the major factors responsible for reduced crop productivity. The crop grows slowly and develops a limited canopy during early growth, allowing weeds to compete for moisture, nutrients, light and space. Weed infestation may reduce groundnut yield by 24-70%, depending on the weed flora and its intensity Jhala *et al.*, 2005 [2].

The critical period of crop-weed competition in groundnut generally extends to about 45 days after sowing. Competition during this period interferes with crop establishment, branching, pegging and pod development. Repeated weed flushes during the rainy season further increase the difficulty of maintaining a clean crop and may lead to considerable yield loss Prasad *et al.*, 2002 [3].

Hand weeding and intercultivation can provide effective weed suppression, but both practices are labour intensive, costly and often delayed by frequent rainfall or shortage of labour. Mechanical operations also become unsuitable after pegging because disturbance of pegs and developing pods can reduce yield. Therefore, timely weed management is essential during the early and reproductive stages of groundnut.

Herbicides provide an opportunity to control weeds at the required stage of crop growth and to reduce dependence on manual labour. Pre-emergence herbicides suppress susceptible weeds during germination and establishment, whereas post-emergence herbicides control weeds after their emergence. Suitable herbicide treatments, when used at recommended doses, can reduce crop-weed competition during the critical period.

However, a single herbicide treatment may not provide season-long control because new weed flushes may emerge later and weed species differ in their sensitivity. Integration of herbicides with hoeing or hand weeding can therefore improve the consistency of weed suppression and protect the crop during pegging and pod filling.

Effective weed control improves the availability of moisture, nutrients and light to the crop, thereby promoting leaf development, branching, dry matter accumulation and yield formation. It can also reduce harvesting

difficulties and improve the economic returns of groundnut cultivation. The selection of an effective and economical herbicide-based practice is consequently important for rainy-season groundnut production.

Keeping in view these considerations, the present investigation entitled "Efficacy of pre and post emergence herbicide in *kharif* groundnut (*Arachis hypogaea* L.)" was conducted during *kharif* season of 2025 at the Experimental Farm, Oilseeds Research Station, Latur, with the objectives of studying the effect of different weed-management practices on growth and yield of groundnut and assessing the economics of the treatments.

Materials and Method

The field experiment was conducted during *kharif* season, 2025 at the Experimental Farm, Oilseeds Research Station, Latur (Maharashtra), situated in the semi-arid region. The experimental soil was deep, black and clayey, moderately alkaline (pH 7.75), low in available nitrogen (237.1 kg ha⁻¹), medium in available phosphorus (18.30 kg ha⁻¹) and very high in available potassium (495.31 kg ha⁻¹).

The experiment was laid out in a Randomized Block Design with three replications and seven treatments. The treatments were T₁ - Diclosulam 84% WDG a.i. @ 26 g ha⁻¹ as pre-emergence followed by one hoeing at 30 DAS, T₂ - Propaquizafop 2.5% + Imazethapyr 3.75% w/w @ 50 + 75 g ha⁻¹ as post-emergence followed by one hoeing at 30 DAS, T₃ - Imazethapyr 10% SL a.i. @ 100 g ha⁻¹ as post-emergence followed by one hoeing at 30 DAS, T₄ - Imazamox 35% + Imazethapyr 35% a.i. @ 70 g ha⁻¹ as post-emergence followed by one hoeing at 30 DAS, T₅ - farmers' practice comprising one hand weeding and one hoeing, T₆ - weed-free treatment comprising two hand weedings, and T₇ - weedy-check control. Treatments were allotted randomly within each replication.

Groundnut variety LGN-1 was sown by dibbling on 21 July 2025 at 30 cm × 10 cm spacing with a seed rate of 100 kg ha⁻¹. The gross and net plot sizes were 4.8 m × 4.2 m and 4.2 m × 3.9 m, respectively. The recommended fertilizer dose of 25:50:00 NPK kg ha⁻¹ was ap-

plied to the crop and other recommended agronomic and plant-protection practices were followed uniformly.

Five plants from each net plot were randomly selected and labelled for recording biometric observations. Plant height, functional leaves plant⁻¹, leaf area plant⁻¹, branches plant⁻¹ and total dry matter plant⁻¹ were recorded at the specified crop-growth stages. Yield attributes, dry pod yield, haulm yield, weed dry weight, weed control efficiency, weed index and economics were also recorded. The data were analysed by analysis of variance for Randomized Block Design and treatment differences were tested using critical difference at 5% (Jhala *et al.*, 2005) [2].

Result and Discussion

Growth attributes of groundnut were significantly influenced by the weed-management treatments (Table 1). Weed-free treatment (T₆) recorded the highest plant height at harvest (52.60 cm), number of functional leaves plant⁻¹ at 90 DAS (89.33), leaf area plant⁻¹ at harvest (16.53 dm²), number of branches plant⁻¹ at 90 DAS (11.00) and total dry matter plant⁻¹ at harvest (38.00 g). Diclosulam 84% WDG a.i. @ 26 g ha⁻¹ as pre-emergence followed by one hoeing at 30 DAS (T₁) recorded 49.33 cm plant height, 85.33 functional leaves plant⁻¹, 15.17 dm² leaf area plant⁻¹, 9.33 branches plant⁻¹ and 34.00 g dry matter plant⁻¹ and remained statistically at par with T₆ for the major growth characters. Imazamox + imazethapyr (T₄) and propaquizafop + imazethapyr (T₂) were the next better herbicidal treatments, whereas the lowest values were recorded under the weedy-check (T₇). The improvement in crop growth under effective weed management may be attributed to reduced competition for moisture, nutrients, light and space. Greater availability of growth resources supported leaf expansion, branching and dry matter accumulation, while uninterrupted competition under the weedy-check restricted canopy development and biomass production. Similar improvement in groundnut growth under efficient herbicide-based weed management was reported by Kachhadiya *et al.*, (2020) [4] and Ramanagouda *et al.*, (2025) [5].

treatments.

