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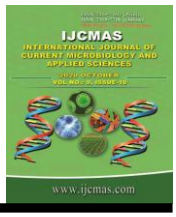

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Evaluation of Pre and Post Emergent Herbicides in Kharif Groundnut (*Arachis hypogaea* L.) at Central Dry Zone of Karnataka, India

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A B S T R A C T

Among the herbicide treatments, significantly lower total number of weeds (7.63, 6.12, 7.84 and 7.71 m^{-2} at 25, 50, 75 DAS and at harvest, respectively) and total weed dry weight (2.52, 2.79, 4.52 and 4.65 g m^{-2} at 25, 50, 75 DAS and at harvest, respectively) was recorded with treatment receiving Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + manual weeding at 30 DAS. Further the same treatment recorded significantly higher pod yield (2,897 kg ha^{-1}), kernel yield (2,076 kg ha^{-1}), haulm yield (4,345 kg ha^{-1}) and oil yield (952 kg ha^{-1}) and economic returns as compared to treatment with application of pendimethalin 38.7 CS @ 1.0 kg ha^{-1} pre-emergence.

Introduction

The average productivity of groundnut in India is about 1,436 kg ha^{-1}. In India, 70 per cent of the groundnut area and 75 per cent of the production is concentrated in the states of Gujarat, Tamil Nadu, Andhra Pradesh, Telangana, Maharashtra, Rajasthan and Karnataka. In Karnataka, groundnut is grown in an area of 6.56 lakh ha with a production of 5.83 lakh tonnes and productivity of 889 kg ha^{-1} (Anon. 2019). The major groundnut growing districts are Chitradurga, Dharwad, Belagavi, Raichur, Vijayapura, Bellary and Bidar. The productivity of groundnut in these districts is lower as compared to national average productivity. Being a *kharif* crop and slow growth during initial stages, where groundnut encounters severe weed infestation problem especially in the early stages of their growth, as the crop seedling emerges seven to ten days after sowing coupled with the slow growth in the initial stages. The critical period for crop-weed competition in groundnut crop was reported to be, up to 45 DAS and by maintaining weed free condition during this

period results in higher pod yield (Geetha *et al*., 2017). The weeds emerge faster and grow rapidly competing with the main crop for the resources namely soil moisture, nutrients, light and space. With the increasing labour scarcity, it is difficult to manage weeds by traditional method. Chemical weed management such as pre or post-emergent herbicide application gives a good result but couldn't control a broad spectrum of weeds. Hence combining the herbicides with manual weeding we can control a broad spectrum of weed population throughout the crop period. Pre-emergent herbicides prevent the germination of weed seeds in the beginning stages of the crop growth. Thus, there will be less weed infestation till the activity of herbicide present in the soil. An additional method to control weeds in later stages of crop growth is through the application of post-emergent herbicide which effectively controls matured weeds. So, post-emergent herbicides help in controlling the emerged weeds in later stages of groundnut crop where it is important to control the crop-weed competition at flowering and peg formation stages.

Keeping this in view, the present investigation entitled 'Evaluation of pre and post emergent herbicides for control of weeds in *kharif* groundnut (*Arachis hypogaea* L.)' was carried out at Central Dry Zone of Karnataka.

Materials and Methods

A field experiment was conducted during *kharif* season of 2019 at Zonal Agricultural and Horticultural Research Station, Hiriyur, Chitradurga district, Karnataka, to study the "Evaluation of pre and post emergent herbicides for control of weeds in *kharif* groundnut (*Arachis hypogaea* L.)". The experimental site situated between 13° 57' 32 N latitude and 70° 37' 38 E longitude with an altitude of 606.1 meters above mean sea level. It comes under Central Dry Zone (Agro-climatic zone 4) of Karnataka. The soil analysis data indicated that the soil was found to be alkaline in reaction with a pH of 8.1 and low in organic carbon (0.47 %). Further, the soil was low in available nitrogen, medium in phosphorus and potassium (258, 35 and 315 kg ha^{-1}, respectively). G-2-52 a variety was sown in July with a spacing of 30 cm x 10 cm. Experiment included nine treatments consisted of T_1-Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} Pre-emergence (PE), T_2-Pendimethalin 30 EC + imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix), T_3: Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + quizalofop–p-ethyl 5 % EC @ 50 g ha^{-1} at 30 DAS Post-emergence (PoE), T_4-Pendimethalin 30 EC + imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + quizalofop–p-ethyl 5 % EC @ 50 g ha^{-1} at 30 DAS (PoE), T_5-Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + imazethapyr 10 % SL @ 75 g ha^{-1} at 30 DAS, T_6-Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + manual weeding at 30 DAS, T_7-Pendimethalin 30 EC + imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + manual weeding at 30 DAS, T_8-Intercultural operation at 15 and 30 DAS followed by manual weeding for intra rows and T_9-Weedy check were laid out in Randomized Complete Block Design (RCBD) with three replications. Data on weed count and weed dry weight have shown high degree of variation. A relationship between the means and variance was observed. Therefore, the data on weed count and weed dry weight were subjected to $(\sqrt{(x+0.5)})$ transformation to make analysis of variance more valid as suggested by Blackman and Roberts (1950). Standard statistical methods were used for comparing the treatment means.

