RESEARCH ARTICLE

# Effect of Integrated Weed Management Practices in *rabi* Groundnut on Nutrient uptake by Crop and Nutrient Removal by Weeds

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## ABSTRACT

*A field experiment was conducted to study the effect of integrated weed management practices on nutrient uptake by groundnut and nutrient removal by weeds at College of Agriculture, Professor Jayashankar Telangana State Agricultural University, Hyderabad, during rabi 2020-21. The experiment consisted of ten treatments laid out in randomised block design replicated thrice. Among all the weed management practices, the highest nutrient uptake by crop and lowest removal of nutrients by weeds were recorded with intercultivation fb hand weeding at 20 and 40 DAS. Among herbicides, pre-emergence application of diclosulam at 26 g ha-1fb intercultivation at 20 DAS in sandy loam soils and next best option was the pre emergence application of imazethapyr + pendimethalin at 960 g ha-1 fb intercultivation at 20 DAS.*

**Keywords:** *drymatter, imazethapyr, intercultivation, nutrient removal and nutrient uptake*

## INTRODUCTION

Groundnut (*Arachishypogaea*L.) is an important oilseed crop in India, which is known as "king of oil seeds" or "wonder nut" or "poor man's cashew nut". Being a leguminous crop, Groundnut is often included in crop rotation as it fixes atmospheric nitrogen. Groundnut is one of the most important cash crops and dominant annual crop widely cultivated in India [9]. It is a low-priced commodity but a valuable source of all the nutrients. Groundnut contributes 67 percent of total edible oil produced in India. The demand for edible oils is rising at about 6 percent per year. Therefore, concerted efforts are now being made to stabilize and increase oilseed production. In Telangana, it is grown in an area of 0.99 lakh hectares with an annual production of 0.23 million tonnes and average productivity of 2348 kg $ha^{-1}$ [5]. Though India ranks first in the world under groundnut area and there is a need to import 8.3 million tonnes of edible oil to meet the Indian requirement. The principal reasons are lower productivity and losses of the commodity at various stages of crop production.The main problems limiting the production of groundnut are poor cultural practices as well as inadequate weed management [3]. Besides competing for nutrients, soil moisture, sunlight, weeds inhibit pegging, pod development in groundnut and interfere with harvest. In groundnut, less crop canopy during the first 6 weeks of growth favours strong competition with weeds causing a significant reduction in yield [7].

The weed problem gets more severe due to certain unforeseen factors such as inefficient and untimely weeding or intercultural and continuous rains during the early crop growth period, coupled with the non-availability of labour for weeding. Depending upon nature, the density of weeds, and severity of competition, losses in groundnut yield ranged from 13- 80%. Minimizing the crop weed competition particularly at the early stages of the growth, the yield could be improved by 20-30% [11]. To overcome the deleterious effects of weeds in groundnut, it is imperative that weeds population be kept below the economic threshold level. The loss in yield of groundnut pods due to weed competition ranged from 30 to 40%. Nutrient losses due to crop weed

competition were 38.8, 9.2 and 23.3 N, P and K kgha-1, respectively. Herbicide gives timely and effective control of weeds, and traditional methods give better aeration and soil condition and weed control. Therefore the use of herbicide alone or in combination with cultural practices has become a necessity to control weeds [2].

