

# Effect of Weed Management Practices on Economics of Groundnut in Coastal Zone of Karnataka

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## Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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## ABSTRACT

**Aims:** To assess efficacy and economic viability of herbicides on weed management in groundnut under groundnut during *rabi*-summer season.

**Study Design:** The experiment was laid out in randomized complete block design with three replications.

**Place and Duration of Study:** The field experiment was conducted at Agricultural Research Station, Kumta, Uttar Kannada, University of Agricultural Sciences, Dharwad (Karnataka) during *rabi* 2016-2017.

**Methodology:** The experiment comprised nine treatments are as follows. T<sub>1</sub>: Unweeded check, T<sub>2</sub>: Weed free check, T<sub>3</sub>: Two hand weeding (At 20 and 40 DAS), T<sub>4</sub>: pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> (PE) *fb* one hand weeding at 25 DAS, T<sub>5</sub>: oxyfluorfen 23.5% E.C. @ 200 g ha<sup>-1</sup>(PE) *fb* one hand weeding at 25 DAS, T<sub>6</sub>: pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> (PE) *fb* quizalofop-p-ethyl 5% E.C. @ 50 g ha<sup>-1</sup> 20-30 DAS (POE), T<sub>7</sub>: pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> (PE) *fb* imazethapyr 10% S.L. @ 75 g ha<sup>-1</sup> 20- 30 DAS (POE), T<sub>8</sub>: pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> (PE) *fb* oxyfluorfen 23.5% E.C. @ 100 g ha<sup>-1</sup> at 20-30 DAS (POE), T<sub>9</sub>: pendimethalin 30% E.C. @ 1.0 kg ha<sup>-1</sup> (PE) *fb* one hand weeding at 25 DAS.

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**Results:** Among the weed management practices revealed that, higher cost of cultivation (₹ 53,340 ha<sup>-1</sup>) under weed free check and pod yield (2255 kg ha<sup>-1</sup>), gross return (₹ 92,446 ha<sup>-1</sup>), net return (₹ 45,239 ha<sup>-1</sup>) and benefit cost ratio (1.96) with pre-emergence application of pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> followed by one hand weeding at 25 DAS.

**Keywords:** Pod yield; cost of cultivation; monetary income; B: C ratio; herbicide and groundnut.

## 1. INTRODUCTION

The groundnut is a valuable food and oilseed crop. It is commonly called as the king of vegetable oilseeds crops or poor man's nut. Groundnut is a rich source of oil, which supplies about 500 calories per 100 g which is higher than all vegetable proteins. Groundnut is also a rich source of minerals and vitamins like vitamin-B, vitamin-E (tocopherol) etc. Groundnut plays an important role in the rural economy of India, which constitute the important component of Indian diet. Kernel contains 48 to 50 per cent of edible oil, 25 per cent protein and 20 per cent of the carbohydrates [1]. The groundnut (also called pea nut, earth nut, monkey nut, goober nut, manila nut, pinder and panda nut) is a native of South American leguminous oil seed [2]. In India, groundnut is being cultivated over an area of 8.59 million hectares with a total production of 6.56 million tonnes with productivity of 1,764 kg ha<sup>-1</sup> [3]. Major groundnut growing states viz., Gujarat, Andhra Pradesh, Tamil Nadu, Rajasthan, Karnataka and Maharashtra, which contribute 90 per cent of total groundnut production. Karnataka ranks fifth in the country with a production of 0.56 million tonnes from an area of 0.82 million hectares and an average yield of 907 kg ha<sup>-1</sup> [3]. Groundnut is grown during *kharif*, *rabi* and summer season in India. Low productivity of groundnut mainly attributed to number of factors viz., vagaries of monsoon, unavailability of irrigation facilities, poor management, heavy weed infestation and lack of improved technologies. Amongst these, weed infestation is one of the key factors. During the early stages of crop growth, it encounters severe weed problem, because of slow growth of crop in the initial stages. Moreover shoot growth is very less when compared to the root development. The weeds emerge fast and grow rapidly competing with the crop severely for the resources viz., nutrients, light, and also transpire lot of water from the soil. The initial four to eight weeks after sowing are considered as the critical period of weed competition during the crop growth period [4]. Lack of pre-emergence herbicide activity for longer period's results in weed growth that necessitate hand weeding at