Table 1. Mean of growth attributes and yield of groundnut as influenced by various

Treatments	Plant height AH (cm)	No. of functional leaves plant ⁻¹ (90 DAS)	Leaf area plant ⁻¹ AH (dm ²)	No. of branches plant ⁻¹ (90 DAS)	Total dry matter plant ⁻¹ AH (g)	Dry pod yield (kg ha ⁻¹)
T ₁ - Diclosulam 26 g ha ⁻¹ (PE) fb hoeing at 30 DAS	49.33	85.33	15.17	9.33	34.00	1700
T ₂ - Propaquizafop + Imazethapyr 50 + 75 g ha ⁻¹ (PoE) fb hoeing	48.00	77.00	14.03	7.80	30.50	1500
T ₃ - Imazethapyr 100 g ha ⁻¹ (PoE) fb hoeing at 30 DAS	43.17	74.50	12.00	6.80	28.00	1320
T ₄ - Imazamox + Imazethapyr 70 g ha ⁻¹ (PoE) fb hoeing	48.50	78.43	14.83	8.37	31.80	1610
T ₅ - Farmers' practice	42.17	74.17	11.50	6.00	27.10	1270
T ₆ - Weed-free treatment	52.60	89.33	16.53	11.00	38.00	1900
T ₇ - Weedy-check	41.67	73.00	11.00	5.80	26.10	1113
SE ±	1.933	3.42	0.52	0.65	1.41	70.54
CD at 5%	5.796	10.55	1.58	1.95	4.23	211.47
Grand Mean	46.49	78.82	13.58	7.87	30.79	1487.62

*AH - at harvest *DAS - days after sowing

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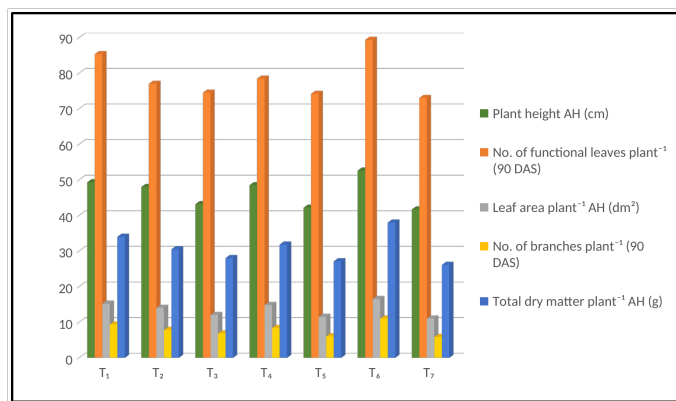


Figure. Mean of growth attributes of groundnut as affected by various treatments

Yield attributes and economics

The yield attributes and yield of groundnut were significantly influenced by the treatments. Weed-free treatment (T₆) recorded the highest number of pods plant⁻¹ (23.00), dry pod yield plant⁻¹ (10.70 g), seed yield plant⁻¹ (7.80 g), number of seeds plant⁻¹ (39.00), dry pod yield (1900 kg ha⁻¹) and haulm yield (3800 kg ha⁻¹). Diclosulam treatment (T₁) recorded 20.60 pods plant⁻¹, 10.00 g dry pod yield plant⁻¹, 7.30 g seed yield plant⁻¹, 35.80 seeds plant⁻¹, 1700 kg ha⁻¹ dry pod yield and 3350 kg ha⁻¹ haulm yield and was statistically at par with T₆ for the major yield characters. Imazamox + imazethapyr (T₄) and propaquizafop + imazethapyr (T₂) recorded 1610 and 1500 kg ha⁻¹ dry pod yield, respectively, while the lowest values were recorded under the weedy-check (T₇).

The higher yield under effective weed management resulted from better crop growth, pod formation and assimilate partitioning under reduced crop-weed competition. Weed-free treatment (T₆) recorded the lowest weed dry weight (14.00 g m⁻²), the highest weed control efficiency (88.52%) and zero weed index. Among herbicidal treatments, Diclosulam (T₁) recorded 28.47 g m⁻² weed dry weight, 74.20% weed control efficiency, 10.05% weed index and the highest benefit:cost ratio (2.92). Weed-free treatment produced the highest gross monetary returns (₹137997 ha⁻¹) and net monetary returns (₹86062 ha⁻¹), whereas the higher labour requirement increased its cultivation cost. Similar advantages of effective herbicide-based weed management were reported by Charitha *et al.*, (2021) [6], Meena *et al.*, (2021) [7], Kalhapure *et al.*, (2013) [8] and Mavarkar *et al.*, (2015) [9].

Conclusion

Among the weed-management treatments, weed-free treatment (T₆) recorded the highest plant height at harvest (52.60 cm), functional leaves plant⁻¹ at 90 DAS (89.33), leaf area plant⁻¹ at harvest (16.53 dm²), branches plant⁻¹ at 90 DAS (11.00), total dry matter plant⁻¹ at harvest (38.00 g), dry pod yield (1900 kg ha⁻¹) and haulm yield (3800 kg ha⁻¹), together with the lowest weed dry weight and weed index. Among the herbicide-based treatments, Diclosulam 84% WDG a.i. @ 26 g ha⁻¹ as pre-emergence followed by one hoeing at 30 DAS (T₁) was the most effective and economical treatment. It remained statistically at par with T₆ for the major growth and yield characters, recorded 1700 kg ha⁻¹ dry pod yield, 74.20% weed control efficiency, 10.05% weed index and the highest benefit:cost ratio (2.92). The results were obtained from one season and require confirmation in another season before wider recommendation.

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