The field experiment was conducted at College Farm, College of Agriculture, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad, Telangana State. The farm is geographically situated at an altitude of 542.3 m above mean sea level at 17˚19' N latitude and 78°23' E longitude in the Southern Telangana agro-climatic zone of Telangana, and it is classified under semi-arid tropics (SAT) according to Troll's classification. The experiment was planned in a randomized block design with three replications of 10 treatments; which included diclosulam 84% WDG 26 g $ha^{-1}$ PE*fb* intercultivation at 20 DAS ($T_1$), imazethapyr 2% EC + pendimethalin 30% EC 960 g $ha^{-1}$ PE*fb* intercultivation at 20 DAS ($T_2$), pyroxasulfone 85 % WDG 127.5 g $ha^{-1}$ PE*fb* intercultivation at 20 DAS ($T_3$), propaquizofop 2.5% + imazethapyr 3.75% w/w ME 125 g $ha^{-1}$ early PoE*fb* intercultivation at 40 DAS ($T_4$), imazethapyr 35% + imazomox 35% WG 70 g $ha^{-1}$ early PoE *fb* intercultivation at 40 DAS ($T_5$), sodium acifluorfen 16.5% EC + clodinafop propargyl 8% EC 250 g $ha^{-1}$ PoE *fb* intercultivation at 40 DAS ($T_6$), imazethapyr 10% SL 100 g $ha^{-1}$ PoE*fb* intercultivation at 40 DAS ($T_7$), intercultivation (20 and 40 DAS) ($T_8$), intercultivation *fb* hand weeding (20 and 40 DAS) (Weed-free) ($T_9$) and Unweeded control ($T_{10}$). Groundnut crop (variety kadiri-9) was sown on 8th October 2020 at the spacing of 30*10 cm using a seed rate of 300 kg $ha^{-1}$. Herbicides were applied using a Knapsack sprayer fitted with a flat fan nozzle calibrated to deliver 500 litres of water per hectare. Cultural practices recommended for groundnut were adopted during the crop growth period. The crop was supplied with recommended fertilizer dose of fertilizers with 20 kg N, 40 kg $P_2O_5$ and 50 kg $K_2O$ $ha^{-1}$ through urea, single super phosphate and muriate of potash, respectively, to all the plots as basal. Topdressing of 10kg of N was applied in the form of urea at 25 DAS. Nutrient uptake of crop and nutrient removal by weeds was calculated in two stages. The crop was harvested on 12th February 2021.

**Nutrient uptake by groundnut**

Among the different weed management practices tried the highest uptake of nitrogen by groundnut plant at harvest was recorded withintercultivation*fb* hand weeding at 20 and 40 DAS (50.63 kg $ha^{-1}$) which was on par with diclosulam PE*fb* intercultivation at 20 DAS (48.79 kg $ha^{-1}$) and this was followed by imazethapyr + pendimethalin *fb* intercultivation at 20 DAS which were significantly superior over rest of weed management practices. These were followed by sodium acifluorfen + clodinafop propa.rgyl PoE *fb* intercultivation at 40 DAS,intercultivation at 20 and 40 DAS and propaquizafop + imazethapyr PoE*fb* intercultivation at 40 DAS and were on par with each other. The unweeded control recorded the least nitrogen uptake.

The highest uptake of nitrogen by groundnut kernel at harvest was recorded withintercultivation*fb* hand weeding at 20 and 40 DAS (70.41 kg $ha^{-1}$) which was on par with diclosulam PE*fb* intercultivation at 20 DAS (67.26 kg $ha^{-1}$). This was followed by imazethapyr + pendimethalin *fb* intercultivation at 20 DAS which were statistically on par with sodium acifluorfen + clodinafop propargyl PoE *fb* intercultivation at 40 DAS,intercultivation at 20 and 40 DAS and propaquizafop + imazethapyr PoE*fb* intercultivation at 40 DAS and were superior to the other treatments. The unweeded control recorded the least nitrogen uptake. Among the different weed management practices tried, the highest uptake of phosphorous by groundnut plant and kernel at harvest was recorded withintercultivation*fb* hand weeding at 20 and 40 DAS which was on par with diclosulam PE*fb* intercultivation at 20 DAS and imazethapyr + pendimethalin PE *fb* intercultivation at 20 DASwhich were significantly superior over rest of weed management practices. These were followed by sodium acifluorfen + clodinafop propargylPoE *fb* intercultivation at 40 DAS, intercultivation at 20 and 40 DAS and propaquizafop + imazethapyr PoE *fb* intercultivation at 40 DAS and were on par with each other. The unweeded control reported the least phosphorous uptake. These results are corroborated with findings of [4] and [8].

Among the different weed management practices observed, the highest uptake of potassium by groundnut plant at harvest was recorded withintercultivation*fb* hand weeding at 20 and 40 DAS (41.28 kg $ha^{-1}$) which was on par with diclosulam PE *fb* intercultivation at 20 DAS (39.60 kg $ha^{-1}$) and imazethapyr + pendimethalin PE *fb* intercultivation at 20 DAS (38.21 kg $ha^{-1}$) which were significantly superior over rest of weed management practices. These were followed by sodium acifluorfen + clodinafop propargylPoE *fb* intercultivation at 40 DAS, intercultivation at 20 and 40 DAS and propaquizafop + imazethapyr PoE*fb* intercultivation at 40 DAS and were statistically on par with each other. The unweeded control reported the least potassium uptake.

