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Weed management in groundnut

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ABSTRACT

A field experiment was conducted on groundnut (*Arachis hypogaea* L.) during *Kharif* (rainy season) 2016 at College of Agriculture, SKRAU, Bikaner (Rajasthan). The soil was loamy sand, low in organic carbon (0.08%) and available N (78 kg/ha) and medium in available P (22 kg/ha) and available K (210 kg/ha) with pH 8.3. Significantly the lowest density and dry matter of weeds and the highest haulm and pod yield were recorded with application of pendimethalin + imazethapyr (30+2) 800 g/ha(PE) followed by pendimethalin 1.0 kg/ha as PE, imazethapyr + imazamox (35:35) 70 g/ha at 20 DAS as PoE (at 3-4 leaf stage), pendimethalin + imazethapyr (30 + 2) premix 800 g/ha(PPI), imazethapyr + imazamox (35:35) 50 g/ha at 20 DAS as PoE (at 3-4 leaf stage), imazethapyr 70 g/ha at 20 DAS as PoE and pendimethalin + imazethapyr (30 + 2) 800 g/ha (Dry). Maximum net returns of ₹ 223016 /ha was realized under the weed free treatment and it was closely followed by pendimethalin + imazethapyr (30+2) 800 g/ha (PE), pendimethalin 1.0 kg/ha (PE) and pendimethalin 1.0 kg/ha (PPI) as ₹ 185045, ₹ 9177813 and ₹ 175462 /ha, respectively.

In India out of total production of edible oil, 67 per cent is contributed by groundnut. The demand for edible oil in the country is rising by 6 per cent per annum. Therefore, concerted efforts are now being made for increasing and stabilizing oilseed production (Narayan 2017). Groundnut (*Arachis hypogaea* L.) is one of the most important food as well as cash crop of the country. It is gaining importance due to its contents namely, 48-50 per cent of oil and 26-28 per cent of protein. Groundnuts also contain vitamin 'E' and small amounts of vitamin 'B' complex and good source of calories, 5.6 calories /nut. Weeds are one of the important factors responsible for low yield of groundnut. They play an important role in the dietary requirements of resource poor women and children and haulms are used as livestock feed. The main problems limiting production of groundnut are poor cultural practices as well as inadequate weed management (EL Naim *et al.* 2010). Weeds reduce yield by competing with the groundnut plant for resources, such as moisture, nutrients, space, and sunlight *etc*. (Upadhyay 1984). Heavy weed infestation appears to be the most serious menace in groundnut production causing extensive losses. Because of its short stature and initial slow growth in comparison to fast growing weeds, weeds smother this crop at every stage by sharing water, nutrients, space, solar radiation and other resources. Pendimethalin as pre-emergence has performed well in leguminous crops. Pendimethalin is a selective and pre-emergence herbicide absorbed by roots and leaves. Affected plants die shortly after germination or following emergence from the soil. If the farmers skipped to apply this herbicide due to one or other reasons, application of post-emergence herbicide is the option left with them.

The field experiment was conducted at College of Agriculture, S.K. Rajasthan Agricultural University, Bikaner during *Kharif* 2016. Bikaner (28.01°N latitude and 73.22°E longitude at an altitude of 234.70 meters above mean sea level). The experimental soil was deep, sandy and coarse loamy, desert soils with low water holding capacity, hot and arid climate, having pH 8.0, organic carbon 0.08%,78.20 N kg/ha, 22.0 P kg/ha, 116.82 potassium kg/ha and bulk density 1.65, respectively. The variety used in this experiment was '*HNG-10*'. The treatments consisted of pendimethalin 1.0 kg/ha as dry, pendimethalin 1.0 kg/ha as pre-plant incorporation (PPI), pendimethalin 1.0 kg/ha as PE, pendimethalin + imazethapyr (30+2) 800 g/ha (dry), pendimethalin imazethapyr (30+2) 800 g/ha(PPI), pendimethalin imazethapyr (30+2) 800 g/

ha(PE), imazethapyr 50 g/ha at 20 DAS as PoE, imazethapyr 70 g/ha at 20 DAS as PoE, imazethapyr + imazamox (35:35) 50 g/ha at 20 DAS as PoE (at 3-4 leaf stage), imazethapyr + imazamox (35:35) 70 g/ha at 20 DAS as PoE (at 3-4 leaf stage), weed free and weedy check. These herbicides were sprayed with knap-sack sprayer using 500 liters of water per hectare. The analysis of data was done using the Fisher's method of analysis of variance technique as described by Gomez and Gomez (1984). The differences of means were identified by Duncan's univariate test at p ≥0.05.