25-40 days after sowing. In such situation post-emergence herbicides (imazethapyr and quizalofop-p-ethyl) were suggested for weed management at critical weed stage [5]. Development of suitable weed management strategies to alleviate weed pressure on the available resources is known to prop up the crop productivity considerably. Hence, the present investigation was undertaken to study the Effect of weed management practices on economics of groundnut in coastal zone of Karnataka

## 2. MATERIALS AND METHODS

The field experiment was conducted at Agricultural Research Station, Kumta, Uttar Kannada, University of Agricultural Sciences, Dharwad (Karnataka). The experiment was laid out in randomized complete block design with three replications. The soil type of experimental site was loamy sand i.e., coastal sands. The variety used was Dh-86, the experiment comprised nine treatments are as follows. T<sub>1</sub>: Unweeded check, T<sub>2</sub>: Weed free check, T<sub>3</sub>: Two hand weeding (At 20 and 40 DAS), T<sub>4</sub>: pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> (PE) fb one hand weeding at 25 DAS, T<sub>5</sub>: oxyfluorfen 23.5% E.C. @ 200 g ha<sup>-1</sup>(PE) fb one hand weeding at 25 DAS, T<sub>6</sub>: pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> (PE) fb quizalofop-p-ethyl 5% E.C. @ 50 g ha<sup>-1</sup> 20-30 DAS (POE), T<sub>7</sub>: pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> (PE) fb imazethapyr 10% S.L. @ 75 g ha<sup>-1</sup> 20- 30 DAS (POE), T<sub>8</sub>: pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> (PE) fb oxyfluorfen 23.5% E.C. @ 100 g ha<sup>-1</sup> at 20-30 DAS (POE), T<sub>9</sub>: pendimethalin 30% E.C. @ 1.0 kg ha<sup>-1</sup> (PE) fb one hand weeding at 25 DAS, The crop was supplied with recommended fertilizer dose of 25:75:25 kg N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O along with FYM of 7.5 tons per ha through urea, single super phosphate and muriate of potash, respectively. The entire dose was applied as basal through placement in the furrows and recommended dose of gypsum @ 500 kg ha<sup>-1</sup> was applied between the rows at the time pegging i.e., 45 days after sowing between the rows and covered with soil.

## 2.1 Pod Yield

Pods from net plot (including the pods from labelled plants) were dried to constant weight and expressed as pod yield in kilogram per hectare.

## 2.2 Cost of Cultivation

The cost of cultivation of groundnut worked out on the basis of per hectare. The requirement of labour and expenses on different operations such as ploughing harrowing, weeding and harvesting were calculated on the basis of prevalent rates. Cost of inputs like seeds, manures were calculated based on the actual amounts applied to land use system

## 2.3 Gross Returns

Monetary value of the produce from each treatment was calculated considering the prevailing market price of groundnut pods and haulms and expressed in rupees per hectare.

Gross returns ( $\text{₹ ha}^{-1}$ ) = Economic yield of a treatment x selling price of produce

## 2.4 Net Returns

Net returns were estimated by deducting the cost of cultivation from gross return expressed in rupees per hectare.

## 2.5 Benefit-Cost Ratio

Benefit-cost ratio = Gross Returns ( $\text{₹ ha}^{-1}$ ) / Cost of production ( $\text{₹ ha}^{-1}$ )

