RESEARCH ARTICLE

EFFECT OF DIFFERENT WEED MANAGEMENT PRACTICES ON GROWTH PARAMETERS AND YIELD ATTRIBUTES OF GROUNDNUT (*ARACHIS HYPOGEA* L.)

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Abstract: A field experiment was conducted on groundnut (*Arachis hypogaea* L.) during *Kharif* season 2016 at College of Agriculture, SKRAU, Bikaner, Rajasthan (India). The experiment was laid out in a randomized block design with 12 treatments and replicated thrice. 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. Maximum plant height, dry matter accumulation, number of nodules, pods, kernels and seed index were recorded with application of pendimethalin+imazethapyr (30+2) 800 g/ha (pre-emergence) followed by pendimethalin 1.0 kg/ha as PE, pendimethalin+imazethapyr (30 + 2) premix 800 g/ha (pre-plant incorporation-PPI), pendimethalin 1.0 kg/ha as (PPI), pendimethalin+imazethapyr (30 + 2) 800 g/ha (Dry), pendimethalin 1.0 kg/ha as (Dry), imazethapyr+imazamox (35:35) 70 g/ha as post-emergence spray (PoE) at 20 DAS (days after sowing), imazethapyr +imazamox (35:35) 50 g/ha at 20 DAS as PoE (at 3-4 leaf stage) and imazethapyr 70 g/ha as PoE at 20 DAS.

Keywords: Groundnut, Imazamox, Kharifseasion, Pendimethalin + Imazethapyr

INTRODUCTION

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 an important edible oilseed crop of India popularly known as peanut, monkeynut and locally called as 'moongphali'. It is mainly grown in *Kharif* season. It belongs to family leguminoseae and sub family papilionaceae. Groundnut kernels contain high quality edible oil (48%), easily digestible protein (26%) and carbohydrates (20%). In addition to protein, groundnut is a good source of calcium, phosphorus, iron, zinc and boron. Groundnut kernels also contain vitamin 'E' and small amounts of vitamin 'B' complex. High in calories, 5.6 calories nut^{-1}. Among groundnut producing countries of the world, India stands first by occupying about 38% of total area. In terms of production, however, our country ranks second in the world. In India groundnut cultivation occupies premier position with regard to both area and production. It accounts for 4.73 m ha area and 6.73 mt of production with the productivity of 1422 kg ha^{-1}. In Rajasthan, groundnut is cultivated mainly in north western region covering the districts of Bikaner, Jaipur, Jodhpur, Nagaur and Sikar. The total area under groundnut in Rajasthan is 6.7 Lakh ha, with the total production of 13.8 Lakh tons and productivity of 2059 kg ha^{-1} during 2018-19. Weeds are one of the important factors responsible for low yield of groundnut. Weeds reduce yield by competing with the groundnut plant for resources, such as moisture, nutrients, space and sunlight not only throughout the growing season, but also create problem during digging and inverting procedures and reduce harvesting efficiency. Harvesting losses increases as the biomass of weeds slow down the field-drying of groundnut vines and pods and increases the possibility of exposure to rainfall. Weeds have allellopathic effect on groundnut (Bansal, 1993) and they act as host for causal organisms of various diseases and insect pests. In the initial growth of crop, there is relatively lesser canopy cover, which allows bumper weed growth between the inter-row area and thus groundnut crop becomes more susceptible to weed-crop competition in the earlier growth period of the crop. Heavy weed infestation appears to be the most serious menace in groundnut production causing economic losses. Because of its short stature and initial slow growth in comparison to fast growing weeds, weeds compete with crop at every stage by sharing water, nutrients, space, solar radiation and other resources. Mortality of plant has also reported in groundnut due to weed suppression (Dev Kumar and Giri, 1998). Groundnut emerges 5 to 7 days after sowing and once the weeds overtake the crop and begin to shade it, the effect becomes more serious within this period. Therefore, it is the most critical period for crop to be kept free of weeds.