Results and Discussion

Weed density and dry weight

Among the herbicide treatments, significantly lower total number of weeds (7.63, 6.12, 7.84

and 7.71 m^{-2} at 25, 50, 75 DAS and at harvest, respectively) (Table 1) and total weed dry weight (2.52, 2.79, 4.52 and 4.65 g m^{-2} at 25, 50, 75 DAS and at harvest, respectively) (Table 2) was recorded with treatment receiving T_7: Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + manual weeding at 30 DAS over T_1: Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE (10.39, 10.88, 11.07 and 11.25 m^{-2} at 25, 50, 75 DAS and at harvest) and (3.46, 4.64, 6.30 and 7.10 g m^{-2} at 25, 50, 75 DAS and at harvest). The above results might be due to pre-emergent herbicide (ready mix) which prevents the emergence of grasses, sedges and broad-leaved weeds by inhibiting root and shoot growth so that there is less crop-weed competition at initial stages. According to Smita *et al.,* (2014) revealed that presence of imazethapyr which is responsible for inhibition of acetolactate synthase (ALS) or actohydroxy acid synthase (AHAS) in broad leaved weeds which caused destruction of these weed growth. Similar observations were also made by Megha Dubey *et al.,* (2010) and Kalaichelvi *et al.,* (2015).

Yield of groundnut

Higher pod yield (2,897 kg ha^{-1}), kernel yield (2,076 kg ha^{-1}), haulm yield (4,345 kg ha^{-1}) and oil yield (952 kg ha^{-1}) at harvest recorded significantly higher in the treatment receiving T_7: Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + manual weeding at 30 DAS. Significantly lower pod yield (2,254 kg ha^{-1}), kernel yield (1,506 kg ha^{-1}), haulm yield (3,552 kg ha^{-1}) and oil yield (644 kg ha^{-1}) at harvest recorded with single application T_1: Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE (Table 3). The reason for the increase in the number of pods per plant is due to lesser weed competition at initial stages which is controlled by the pre-emergent spray of pendimethalin which effect the cell division (microtubulaes assembly inhibitor) thus controls the germinated weed seeds (Aradhanabali *et al*., 2016) and one manual weeding at 30 DAS, helped in the loosening of soil which favours easy penetration and peg formation, thus increased the number of pods per plant. Similar results were also obtained by Kalhapure *et al.,* (2013) and Jadhav *et al.,* (2015).

Economics

The highest cost of cultivation incurred for plot receiving T_8: Intercultural operation at 15 and 30 DAS followed by manual weeding for intra rows (Rs. 58,315 ha^{-1}) as compared to other treatments. Gross and net returns differed significantly due to different weed management practices. However, Intercultural operation at 15 and 30 DAS followed by manual weeding for intra rows significantly recorded higher gross returns (Rs. 1,37,720 ha^{-1}) and net returns (Rs. 79,405 ha^{-1}) over weedy check. However, it was on par with T_7: Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + manual weeding at 30 DAS (Rs. 1,33,986 ha^{-1} and ₹ 78,7 ha^{-1}, respectively) and T_4: Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + quizalofop-p-ethyl 5 % EC @ 50 g ha^{-1} at 30 DAS (PoE) (Rs. 1,26,682 ha^{-1} and 73,378 ha^{-1}, respectively). Unlike observed in gross and net returns treatments receiving T_7: Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + manual weeding at 30 DAS (2.42) recorded significantly superior B: C over rest of the treatments. Where, weedy check culminated in lower B: C (0.92) (Table 4). This is due to the production of the higher pod and haulm yield by the effective control of weeds through an integrated method of weed management which effectively controlled weeds throughout the crop growth stage, because of the integrated method the cost of herbicide and labour was high which resulted in higher cost of cultivation. These findings are in line with these reported by Kumar *et al.,* (2013) and Sardana *et al.,* (2006).

