Short communication

Indian Journal of Weed Science **46**(3): 302–304, 2014

Weed management in groundnut with imazethapyr + surfactant

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Received: 29 June 2014; Revised: 30 August 2014

Key words: Groundnut, Herbicides, Imazethapyr, Seed yield, Surfactant, Weed, Weed management

Groundnut (*Arachis hypogaea* L.) is most important oilseed crop of India grown during rainy season. The slow initial growth of groundnut and favourable weather conditions during rainy season allow the weeds to grow faster. Season long weed competition reduces the yield as high as 24 to 70% (Wani *et al*. 2010). The first three-four weeks of crop growth period are critical for weed control in groundnut (Mulik *et al*. 2010). During rainy season, effective and economical weed control is not possible through manual and mechanical weeding due to unfavourable soil condition and also the unavailability of costly laborers. Herbicides have been accepted as cost-effective tool to manage weeds menace in groundnut. There are number of pre-emergence herbicides such as oxyfluorfen, fluchloralin, pendimethalin *etc*. which are being used for weed control in groundnut. However, they often fail to control weeds emerging during early vegetative phase of the crop. Imazethapyr applied as pre-plant incorporated, pre-emergence, early post-emergence or late post-emergence controlled many weeds in groundnut (Wilcut *et al*. 1995). Imazethapyr is the first herbicide registered in peanut to provide both post-emergence and residual control of many problem weeds (Grichar and Sestak 2000). Therefore, the present study was undertaken to evaluate the bio-efficacy of imazethapyr 10 per cent SL, as early post-emergence against important weeds of groundnut under agro-climatic condition of Varanasi in Eastern Uttar Pradesh.

A field experiment was conducted during *Kharif* season 2009 at Institute of Agricultural Sciences, BHU, Varanasi (23.2^0 N latitude, 83.03^{0}E longitude and at an altitude of 113 msl). The soil of experimental site was sandy clay loam in texture with saline in reaction (pH-7.2). It was low in organic C (0.32%) and available nitrogen (168.9 kg/ha), medium in available phosphorus (26.6 kg/ha) and potassium (242.5 kg/ha). The total rainfall received during 2008 was 742.8 mm of which 353.2, 333.2 and 56.2 mm, respectively was received during July, August and September. The field was kept under rice-wheat rotation for the last eight years. Treatments consisted of imazethapyr 10% SL, 75 g/ha + 0.2% surfactant, imazethapyr 10% SL, 100 g/ha + 0.2% surfactant, imazethapyr 10% SL, 125 g/ha + 0.2% surfactant, imazethapyr 10% SL, 200 g/ha + 0.2% surfactant, imazethapyr 10% SL, 100 g/ha + 0.2% surfactant (market sample), oxyfluorfen 23.5% EC 250 g/ha, weed free check and untreated control in completely randomized block design with three replications. The groundnut variety '*Type-28*' was sown manually at 45 x 15 cm row spacing using 80 kg seed/ha on 2nd August 2008 in 4.6 x 3.6 m^2 plot. Crop was raised with recommended package of practices for the region. Herbicides were applied as per treatments with hand sprayer fitted with flatfan nozzle and the spray volume was 400 litters/ha after two days of sowing. Density, dry weight and weed control efficiency of weeds were observed at 30 and 45 days after sowing of crop. Data on weed density was recorded from an area enclosed in the quadrate of 0.25/m^2 randomly selected at four places in each plot. Weed species were separately counted from each sample and their density was recorded as average number/m^2. Weed data were subjected to square root transformation ($\sqrt{x + 0.5}$) before statistical analysis.

The major weeds in experimental crop were *Echinochloa colona* (15.4%), *Cyperus rotundus* (16.1%), and *Dactyloctenium aegyptium* (20.9%) among narrow-leaf weeds and *Trianthema portulacastrum* (47.5%) was the major broad-leaf weed.