Effect on weeds

Major weeds of the experimental field were *Amaranthus spinosus* L., *Digera arvensis* Forsk, *Physalis minima, Tribulus terrestris* L., *Portulaca oleracea* L., *Trianthima portulacastrum*, *Cyperus rotundus* L., *Cenchrus biflorus* L., *Eleusine indica* L., and *Dactyloctenium aegypticum*. Weed control treatments brought about significant variation in the count and dry weights of weeds (**Table 1**). All the weed control treatments had significantly lower total weed count and dry matter as compared to untreated plot. At the 30, 60 DAS and at harvest, the significantly lower count and dry matter of weed with application of pendimethalin + imazethapyr (30 + 2) premix 800 g/ha (PE) followed by pendimethalin 1.0 kg/ha as PE, imazethapyr + imazamox (35:35) 70 g/ha at 20 DAS as PoE (at 3-4 leaf stage), pendimethalin + imazethapyr (30 + 2) premix 800 g/ha (PPI), imazethapyr + imazamox (35:35) 50 g/ha at 20 DAS as PoE (at 3-4 leaf stage), imazethapyr 70 g/ha at 20 DAS as PoE and pendimethalin + imazethapyr (30 + 2) premix 800 g/ha (Dry), respectively. These treatments were statistically at par with each other. Similar result also collaborated with Rana *et al.* (2019), Singh *et al.* (2019) and Komal *et al.* (2015).

Pendimethalin + imazethapyr (30 + 2) pre-mix 800 g/ha (PE), pendimethalin 1.0 kg/ha (PE) and imazethapyr + imazamox (35:35) 70 g/ha at 20 DAS as PoE (at 3-4 leaf stage) pendimethalin + imazethapyr (30 + 2) premix 800 g/ha (PPI) recorded higher weed control efficiency 99.23, 98.68, 86.75 and 82.55% (**Table 2**). Data further indicate that the lowest weed index was recorded under pendimethalin + imazethapyr (30 + 2) premix 800 g/ha (PE) (3.99%) followed by pendimethalin 1.0 kg/ha (PE) (7.35%) and imazethapyr + imazamox (35:35) 70 g/ha at 20 DAS as PoE (at 3-4 leaf stage) (9.70%). These findings are akin to report of Gupta *et al.* (2015) and Singh *et al.* (2019).

Effect on groundnut

Pod and haulm yield were also significantly increased under various treatments of weed management during the experimentation over weedy check. Increase in straw yield might be due to the direct influence of various weed management treatments on the suppression of weeds. Thus, crop weed competition resulted into increased plant height, dry matter accumulation (**Table 2**) and nutrient uptake. The results so obtained for straw corroborate with the findings of Kumar *et al.* (2003), Mishra and Chandrabhanu (2006) and Tiwari *et al.* (2014).

Table 1. Effect of weed control measures on total density and dry weight of weeds in groundnut