The highest uptake of potassium at harvest by groundnut kernel was recorded withintercultivation*fb* hand weeding at 20 and 40 DAS which was on par with diclosulam PE *fb* intercultivation at 20 DAS, imazethapyr + pendimethalin PE *fb* intercultivation


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at 20 DAS and sodium acifluorfen + clodinafop propargylPoE *fb* intercultivation at 40 DAS which were significantly superior over rest of weed management practices. The unweeded control reported the lowest phosphorous uptake. These results are in accordance with the findings of [1]

**Nutrient removal by weeds**

The removal of nitrogen by weeds at harvest varied significantly with different weed management practices. The lowest nitrogen uptake was recorded withintercultivation*fb* hand weeding at 20 and 40 DAS (4.84 kg ha$^{-1}$) which was statistically on par with sodium acifluorfen + clodinafop propargylPoE *fb* intercultivation at 40 DAS (6.34 kg ha$^{-1}$), propaquizafop + imazethapyr PoE*fb* intercultivation at 40 DAS (6.60 kg ha$^{-1}$) and diclosulam PE *fb* intercultivation at 20 DAS (6.74 kg ha$^{-1}$) and were significantly superior to the all other treatments. This was due to the most minor weed dry matter present in the treatments, which was inturn initial flush was controlled by spraying of herbicides and the later flush by intercultivation.

The removal of phosphorous by weeds at harvest was in the range from 0.81 to 3.82 kg ha$^{-1}$ and the lowest removal was recorded with intercultivation*fb* hand weeding at 20 and 40 DAS (0.81 kg ha$^{-1}$), which was statistically on par with sodium acifluorfen + clodinafop propargylPoE *fb* intercultivation at 40 DAS, propaquizafop + imazethapyr PoE*fb* intercultivation at 40 DAS and diclosulam PE *fb* intercultivation at 20 DAS and were significantly superior to the all other treatments.

The minimum removal of phosphorous by weeds at harvest was recorded with intercultivation*fb* hand weeding at 20 and 40 DAS (2.37 kg ha$^{-1}$) which was followed by sodium acifluorfen + clodinafop propargylPoE *fb* intercultivation at 40 DAS, propaquizafop + imazethapyr PoE*fb* intercultivation at 40 DAS and diclosulam PE *fb* intercultivation at 20 DAS. It were significantly superior to the all other treatments.The maximum removal of nutrients is in unweeded control at both stages of the crop.

**Table 1.** Nutrient uptake (kg ha$^{-1}$) in groundnut as influenced by weed management practices

| Treatments | | N uptake | | P uptake | | K uptake | |
|---|---|---|---|---|---|---|---|
| | | plant | Kernel | plant | Kernel | Plant | Kernel |
| $T_1$ | Diclosulam 84% WDG 26 g ha$^{-1}$PE *fb* intercultivation at 20 DAS | 48.79 | 67.26 | 3.74 | 7.96 | 39.60 | 19.40 |
| $T_2$ | Imazethapyr 2% EC+ pendimethalin 30% EC 960 g ha$^{-1}$ PE *fb* intercultivation at 20 DAS | 47.61 | 63.09 | 3.63 | 7.83 | 38.21 | 18.64 |
| $T_3$ | Pyroxasulfone 85 % WDG 127.5 g ha$^{-1}$ PE *fb* intercultivation at 20 DAS | 35.02 | 53.99 | 2.84 | 4.85 | 29.44 | 16.29 |
| $T_4$ | Propaquizafop 2.5% + imazethapyr 3.75% ME 125 g ha$^{-1}$ Early PoE *fb* intercultivation at 40 DAS | 41.34 | 57.73 | 3.34 | 6.28 | 34.55 | 17.49 |
| $T_5$ | Imazethapyr 35% + imazamox 35% WG 70 g ha$^{-1}$ Early PoE *fb* intercultivation at 40 DAS | 40.59 | 47.39 | 3.29 | 5.39 | 33.82 | 15.54 |
| $T_6$ | Sodium acifluorfen 16.5% EC + clodinafop propargyl 8% EC 250 g ha$^{-1}$PoE *fb* intercultivation at 40 DAS | 43.79 | 60.17 | 3.47 | 6.80 | 35.94 | 18.14 |
| $T_7$ | Imazethapyr 10% SL 100 g ha$^{-1}$ PoE *fb* intercultivation at 40 DAS | 35.80 | 42.20 | 3.00 | 5.75 | 30.00 | 14.11 |
| $T_8$ | Intercultivation ( 20 and 40 DAS) | 42.40 | 58.44 | 3.36 | 6.49 | 33.74 | 17.60 |
| $T_9$ | Intercultivation *fb* hand weeding (20 and 40 DAS) (Weed free) | 50.63 | 70.41 | 3.90 | 8.68 | 41.28 | 20.64 |
| $T_{10}$ | Unweeded control | 25.05 | 28.97 | 2.05 | 3.17 | 19.36 | 9.72 |
| | S.Em ± | 0.99 | 2.38 | 0.10 | 0.30 | 0.92 | 0.93 |
| | CD (P = 0.05) | 2.89 | 6.93 | 0.31 | 0.87 | 2.66 | 2.70 |