Table.1 Total number of weeds per m^2 as influenced by weed management practices at different crop growth stages

Treatments		Total number of weeds			
		25 DAS	**50 DAS**	**75 DAS**	**At harvest**
T_1	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE	10.39* (107.4)	10.88 (118.0)	11.07 (122.0)	11.25 (126.2)
T_2	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix)	8.16 (66.1)	10.41 (107.9)	10.60 (112.0)	10.88 (118.0)
T_3	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + quizalofop-p-ethyl 5 % EC @ 50 g ha^{-1} at 30 DAS (PoE)	8.97 (80.0)	8.62 (73.8)	9.30 (86.0)	9.63 (92.2)
T_4	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + quizalofop-p-ethyl 5 % EC @ 50 g ha^{-1} at 30 DAS (PoE)	7.95 (62.8)	8.20 (66.7)	8.63 (74.0)	8.69 (75.0)
T_5	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + Imazethapyr 10 % SL @ 75 g ha^{-1} (PoE) at 30 DAS	9.25 (85.1)	8.83 (77.4)	9.64 (92.5)	9.69 (93.5)
T_6	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + manual weeding at 30 DAS	9.17 (83.6)	6.61 (43.2)	8.31 (68.6)	8.47 (71.2)
T_7	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + manual weeding at 30 DAS	7.63 (57.7)	6.12 (37.0)	7.84 (61.0)	7.71 (59.0)
T_8	Intercultural operation at 15 and 30 DAS followed by manual weeding for intra rows	3.94 (15.0)	5.37 (28.3)	6.10 (36.7)	5.86 (33.8)
T_9	Weedy check	12.47 (155.0)	12.88 (165.4)	13.16 (172.6)	12.71 (161.1)
S. Em ±		**0.65**	**0.65**	**0.72**	**0.71**
CD at 5 %		**1.95**	**1.96**	**2.17**	**2.13**

Note: **PE**: Pre-emergence (2 DAS), **PoE**: Post-emergence (30 DAS), **DAS**: Days after sowing, **SL:** Soluble liquid, **EC:** Emulsifiable concentration, **CS**: Capsule suspension, ***** - Transformed values $\left(\sqrt{x+0.5}\right)$, figures in the parentheses indicate original values.

Table.2 Total weeds dry weight per m^2 as influenced by weed management practices at different crop growth stages

Treatments		Total weeds dry weight (g m^{-2})			
		25 DAS	**50 DAS**	**75 DAS**	**At harvest**
T_1	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE	3.46* 11.5)	4.64 (21.0)	6.30 (39.2)	7.10 (49.9)
T_2	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix)	2.80 (7.4)	4.31 (18.1)	6.00 (35.5)	6.54 (42.3)
T_3	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + quizalofop-p-ethyl 5 % EC @ 50 g ha^{-1} at 30 DAS (PoE)	3.39 (11.0)	4.02 (15.7)	5.50 (29.7)	5.51 (29.9)
T_4	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + quizalofop-p-ethyl 5 % EC @ 50 g ha^{-1} at 30 DAS (PoE)	2.57 (6.1)	3.82 (14.1)	4.87 (23.2)	5.12 (25.7)
T_5	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + Imazethapyr 10 % SL @ 75 g ha^{-1} (PoE) at 30 DAS	3.38 (10.9)	4.09 (16.3)	6.06 (36.2)	6.07 (36.4)
T_6	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + manual weeding at 30 DAS	3.32 (10.5)	3.88 (14.5)	5.23 (26.9)	5.06 (25.1)
T_7	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + manual weeding at 30 DAS	2.52 (5.8)	2.79 (7.3)	4.52 (19.9)	4.65 (21.1)
T_8	Intercultural operation at 15 and 30 DAS followed by manual weeding for intra rows	1.81 (2.8)	2.16 (4.2)	3.66 (12.9)	3.16 (9.5)
T_9	Weedy check	6.0 (35.5)	7.29 (52.6)	8.21 (66.9)	9.21 (84.4)
S. Em ±		**0.3**	**0.3**	**0.4**	**0.4**
CD at 5 %		**0.8**	**0.9**	**1.2**	**1.3**

Note: **PE**: Pre-emergence (2 DAS), **PoE**: Post-emergence (30 DAS), **DAS**: Days after sowing, **SL:** Soluble liquid, **EC:** Emulsifiable concentration, **CS**: Capsule suspension, ***** - Transformed values $\left(\sqrt{x+0.5}\right)$, figures in the parentheses indicate original values

Table.3 Yield parameters of groundnut as influenced by weed management practices

Treatments		Yield parameters			
		Pod yield (kg ha^{-1})	**Kernel yield (kg ha^{-1})**	**Haulm yield (kg ha^{-1})**	**Oil yield (kg ha^{-1})**
T_1	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE	2254	1506	3552	644
T_2	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix)	2333	1618	3710	696
T_3	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + quizalofop–p-ethyl 5 % EC @ 50 g ha^{-1} at 30 DAS (PoE)	2504	1803	4048	781
T_4	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + quizalofop–p-ethyl 5 % EC @ 50 g ha^{-1} at 30 DAS (PoE)	2738	1909	4206	861
T_5	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + Imazethapyr 10 % SL @ 75 g ha^{-1} (PoE) at 30 DAS	2487	1786	3925	799
T_6	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + manual weeding at 30 DAS	2540	1829	4167	805
T_7	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + manual weeding at 30 DAS	2897	2076	4345	952
T_8	Intercultural operation at 15 and 30 DAS followed by manual weeding for intra rows	2976	2135	4623	982
T_9	Weedy check	975	586	2053	242
S. Em ±		**165**	**125.9**	**281**	**56**
CD at 5 %		**494**	**377**	**844**	**168**

