



## BIO-EFFICACY OF HERBICIDE MIXTURES FOR WEED MANAGEMENT IN RABI GROUNDNUT

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Date of Receipt: 16-06-2017

ABSTRACT

Date of Acceptance: 06-09-2017

A field experiment was conducted at the wetland farm of S.V. Agricultural college, Tirupati during *rabi*, 2016 to study the efficacy of herbicide mixtures for weed control and yield of groundnut (*Arachis hypogaea* L.). Two hand weedings at 20 and 40 DAS was found to be effective to control the weeds in groundnut and recorded the lowest weed density and higher weed control efficiency and pod yield, which was at par with pre-emergence application of pendimethalin @ 1000 g a.i ha<sup>-1</sup> followed by one hand weeding at 20 DAS and post-emergence application of imazethapyr @ 37.5 g a.i ha<sup>-1</sup> + quizalofop-p-ethyl @ 25 g a.i ha<sup>-1</sup>. Among the herbicide mixtures imazethapyr @ 37.5 g a.i ha<sup>-1</sup> and quizalofop-p-ethyl 25 g a.i ha<sup>-1</sup> applied as post-emergence at 2-4 leaf stage of the weeds is the effective herbicide mixture for broad spectrum weed control as well as to enhance the productivity of *rabi* groundnut.

**KEYWORDS:** Groundnut, herbicide mixtures, pod yield, weed management.

### INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is considered to be one of the most important food legume and oilseed crop in India, which is cultivated over an area of 4.7 M ha, with a production of 7.4 M T and average productivity of 1552 kg ha<sup>-1</sup>. Weed infestation is one of the major constraints that limit the productivity of groundnut. Critical period of crop weed competition ranges between 40 to 60 days after sowing. Though, groundnut is a hardy crop, but it is highly susceptible to weed preponderance due to small canopy and slow initial growth. In groundnut, weeds compete with crop plants for nutrients and remove 30-40 per cent of applied nutrients resulting in significant yield reduction (Dryden and Krishnamurthy, 1997). In India, yield losses of groundnut due to weeds range from 24-70 per cent (Jhala *et al.*, 2005). Generally weeds are controlled by hand weeding, which is very expensive, laborious in the context of shortage of labours. It is therefore important to find out suitable herbicides that will control the weeds economically and safely. Use of pre- and post-emergence herbicide mixtures offers an alternative viable option for effective and timely control of all categories of weeds in groundnut. At present, farmers are using pendimethalin @ 1000 g ha<sup>-1</sup> as pre-emergence and imazethapyr as post-emergence 75 g ha<sup>-1</sup> for the control of weeds in groundnut, but the choice of

succeeding crops is limited because imazethapyr persists in soil and plant for longer time with a half life period of 33 months and is not effective against grasses (Sondhia *et al.*, 2015) Hence, there is a need to evaluate the pre- and post-emergence herbicide mixtures for obtaining broad spectrum weed control in *rabi* groundnut and to reduce the imazethapyr residue in soil and plant.

### MATERIAL AND METHODS

A field experiment was carried out during *rabi*, 2016 at the wetland farm of S.V. Agricultural college, Tirupati. The experimental soil was sandy loam in texture, neutral in reaction (pH 7.7), low in organic carbon (0.38 per cent) and available nitrogen (158.0 kg ha<sup>-1</sup>), medium in available phosphorus (23.4 kg ha<sup>-1</sup>) and available potassium (211.3 kg ha<sup>-1</sup>). The experiment was laid out in a randomized block design with three replications. The treatments consisted of ten weed management practices *viz.*, pre-emergence application of pendimethalin 1000 g a.i ha<sup>-1</sup> (W<sub>1</sub>), pre-emergence application of pendimethalin 1000 g a.i ha<sup>-1</sup> + one hand weeding at 20 DAS (W<sub>2</sub>), pre-emergence application of pendimethalin + imazethapyr (pre-mix) 1000 g a.i ha<sup>-1</sup> (W<sub>3</sub>), post-emergence application of imazethapyr 75 g a.i ha<sup>-1</sup> (W<sub>4</sub>), post-emergence application of imazethapyr + imazamox (pre-mix) 70 g a.i ha<sup>-1</sup> (W<sub>5</sub>), post-emergence application of sodium salt of acifluorfen + cladinofop propargyl (pre-mix) 75 g a.i