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**Table 2.** Nutrient removal (kg ha$^{-1}$) by weeds in groundnut as influenced by weed management practices

| Treatments | | N | P | K |
|---|---|---|---|---|
| $T_1$ | Diclosulam 84% WDG 26 g ha$^{-1}$PE *fb* intercultivation at 20 DAS | 6.74 | 1.34 | 10.72 |
| $T_2$ | Imazethapyr 2% EC+ pendimethalin 30% EC 960 g ha$^{-1}$ PE *fb* intercultivation at 20 DAS | 7.46 | 1.83 | 11.75 |
| $T_3$ | Pyroxasulfone 85 % WDG 127.5 g ha$^{-1}$ PE *fb* intercultivation at 20 DAS | 9.31 | 2.15 | 13.42 |
| $T_4$ | Propaquizafop 2.5% + imazethapyr 3.75% ME 125 g ha$^{-1}$ Early PoE *fb* intercultivation at 40 DAS | 6.60 | 1.12 | 6.65 |
| $T_5$ | Imazethapyr 35% + imazamox 35% WG 70 g ha$^{-1}$ Early PoE *fb* intercultivation at 40 DAS | 8.79 | 2.12 | 12.64 |
| $T_6$ | Sodium acifluorfen 16.5% EC + clodinafop propargyl 8% EC 250 g ha$^{-1}$PoE *fb* intercultivation at 40 DAS | 6.34 | 0.94 | 5.26 |
| $T_7$ | Imazethapyr 10% SL 100 g ha$^{-1}$ PoE *fb* intercultivation at 40 DAS | 10.13 | 2.93 | 14.52 |
| $T_8$ | Intercultivation ( 20 and 40 DAS) | 7.81 | 2.07 | 11.84 |
| $T_9$ | Intercultivation *fb* hand weeding (20 and 40 DAS) (Weed free) | 4.84 | 0.81 | 2.37 |
| $T_{10}$ | Unweeded control | 15.42 | 3.82 | 18.74 |
| | S.Em ± | 0.70 | 0.21 | 0.30 |
| | CD (P = 0.05) | 2.03 | 0.63 | 0.88 |

## CONCLUSION

The highest uptake of N, P and K by the treatments might be due to higher dry matter accumulation and higher nutrient content in the tissues of the plant. The nutrient uptake by crop and associated weeds follow an inverse relationship in a community. It was also evident in the present investigation. The lower nutrient uptake,*i.e.* nitrogen, phosphorus and potassium by groundnut, was recorded with unweeded control due to poor dry matter production and reduced nutrient content as a result of heavy weed competition. The detailed examination of data on nutrient removal revealed that potassium content in the weeds was higher than nitrogen and phosphorous content was low compared to the N and K content. The most increased uptake of nutrients by weeds was noticed with unweeded control. This might be due to heavy weed infestation and increased dry matter production of weeds. Similar findings were reported by [6] and [10].

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