## 3. RESULTS AND DISCUSSION

### 3.1 Pod Yield

A critical examination of the data revealed that the higher pod yield ( $2,255 \text{ kg ha}^{-1}$ ) was recorded with the treatment where pendimethalin 30% E.C. @  $1.5 \text{ kg ha}^{-1}$  fb one hand weeding at 25 DAS. Similar findings were reported by [6,7]. The cumulative effect of the yield attributing

characters was reflected in terms of pod yield. Unweeded check treatment recorded significantly lower pod yield ( $1453 \text{ kg ha}^{-1}$ ) than all other treatments and it accounted for 35.6 per cent reduction when compared to pendimethalin 30% E.C. @  $1.5 \text{ kg ha}^{-1}$  fb one hand weeding at 25 DAS. This might be due to higher weed density and weed dry matter production in the unweeded check, which depleted the nutrients and moisture from soil, which were the most limiting factors for growth, yield attributing characters and yields of crop. Further this treatment was at par with pendimethalin 30% E.C. @  $1.5 \text{ kg ha}^{-1}$  fb quizalofop-p-ethyl 5% E.C. @  $50 \text{ g ha}^{-1}$  20-30 DAS and pendimethalin 30% E.C. @  $1.5 \text{ kg ha}^{-1}$  fb imazethapyr 10% S.L. @  $75 \text{ g ha}^{-1}$  at 20-30 DAS. Reduction in weed competition, improves growth parameters and these improved growth parameters increases the yield attributes which in turn increase pod yield. These results are in conformity with [8,9].

### 3.2 Cost of Cultivation

Higher cost of cultivation ( $\text{₹ } 53,340 \text{ ha}^{-1}$ ) was observed with weed free check followed by two hand weeding at 20 and 40 DAS ( $\text{₹ } 48,340 \text{ ha}^{-1}$ ). Among the weed management treatments, higher cost of cultivation ( $\text{₹ } 47,740 \text{ ha}^{-1}$ ) was observed with pre-emergence application of pendimethalin 30% E.C. @  $1.5 \text{ kg ha}^{-1}$  followed by one hand weeding at 25 DAS. Whereas, lower cost of cultivation ( $\text{₹ } 43,340 \text{ ha}^{-1}$ ) was observed with unweeded check.

### 3.3 Gross Returns

Among the weed management treatments, significantly higher gross return ( $\text{₹ } 92,446 \text{ ha}^{-1}$ ) was recorded with pre-emergence application of pendimethalin 30% E.C. @  $1.5 \text{ kg ha}^{-1}$  followed by one hand weeding at 25 DAS followed by pendimethalin 30% E.C. @  $1.5 \text{ kg ha}^{-1}$  fb quizalofop-p-ethyl 5% E.C. @  $50 \text{ g ha}^{-1}$  20-30 DAS ( $\text{₹ } 88,015 \text{ ha}^{-1}$ ), over pendimethalin 30% E.C. @  $1.0 \text{ kg ha}^{-1}$  fb One hand weeding at 25 DAS ( $\text{₹ } 82,970 \text{ ha}^{-1}$ ). Whereas, weed free check recorded higher gross return ( $\text{₹ } 98,731 \text{ ha}^{-1}$ ). However, significantly lower gross return ( $\text{₹ } 59,732 \text{ ha}^{-1}$ ) was recorded with unweeded management.

**Table 1. Yield, cost of cultivation, gross returns, net returns and B: C ratio of groundnut as influenced by weed management practices**