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**Table 1. Effect of different weed management practices on weed density ( $\text{g m}^{-2}$ ), weed control efficiency (%) and pod yield ( $\text{kg ha}^{-1}$ ) in groundnut at harvest**

Treatments	Weed density ( $\text{g m}^{-2}$ )			Weed control efficiency (%)	Pod yield ( $\text{kg ha}^{-1}$ )
	Grasses	Sedges	BLWs		
W <sub>1</sub> : Pre-emergence application of Pendimethalin 1000 g <i>a.i</i> ha <sup>-1</sup>	29.00 <sup>d</sup> (5.41)	246.67 <sup>d</sup> (15.70)	31.33 (5.55)	40.94 (39.35)	1451.60
W <sub>2</sub> : Pre-emergence application of Pendimethalin 1000 g <i>a.i</i> ha <sup>-1</sup> + one hand weeding at 20 DAS	18.00 <sup>b</sup> (4.30)	181.33 <sup>b</sup> (13.47)	16.00 (4.05)	61.13 (51.33)	1632.67
W <sub>3</sub> : Pre-emergence application of Pendimethalin + imazethapyr pre-mix)	34.67 <sup>s</sup> (5.89)	258.00 <sup>s</sup> (16.09)	36.00 (6.00)	37.45 (37.01)	1372.87
W <sub>4</sub> : Post-emergence application of imazethapyr 75 g <i>a.i</i> ha <sup>-1</sup>	45.33 <sup>i</sup> (6.72)	255.00 <sup>f</sup> (15.98)	27.5 (5.48)	31.07 (33.86)	1359.00
W <sub>5</sub> : Post-emergence application of imazethapyr + imazamox (pre- mix) 70 g <i>a.i</i> ha <sup>-1</sup>	31.67 <sup>e</sup> (5.65)	254.00 <sup>e</sup> (15.96)	34.33 (5.88)	40.22 (38.86)	1438.66
W <sub>6</sub> : Post-emergence application of sodium salt of acifluorfen + clodinofof propargyl ( pre- mix) 75 g <i>a.i</i> ha <sup>-1</sup>	44.33 <sup>h</sup> (6.66)	299.33 <sup>h</sup> (17.26)	44.00 (6.56)	16.45 (23.91)	1248.00
W <sub>7</sub> : Post-emergence application of imazethapyr 37.5 g <i>a.i</i> ha <sup>-1</sup> + quizalofop-p-ethyl 25 g <i>a.i</i> ha <sup>-1</sup> (tank-mix)	19.00 <sup>c</sup> (4.46)	183.33 <sup>c</sup> (13.57)	18.33 (4.33)	60.20 (50.96)	1623.15
W <sub>8</sub> : Post-emergence application of imazethapyr 37.5 g <i>a.i</i> ha <sup>-1</sup> + propaquizafop 32 g <i>a.i</i> ha <sup>-1</sup> (tank-mix)	33.33 <sup>f</sup> (5.77)	256.00 <sup>f</sup> (16.03)	34.67 (5.91)	38.57 (37.84)	1404.11
W <sub>9</sub> : Two hand weedings at 20 and 40 DAS	16.67 <sup>a</sup> (4.13)	172.67 <sup>a</sup> (13.70)	17.33 (4.23)	62.50 (52.33)	1654.38
W <sub>10</sub> : Un weeded check (control)	58.67 <sup>j</sup> (7.71)	452.67 <sup>j</sup> (21.98)	59.67 (7.69)	-	1132.91
<b>S.Em±</b>	0.204	0.340	0.182	2.87	31.02
<b>CD (P = 0.05)</b>	0.61	1.01	0.55	8.61	94.08

Values in paranthesis are arc sine values

ha<sup>-1</sup> (W<sub>6</sub>), post-emergence application of imazethapyr 37.5 g a.i ha<sup>-1</sup> + quizalofop-p-ethyl 25 g ha<sup>-1</sup> (tank-mix) (W<sub>7</sub>), post-emergence application of imazethapyr 37.5 g a.i ha<sup>-1</sup> + propaquizafop 25 g ha<sup>-1</sup> (tank-mix) (W<sub>8</sub>), two hand weedings at 20 and 40 DAS (W<sub>9</sub>) and unweeded check (W<sub>10</sub>). The recommended basal dose of nitrogen, phosphorous and potassium @ 30, 40 and 50 kg ha<sup>-1</sup> and gypsum @ 500 kg ha<sup>-1</sup> at time of flowering stage was applied. The test variety of groundnut 'Dharani' was used in the study by adopting spacing of 22.5cm x 10 cm.