Treatment	Total weeds density (no./m^2)			Total weeds dry weight (g/m^2)			Weed control efficiency (%)	Weed index (%)
	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest		
Pendimethalin 1.0 kg/ha as dry	6.0(35.6)	6.5(42.0)	6.5(42.0)	5.2(27.0)	5.9(34.3)	4.51(19.9)	75.38	17.00
Pendimethalin 1.0 kg/ha as PPI	5.4(28.8)	6.0(33.6)	6.0(33.6)	4.5(19.5)	5.2(26.2)	3.93(15.0)	80.58	12.87
Pendimethalin 1.0 kg/ha as PE	3.4(11.2)	3.5(11.7)	3.5(11.7)	1.4(1.5)	1.5(1.8)	1.35(1.3)	98.68	7.35
Pendimethalin + imazethapyr (30+2) premix 800 g/ha(dry)	4.9(23.7)	5.6(31.1)	5.6(31.1)	5.1(25.2)	5.7(32.1)	4.37(18.6)	76.03	16.28
Pendimethalin + imazethapyr (30+2) premix 800 g/ha (PPI)	4.3(18.2)	4.8(22.9)	4.8(22.9)	4.2(17.1)	5.0(24.3)	3.84(14.3)	82.55	9.70
Pendimethalin + imazethapyr (30+2) premix 800 g/ha (PE)	1.0(0.5)	1.2(1.0)	1.2(1.0)	1.1(0.7)	1.3(1.1)	1.11(0.7)	99.23	3.99
Imazethapyr 50 g/ha at 20 DAS as PoE	6.2(37.8)	6.8(45.4)	6.8(45.4)	5.9(33.9)	6.8(45.6)	5.48(29.6)	64.54	28.57
Imazethapyr 70 g/ha at 20 DAS as PoE	4.9(26.4)	5.1(26.0)	5.1(26.0)	5.1(26.0)	5.4(29.0)	4.46(19.4)	79.29	21.71
Imazethapyr + imazamox (35:35) 50 g/ha at 20 DAS as PoE	4.5(19.4)	5.6(30.9)	5.6(30.9)	4.5(20.1)	5.6(30.4)	4.21(17.2)	75.16	23.68
Imazethapyr + imazamox (35:35) 70 g/ha at 20 DAS as PoE	3.9(15.0)	4.1(16.3)	4.1(16.3)	3.7(12.9)	4.4(18.8)	3.42(11.2)	86.75	20.84
Weed free	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.71(0.0)	100.00	0.00
Weedy check	10.7(114.3)	11.5(132.1)	11.5(132.1)	10.1(102.3)	11.6(134.8)	9.19(83.9)	0.00	90.54
LSD (p=0.05)	0.12	0.14	0.14	0.12	0.13	0.11		

Figures in parentheses are original, weed density transformed to $\sqrt{x+0.5}$

Table 2. Effect of weed control measures on yield, net return and B:C ratio in groundnut

Treatment	Pod yield (t/ha)	Haulm yield (t/ha)	Net return (x10^3 ₹/ha)	B C ratio
Pendimethalin 1.0 kg/ha as dry	3.89	7.71	169.20	2.34
Pendimethalin 1.0 kg/ha as PPI	4.06	8.26	178.40	2.47
Pendimethalin 1.0 kg/ha as PE	4.35	8.89	180.80	2.50
Pendimethalin + imazethapyr (30+2) premix 800 g/ha (Dry)	3.90	7.97	170.60	2.36
Pendimethalin + imazethapyr (30+2) premix 800 g/ha (PPI)	4.20	8.83	172.70	2.39
Pendimethalin + imazethapyr (30+2) premix 800 g/ha (PE)	4.48	8.92	188.00	2.60
Imazethapyr 50 g/ha at 20 DAS as PoE	3.34	6.73	136.40	1.89
Imazethapyr 70 g/ha at 20 DAS as PoE	3.64	7.62	148.30	2.06
Imazethapyr + imazamox (35:35) 50 g/ha at 20 DAS as PoE	3.58	6.99	152.60	2.10
Imazethapyr + imazamox (35:35) 70 g/ha at 20 DAS as PoE	3.71	7.60	153.40	2.10
Weed free	4.69	10.27	223.00	3.01
Weedy check	2.49	5.02	93.20	1.31
LSD (p=0.05)	0.49	1.55	27.46	0.38

The extents of increase in pod, haulm and biological yield of groundnut were followed by 93.48, 104.5 and 99.04% under weed free treatment However, the increases pod yield under pendimethalin + imazethapyr (30 + 2) premix 800 g/ha (PE) and pendimethalin 1.0 kg/ha (PE) were 79.83 and 74.21%, respectively compared to weedy check. The results so obtained for straw corroborate with the findings of Singh *et al.* (2019).

Maximum net returns of ₹223016 /ha was realized under the weed free treatment and it was closely followed by pendimethalin + imazethapyr (30 + 2) premix 800 g/ha (PE), pendimethalin 1.0 kg/ha (PE) and pendimethalin 1.0 kg/ha (PPI) 185045, 9177813 and 175462/ha, respectively (**Table 2**). The higher pod yield recorded with this treatment might be responsible for higher net returns. The maximum B:C ratio (2.5) was accrued under treatment pendimethalin + imazethapyr (30 + 2) pre-mix 800 g/ha (PE) followed by pendimethalin 1.0 kg/ha (PE) and pendimethalin 1.0 kg/ha (PPI) values 2.4 and 2.3. These findings were in close vicinity with those reported by Gupta *et al.* (2015), Singh *et al.* (2016).

It was concluded that pre-emergence application of pendimethalin and imazethapyr 800 g/ha could be adopted for effective management of weeds and higher productivity of groundnut in hyper arid region of Rajasthan.

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