Application of imazethapyr 200 g/ha + surfactant recorded minimum density of all the dominant weed species and it was at par to its lower rates of 100 and 125 g/ha, irrespective of stages of observation (Table 1). Test sample of imazethapyr 100 g/ha + surfactant recorded less density of weeds than market sample (Pursuit) at same rate, but both remained at par with each other. Pre-emergence application of oxyfluorfen 250 g/ha effectively controlled the *Dactyloctenium aegyptium* and *Trianthema portulacastrum* whereas, it was least effective against

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Echinochloa colona and *Cyperus rotundus* and had significantly higher density of these weed species when compared with imazethapyr 100-200 g/ha + surfactant. The results were corroborated with the findings of Grichar and Sestak (2000).

Test sample of imazethapyr 100 g/ha + surfactant did not differ significantly from its higher rates (125 and 200 g/ha) in respect of dry matter accumulation by weeds, irrespective of stage of observation. Imazethapyrat 100 g/ha + surfactant was comparable to market sample of imazethapyr (Pursuit) at 100 g/ha + surfactant and was significantly superior over pre-emergence application of oxyfluorfen 250 g/ha. However, all the herbicides were significantly superior to untreated control. The results were in line with those of Wilcut *et al*. (1995) and Wani *et al*. (2010).

Weed control efficiency varied from 39.8 to 66.6% at 30 DAS and 29.2 to 65.9% at 45 DAS under different weed control treatments. Among the herbicidal treatments, highest weed control efficiency (66.6 and 65.9%) was also recorded under imazethapyr 200 g/ha + surfactant followed by imazethapyr 125 g/ha + surfactant, imazethapyr100 g/ha + surfactant and imazethapyr 75 g/ha + surfactant (market sample), respectively. Lower weed control efficiency (39.8 and 29.2) was recorded under pre-emergence application of oxyfluorfen 250 g/ha (Table 1). Weed free check recorded the highest weed control efficiency (100%) over other weed control treatments.

On the basis of visual observation at 5 days after spraying of herbicide, the phytotoxicity of higher rate was compared with untreated control and also lowers rates of imazethapyr. No-phytotoxicity symptoms appeared on crop even at higher rate (200 g/ha) of the herbicide.

The seed and haulm of yield of groundnut was significantly affected by different weed control treatments (Table 1). Among the herbicidal treatments, imazethapyr 200 g/ha + surfactant was recorded significantly the highest seed and haulm yield over imazethapyr 100 g/ha + surfactant (market sample), imazethapyr 75 g/ha + surfactant and oxyflurfen 250 g/ha and were at par with imazethapyr 100 and 125 g/ha + surfactant. However, all the rates of herbicides were significant superior to untreated control. Higher yield under imazethapyr 200 g/ha + surfactant was mainly due to effective control of narrow and broadleaf weeds in groundnut, leading to synergistic effect on growth and yield attributes. The results were in close conformity with the finding of Dowler (1992), Wilcut *et al*. (1993), Wilcut *et al*. (1995), Mulik *et al*. 2010 and Wani *et al*. (2010).

The regression equation predicted linear reduction in the seed yield with a unit increase in the dry weight of weeds (Fig. 1). The extent of reduction could be 33.4 kg/ha for weed dry weight. The evaluation of weed control efficiency of the different treatments and the regression of yield on it revealed that 1% increase in the weed control efficiency increased the grain yield by 13.6 kg/ha (Fig. 2).

Table 1. Effect of imazethapyr + surfactant on weed growth at 45 DAS and yield of groundnut