Treatments	Pod yield (kg ha <sup>-1</sup> )	Cost of cultivation (₹ ha <sup>-1</sup> )	Gross return (₹ ha <sup>-1</sup> )	Net return (₹ ha <sup>-1</sup> )	Benefit Cost ratio
T <sub>1</sub> Un-weeded check	1453	43,340	59,732	16,392	1.38
T <sub>2</sub> Weed free check	2408	53,340	98,731	45,391	1.85
T <sub>3</sub> Two hand weeding (At 20 and 40 DAS)	1974	48,340	80,999	32,659	1.68
T <sub>4</sub> Pendimethalin 30 % E.C. @1.5 kg ha <sup>-1</sup> (PE) fb One hand weeding at 25 DAS (POE)	2255	46,140	92,446	45,239	1.96
T <sub>5</sub> Oxyfluorfen 23.5% E.C. @ 200 g ha <sup>-1</sup> (PE) fb One hand weeding at 25 DAS	1633	46,440	67,094	20,724	1.45
T <sub>6</sub> Pendimethalin 30 % E.C. @1.5 kg ha <sup>-1</sup> (PE) fb Quizalofop-p-ethyl 5% E.C. @ 50 g ha <sup>-1</sup> 20- 30 DAS (POE)	2145	46,040	88,015	40,908	1.87
T <sub>7</sub> Pendimethalin 30% E.C. @1.5 kg ha <sup>-1</sup> (PE) fb Imazethapyr 10 % S.L. @ 75 g ha <sup>-1</sup> at 20- 30 DAS (POE)	2133	45,540	87,439	40,999	1.88
T <sub>8</sub> Pendimethalin 30% E.C. @1.5 kg ha <sup>-1</sup> (PE) fb Oxyfluorfen 23.5% E.C. @ 100 g ha <sup>-1</sup> at 20-30 DAS (POE)	1688	45,240	69,342	23,306	1.51
T <sub>9</sub> Pendimethalin 30% E.C. @1.0 kg ha <sup>-1</sup> (PE) fb One hand weeding at 25 DAS.	2023	46,140	82,970	36,208	1.77
S.Em±	98	-	3,960	3,960	0.08
C.D. at 5%	293	-	11,873	11,873	0.25

Note: DAS:- Days after sowing, fb: followed by, HW: Hand weeding, E.C. Emulsifiable Concentrate, S.L. Soluble liquid, PE: Pre-emergence; POE: Post-emergence

### 3.4 Net Returns

Among the weed management treatments, significantly higher net return (₹ 45,239 ha<sup>-1</sup>) was recorded with pre-emergence application of pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> followed by one hand weeding at 25 DAS which was on par with T<sub>6</sub>: pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> fb quizalofop-p-ethyl 5% E.C. @ 50 g ha<sup>-1</sup> 20-30 DAS (₹ 40,908ha<sup>-1</sup>), T<sub>7</sub>: pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> fb imazethapyr 10% S.L. @ 75 g ha<sup>-1</sup> at 20-30 DAS (₹ 40,999 ha<sup>-1</sup>) and T<sub>9</sub>: pendimethalin 30% E.C. @ 1.0 kg ha<sup>-1</sup> fb One hand weeding at 25 DAS (₹ 36,208 ha<sup>-1</sup>). Whereas, weed free check recorded higher net return (₹ 45,391 ha<sup>-1</sup>). However, significantly lower net return (₹ 16,392 ha<sup>-1</sup>) was recorded with unweeded check plot. These results were in agreement with the findings of [5,9,10,11,12].

### 3.5 Benefit Cost Ratio

Among the weed management treatments, significantly higher benefit cost ratio (1.96) was recorded with T<sub>4</sub> i.e., pre-emergence application of pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> followed by one hand weeding at 25 DAS which was on par with T<sub>6</sub> pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> fb quizalofop-p-ethyl 5% E.C. @ 50 g ha<sup>-1</sup> 20-30 DAS (1.88 ha<sup>-1</sup>) T<sub>7</sub>: pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> imazethapyr 10% S.L. @ 75 g ha<sup>-1</sup> at 20-30 DAS (1.87 ha<sup>-1</sup>) and T<sub>9</sub>: pendimethalin 30% E.C. @ 1.0 kg ha<sup>-1</sup> fb One hand weeding at 25 DAS (1.77 ha<sup>-1</sup>). Whereas, weed free check recorded higher benefit cost ratio (1.85 ha<sup>-1</sup>). However, significantly lower benefit cost ratio (1.38 ha<sup>-1</sup>) was recorded with unweeded check.

## 4. CONCLUSION

On the basis of results obtained during study, it can be concluded that for obtaining higher cost of cultivation (₹ 53,340 ha<sup>-1</sup>) under weed free check and pod yield (2255 kg ha<sup>-1</sup>), gross return (₹ 92,446 ha<sup>-1</sup>), net return (₹ 45,239 ha<sup>-1</sup>) and benefit cost ratio (1.96) with pre-emergence application of pendimethalin 30% E.C. @ 1.5 kg ha<sup>-1</sup> followed by one hand weeding at 25 DAS in coastal zone of Karnataka.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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