## RESULTS AND DISCUSSION

The predominant weed species associated with groundnut are *Cyperus rotundus*, *Digitaria sanguinalis*, *Commelina benghalensis*, *Phyllanthus niruri*, *Cleome viscosa*, *Boerhavia diffusa* and *Dactyloctenium aegyptium*.

### Weed density

Among the pre-emergence application of herbicides, the lowest density of grasses, sedges and broad leaved weeds as well as total weeds were recorded with pre-emergence application of pendimethalin + imazethapyr (premix) @ 1000 g ha<sup>-1</sup> (W<sub>3</sub>), which was however, comparable with pre-emergence application of pendimethalin @ 1000 g ha<sup>-1</sup> one hand weeding at 20 DAS (W<sub>2</sub>) or pendimethalin alone as pre-emergence @ 1000 g a.i ha<sup>-1</sup> (W<sub>1</sub>), which maintained parity with each other. At 40 & 60 DAS and at harvest, hand weeding twice at 20 and 40 DAS (W<sub>9</sub>) recorded lower density and dry weight of grasses, sedges and broad leaved weeds as well as total weeds, which was however, comparable with pre-emergence application of pendimethalin *fb* hand weeding at 20 DAS (W<sub>2</sub>) and post-emergence application of imazethapyr @ 37.5 g a.i ha<sup>-1</sup> and quizalofop-p-ethyl 25 g a.i ha<sup>-1</sup> (W<sub>7</sub>) and these three treatments were distinctly more effective than the rest of the weed management practices tried. These results are in accordance with the findings Sharma *et al.* (2015), pre-emergence application of pendimethalin *fb* by hand weeding helps in effective control of wide spectrum of weeds during the early stages of crop growth there by limited competition for growth resources during the critical stages of crop growth.

### Weed control efficiency

Highest weed control efficiency at harvest was obtained with hand weeding twice at 20 and 40 DAS (W<sub>9</sub>), which was at par with pre-emergence application of pendimethalin *fb* hand weeding at 20 DAS (W<sub>2</sub>) and post-emergence application of imazethapyr @ 37.5 g a.i ha<sup>-1</sup> and quizalofop-p-ethyl 25 g a.i ha<sup>-1</sup> (W<sub>7</sub>). This might be

due to effective control of sedges and broad leaved weeds with imazethapyr and control of broad leaved with quizalofop-p-ethyl. The better performance of combination of herbicides might be due to synergistic effect between the two herbicides in reducing the population of weeds. These results are in accordance with those of Sharma *et al.* (2015).

### Pod yield

Among the different weed management practices tested, the highest hundred pod weight was recorded with hand weeding twice at 20 and 40 DAS (W<sub>9</sub>), which was on par with pre-emergence application of pendimethalin *fb* one hand weeding at 20 DAS (W<sub>2</sub>), or post-emergence application of imazethapyr + quizalofop-p-ethyl (W<sub>7</sub>). This might be due to increased dry matter production and efficient translocation of photosynthates to pods as a result of efficient utilization of growth resources because of weed free environment during critical stages of crop growth, thereby higher 100 pod weight. These results are in conformity with those of Sharma *et al.* (2015).

## CONCLUSION

In conclusion, the lowest weed density and highest weed control efficiency and pod yield was recorded with hand weeding twice at 20 and 40 DAS (W<sub>9</sub>), which was on par with pre-emergence application of pendimethalin *fb* one hand weeding at 20 DAS (W<sub>2</sub>), or post-emergence application of imazethapyr @ 37.5 g a.i ha<sup>-1</sup> + quizalofop-p-ethyl @ 225 g a.i ha<sup>-1</sup> (W<sub>7</sub>).

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