Note: **PE**: Pre-emergence (2 DAS), **PoE**: Post-emergence (30 DAS), **DAS**: Days after sowing, **EC:** Emulsifiable concentration, **CS**: Capsule suspension, **SL:** Soluble liquid.

Table.4 Economics of groundnut as influenced by different weed management practices

Treatments		Cost of cultivation (₹ ha^{-1})	Gross returns (₹ ha^{-1})	Net returns (₹ ha^{-1})	B: C
T_1	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE	52165	104333	52168	2.00
T_2	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix)	52205	108007	55802	2.07
T_3	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + quizalofop–p-ethyl 5 % EC @ 50 g ha^{-1} at 30 DAS (PoE)	53255	115956	62701	2.18
T_4	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + quizalofop–p-ethyl 5 % EC @ 50 g ha^{-1} at 30 DAS (PoE)	53305	126682	73378	2.38
T_5	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + Imazethapyr 10 % SL @ 75 g ha^{-1} (PoE) at 30 DAS	53015	115121	62106	2.17
T_6	Pendimethalin 38.7 CS @ 1.0 kg ha^{-1} PE + manual weeding at 30 DAS	52415	117653	65239	2.24
T_7	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg ha^{-1} PE (ready mix) + manual weeding at 30 DAS	55255	133986	78732	2.42
T_8	Intercultural operation at 15 and 30 DAS followed by manual weeding for intra rows	58315	137720	79405	2.36
T_9	Weedy check	49315	45389	-3925	0.92
S. Em ±		-	5872	2301	0.09
CD at 5 %		-	17606	6900	0.26

Note: **PE**: Pre-emergence (2 DAS), **PoE**: Post-emergence (30 DAS), **DAS**: Days after sowing, **EC:** Emulsifiable concentration, **CS**: Capsule suspension, **SL:** Soluble liquid.

References

Anonymous, 2019, Directorate of economics and statistics, https://www.indiastat. com.

Aradhana., Bali, Bazaya, B. R., Lekh, Chand and Sanjay, Swami, 2016. Weed management in Soybean (*Glycine max* L.). Int. J. Life Sci., 11(1): 255-257.

Blackman.G.E. and Roberts, H.A., 1950. Studies on selective weed control. Agril. Sci., 40: 62-69.

Geetha, D. S., Venkateshwarulu, S. and Chandrasekar, K., 2017. Effect of integrated weed management practices on weed dynamics, yield and economics of *Rabi* groundnut (*Arachis hypogaea*) in sandy loam soils of Andhra Pradesh, Int. J. Curr. Res., 9(01): 44605-44608.

Jadhav, P. B., Singh, R., and Kamble, D. R., 2015. Effect of weed control methods on growth and yield of groundnut. Adv. Res. J. Crop Improv., 6(2): 151-157.

Kalaichelvi, K., Sakthivel, S. and Balakrishnan, A., 2015. Integrated weed management in groundnut. Indian J. Weed Sci., 47(2): 174 -177.

Kalhapure, A. H., Shete, B. T. and Bodake, P. S. 2013. Integration of chemical and cultural methods for weed management in groundnut. Indian J. Weed Sci., 45(2): 116-119.

Kumar, Y., Saxena, R., Gupta, K. C., Fagaria, V. D. and Singh, R., 2013. Yield attributes and yield of groundnut (*Arachis hypogaea* L.) as influenced by weed management practices in semi-arid region. J. Crop Weed., 9(2): 185-189.

Megha Dubey., Smita Singh., Kewat, M. L. and Sharma, J. K., 2010. Efficacy of imazethapyr against weeds in groundnut. Indian J. Weed Sci., 42(1&2): 27-30.

Sardana, V., Walia, U. S. and Kandhola, S. S., 2006. Productivity and economics of summer groundnut (*Arachis hypogaea* L.) cultivation as influenced by weed management practices. Indian J. Weed Sci., 18(1&2): 156-158.

Smita, Singh, Kewat, M. L., Megha, Dubey, Shukla, U. N. and Sharma, J. K., 2014. Efficacy of imazethapyr on weed dynamics, yield potential and economics of groundnut (*Arachis hypogaea* L.). Int. J. Legume Res., 37(1): 87-92.

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