MATERIALS AND METHODS

The field experiment was conducted at Instructional Farm of College of Agriculture, S.K. Rajasthan Agricultural University, Bikaner during *Kharif* 2016. Bikaner is situated at 28.01°N latitude and 73.22°E

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longitude at an altitude of 234.70 meters above mean sea level. Annual PET in this region ranges between 1500-2000 mm. 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 %, available nitrogen 78.20 kg ha^{-1}, available phosphorus 22.0 kg ha^{-1} and available potassium 116.82 kg ha^{-1} and bulk density 1.65 gcm^{-3}, respectively. The variety used in this experiment was *"HNG-10"* with12 treatments replicated four times with randomized block design. Each plot size was of 4.0 m x 3.0 m^{-2}. The treatments including Pendimethalin 1 kg ha^{-1} as Dry, Pendimethalin 1 kg ha^{-1} as PPI, Pendimethalin 1 kg ha^{-1} as PE, Pendimethalin + Imazethapyr (30+2) premix 800 g ha^{-1} (dry), Pendimethalin + Imazethapyr (30+2) premix 800 g ha^{-1}(PPI), Pendimethalin +Imazethapyr (30+2) premix 800 g ha^{-1} (PE), Imazethapyr 50 g ha^{-1} at 20 DAS as PoE, Imazethapyr 70 g ha^{-1} at 20 DAS as PoE, Imazethapyr + Imazamox (35:35) 50 g ha^{-1} at 20 DAS as PoE (at 3-4 leaf stage), Imazethapyr + Imazamox (35:35) 70 g ha^{-1} at 20 DAS as PoE (at 3-4 leaf stage), Weed free and Weedy check. These herbicides were sprayed with knapsack sprayer using 500 liters of water per hectare. All the recommended improved package of practices were followed in this experiment including the plant protection measures. 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 $P \geq 0.05$.

RESULTS AND DISCUSSION

Growth, yield and yield attributes

Weed free treatment recorded significantly taller plants and higher dry matter accumulation, number of nodules, pod yield t/ha and seed index over all the other treatments (Table1). This was followed by treatment pendimethalin + imazethapyr (30 + 2) premix 800 g ha^{-1} (PE). However, in respect of pods/plant and kernel/pod weed free and pendimethalin + imazethapyr (30 + 2) premix 800 g ha^{-1} (PE) were found at par with each other treatments. This might be due to minimizing the competition of weeds with main crop for resources *viz*. space, light, nutrients and moisture with adaption of effective weed control methods. Thus, reduced crop- weed competition resulted into overall improvement in crop growth as reflected by plant height and dry matter accumulation consequently resulted into better development of reproductive structure and translocation of photosynthates to the sink. The results corroborate with the findings of Singh *et al*. (1994) and Yadav *et al*. (2014). These growth parameters were significantly the lowest in weedy check. This might be due to severe competition by weeds for resources, which made the crop plant inefficient to take up more moisture, nutrients and ultimately growth was adversely affected due to less supply of carbohydrates. Similar findings were reported by Malliswari *et al*. (2008).

At harvest, the highest (49.2 g) dry matter accumulation in groundnut plant was recorded in weed free treatment. It was followed by pendimethalin + imazethapyr (30+2) premix 800 g ha^{-1}(PE), pendimethalin 1 kg ha^{-1} PE. Weedy check recorded lowest dry matter than rest of the treatments.

At 50 and 75 DAS, significantly higher number of nodules $plant^{-1}$ were observed in weed free which were significantly higher over weedy check but, remained at par with rest of the treatments. The extent 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.

All the growth attributing characters which were dominant in different weed control methods helped to bear a greater number of pods and kernel than weedy check. Total number of pods and kernel were observed maximum (15.4 $plant^{-1}$ and 2.0 $plant^{-1}$) in weed free over rest of the treatments but was at par with pendimethalin + imazethapyr (30 + 2) premix 800 g/ha (PE). The seed index was significantly maximum (50.8 g) (Table 1). These results were in close conformity with the results obtained by Refey and Prasad (1995).

Table 1. Effect of different weed control measures on growth and yield parameters in groundnut

Treatments	Plant height (cm)	No. of nodules/ plant at 50 DAS	Dry matter accumulation (g $plant^{-1}$)	Pods $plant^{-1}$	Kernels pod^{-1}	Seed index (g)
Pendimethalin 1 kg ha^{-1} as Dry	50.3	133.7	16.3	12.8	1.8	42.3
Pendimethalin 1 kg ha^{-1} as PPI	52.9	138.2	18.2	13.3	1.8	43.1
Pendimethalin 1 kg ha^{-1} as PE	56.1	145.5	22.5	14.2	1.9	45.0
Pendimethalin + Imazethapyr (30+2) premix 800 g ha^{-1} (Dry)	51.4	135.7	17.7	12.9	1.8	42.9
Pendimethalin + Imazethapyr (30+2) premix 800 g ha^{-1} (PPI)	54.6	143.2	21.2	13.7	1.9	45.3
Pendimethalin + Imazethapyr (30+2) premix 800 g ha^{-1} (PE)	57.9	146.7	23.2	14.8	1.9	48.0