Treatment	Dose (g/ha)	Weed density (no./m^2)				Total weed dry weight (g/m^2)	Weed control efficiency (%)	Seed yield (t/ha)	Haulm yield (t/ha)	Harvest index
		Echinochloa colona	*Cyperus rotundus*	*Trianthima portulacastrum*	*Dactylocteniu maegyptium*					
Imazethapyr + 0.2% surfactant	75	2.37 (6.0)	3.53 (12.0)	9.11 (82.7)	3.81 (14.3)	5.18 (26.3)	35.5			
Imazethapyr + 0.2% surfactant	100	2.25 (6.7)	3.43 (11.3)	8.43 (72.7)	3.43 (11.3)	4.85 (23.0)	43.6	2.04	5.47	0.27
Imazethapyr + 0.2% surfactant	125	1.94 (3.3)	1.64 (2.7)	8.21 (67.0)	2.95 (8.3)	4.11 (16.4)	59.8	2.10	5.97	0.26
Imazethapyr + 0.2% surfactant	200	1.27 (1.3)	1.35 (1.7)	6.91 (47.3)	2.58 (6.3)	3.80 (13.9)	65.9	2.23	6.22	0.26
Imazethapyr + 0.2% surfactant (market sample)	100	2.81 (7.5)	3.6 (12.2)	8.89 (78.6)	3.60 (12.5)	5.22 (26.8)	34.3	1.99	5.09	0.28
Oxyflurfen 23.5% EC	250	5.80 (32.4)	3.92 (15.0)	5.20 (26.7)	5.40 (28.6)	5.43 (28.9)	29.2	1.26	4.57	0.22
Weed free check (two hand weeding)	20 & 40 DAS	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	100.0	2.47	6.67	0.27
Untreated control		5.89 (34.3)	6.04 (36.0)	10.3 (106)	6.84 (46.7)	6.43 (40.8)	-	1.20	3.55	0.25
LSD (P=0.05)		1.20	0.78	0.72	0.69	0.72	-	0.24	0.63	-

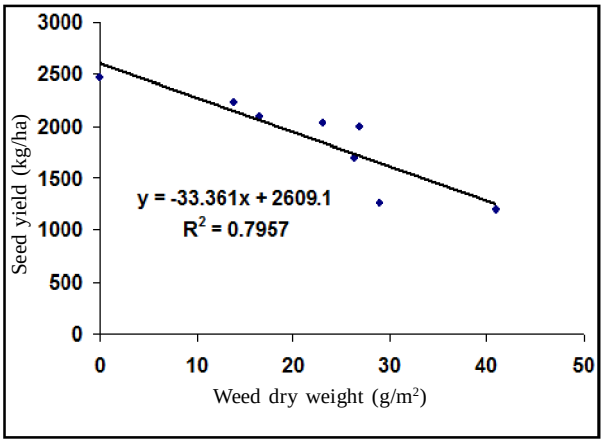

Fig. 1. Reationship between weed dry weight and seed yield of groundnut

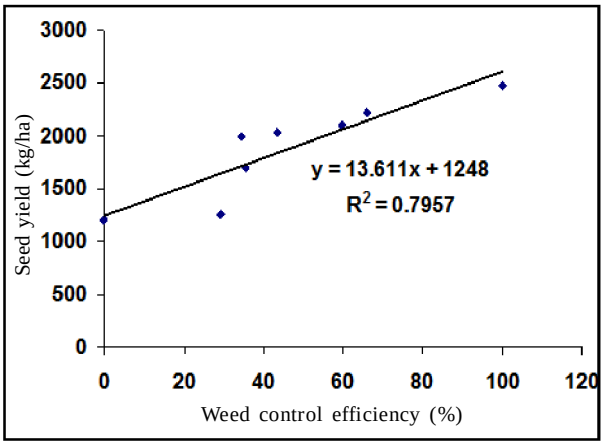

Fig. 2. Reationship between weed control efficiency and seed yield of groundnut

SUMMARY

An experiment was conducted during *Kharif* season of 2009 at BHU, Varanasi to evaluate the bio-efficacy of imazethapyr 10% SL + surfactant against important weeds of groundnut. Application of imazethapyr 200 g/ha + surfactant being at par with its lower rates of 100 and 125 g/ha, reduced the density of dominant weeds. Pre-emergence application of oxyfluorfen 250 g/ha effectively controlled the *Dactyloctenium aegyptium* and *Trianthema portulacastrum* whereas, it was least effective against *Echinochloa colona* and *Cyperus rotundus*. Imazethapyr 200 g/ha + surfactant recorded significantly the highest seed and haulm yield and weed control efficiency over imazethapyr 100 g/ha + surfactant (market sample), imazethapyr 75 g/ha + surfactant and oxyfluorfen 250 g/ha. There was no-phytotoxicity symptoms on crop even at higher rate (200 g/ha) of the herbicide.

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