Imazethapyr 50 g ha^{-1} at 20 DAS as PoE	43.7	122.7	11.7	11.1	1.8	41.5
Imazethapyr 70 g ha^{-1} at 20 DAS as PoE	45.1	126.8	13.6	11.9	1.8	41.5
Imazethapyr + Imazamox (35:35) 50 g ha^{-1} at 20 DAS as PoE (at 3-4 leaf stage	46.9	128.3	13.7	11.9	1.8	41.9
Imazethapyr + Imazamox (35:35) 70 g ha^{-1} at 20 DAS as PoE (at 3-4 leaf stage	48.1	130.5	15.3	12.3	1.8	42.2
Weed free	60.8	149.8	26.8	15.4	2.0	50.8
Weedy check	39	119.2	8.3	8.2	1.7	40.6
LSD (p=0.05)	6.5	14.0	5.2	1.6	0.2	5.9

Table 2. Effect of weed control measures on nutrient uptake in weed and groundnut

Treatments	Nutrient uptake by weed (kg ha^{-1})		Nutrient uptake by crop (kg ha^{-1})			
			N		P	
	N	P	Seed	Haulm	Seed	Haulm
Pendimethalin 1 kg ha^{-1} as Dry	46.19	6.64	99.5	109.8	11.9	16.3
Pendimethalin 1 kg ha^{-1} as PPI	38.39	5.55	105.2	119.4	13.1	18.2
Pendimethalin 1 kg ha^{-1} as PE	12.84	1.88	115.0	129.1	14.8	22.5
Pendimethalin + Imazethapyr (30+2) premix 800 g ha^{-1} as Dry	35.12	5.1	100.4	114.1	12.2	17.7
Pendimethalin + Imazethapyr (30+2) premix 800 g ha^{-1} as PPI	28.23	4.06	109.2	128.8	13.7	21.2
Pendimethalin + Imazethapyr (30+2) premix 800 g ha^{-1} as PE	1.56	0.23	118.4	131.7	15.5	23.2
Imazethapyr 50 g ha^{-1} at 20 DAS as PoE	50.66	7.53	80.2	90.5	8.6	11.7
Imazethapyr 70 g ha^{-1} at 20 DAS as PoE	34.14	5.03	90.4	104.4	10.1	13.6
Imazethapyr + Imazamox (35:35) 50 g ha^{-1} at 20 DAS as PoE (at 3-4 leaf stage	30.81	4.49	91.1	97.3	10.5	13.7
Imazethapyr + Imazamox (35:35) 70 g ha^{-1} at 20 DAS as PoE (at 3-4 leaf stage	20.41	2.97	94.8	107.5	11.2	15.3
Weed free	0	0	125.3	152.5	16.6	26.8
Weedy check	134.97	20.86	61.2	66.3	6.3	8.3
LSD (p=0.05)	4.94	0.48	14.9	19.9	3.3	5.2

Effect on nutrient uptake by weeds and crop

Results revealed that N, P uptake by weeds almost followed the footsteps of weed biomass in trend (Table 2). It was found that all weed control treatments significantly reduced the N, P uptake both by the individual weed categories and total weeds at harvest. The nil uptakes of N and P by weeds was recorded with weed free treatment, followed by treatment pendimethalin + imazethapyr (30 + 2) premix 800 g ha^{-1} (PE) which was at par with pendimethalin 1 kg ha^{-1} PE and pendimethalin + imazethapyr (30 + 2) premix 800 g/ha (PPI) during the experimentation. Reduced nutrient uptake by weeds under the influence of different weed control measures had been also reported by Chhokar *et al.* (1995). The nutrient uptake by the crop was influenced significantly by the weed control measures. The data in (Table 2). revealed that N and P uptake by crop almost followed the footsteps of crop biomass in trend. It was found that all weed control treatments significantly increase the N and P uptake both by the haulm and seed at harvest. The highest uptake was recorded by the weed free over the rest of treatments. The treatment pendimethalin + imazethapyr (30 + 2) premix 800 g ha^{-1} (PE) recorded highest N and P uptake by seed and haulm.

CONCLUSION

From above-mentioned experimental result, it can be concluded that pre-emergence application of pendimethalin + imazethapyr (30 + 2) premix 800 g ha^{-1} proved superior in terms of enhanced crop growth parameters, yield and yield attributes of groundnut in the arid region of Rajasthan, India.

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