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Sowing date and weed management effects on weeds, nutrient uptake and productivity of summer greengram

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ABSTRACT

A field experiment was conducted during the summer seasons of 2016 and 2017 at Banka, (Bihar) to evaluate the effect of sowing dates and weed management on weeds and productivity of summer greengram (*Vigna radiata* L.). The experiment was laid out in a split plot design replicated thrice. Eleven weed species, *viz. Cynodon dactylon, Dactyloctenium aegyptium, Digitaria sanguinalis, Panicum repens, Cyperus rotundus, Amaranthus viridis, Celosia argentea, Commelina benghalensis, Digera arvensis, Euphorbia hirta* and *Trichodesma indicum* infested the greengram.Two hands weedings 20 and 40 days after sowing (DAS) recorded the lowest weed density and biomass which was significantly superior over rest of the weed management treatment. Pendimethalin (1000 g/ha) 2 DAS *fb* one hand weeding at 20 DAS gave significantly higher plant height, pods/plant, seeds/pod and seed index, higher seed yield, maximum net returns and B:C ratio and was found at par with two hands weeding at 20 and 40 DAS. Pendimethalin (1000 g/ha) 2 DAS *fb* 1 hand weeding at 20 DAS recorded the highest nutrient uptake N, P and K and was at par with of pendimethalin (1000 g/ha) 2 DAS during both years of experimentation.

Legume crops play a vital role as they provide food, feed and also maintains the soil environment by biological nitrogen fixation (Singh *et al*. 1970). Sowing time is one of the most important non-monetary agronomic factors for realizing the yield potential of improved varieties. Sowing of the crop at optimum time therefore, plays a key role in obtaining the high seed yields (Rathore *et al*. 2010). Among several factors responsible for low yields of pulse crops in India, weed infestation is considered as one of the major factors. Greengram often suffers severe weed competition especially during early growth phases. Being a short duration and initially slow growing, greengram is heavily infested with narrow and broad-leaved weeds and sedges which compete with crops, resulting in yield reduction to the tune of 30-79% (Lawn 1995, Shuaib 2001, Dungarwal *et al.* 2003). Therefore, removal of weeds at appropriate time using a suitable method is essential to obtain high yield of greengram. Delayed removal of weeds is not as effective in controlling weeds and obtaining higher yields as the timely removal of weeds. Thus, the present study was conducted with an objective to study the effect of sowing dates and weed management treatments on weeds and summer greengram yield and nutrient uptake.

A field experiment was conducted during summer seasons of 2016 and 2017 at farmer's field ($24^0$30'N latitude and $86^0$30'E latitude at an altitude of 79 m from the mean sea level) in Banka District of Bihar as an On Farm Trial to evaluate the effect of different sowing dates and weed management treatments on weed density and biomass, production and nutrient uptake of summer greengram. The soil of experimental site was sandy-clay-loam in texture with neutral pH (7.23), low in organic C (0.46%) and available N (193.5 kg/ha), and medium in available P (17.1 kg/ha) and K (213.3 kg/ha). The field experiment consisted four sowing dates in main plot, (15 March, 25 March, 5 April and 15 April) and four weed management treatments in sub plot, (weedy check, two hands weeding at 20 and 40 DAS, pendimethalin 1.0 kg/ha pre-emergence *fb* 1 hand weeding at 20 DAS and pendimethalin 1.0 kg/ha pre-emergence alone was conducted with the greengram cultivar '*HUM-16*'. The land was prepared by giving two ploughing each followed by planking with the help of a tractor-drawn cultivator. The sowing of greengram was done behind the plough after preparation of field at 30 x 10 cm apart. An uniform fertilizer dose of 20 and 40 kg N and P_2O_5/ha,

respectively in the form of urea and diammonium phosphate was applied to each experimental unit. Full dose of nitrogen and phosphorus was applied at the time of sowing. Treatment-wise pre-emergence herbicide was applied at 2 day after sowing (DAS) by knap-sack sprayer fitted with flat-fan nozzle using water volume of 300 L/ha. Weed and crop samples were collected from each individual plot for studying various crop and weed characters. Weed samples were collected by placing a quadrat (0.5 x 0.5 m) randomly at two places in each plot. The data on density and biomass of total weeds were subjected to square root transformation before statistical analysis to obtain homogeneity of variances. The data on density and biomass of total weeds were taken at 20 and 40 DAS and grain yield (t/ha) was recorded at the time of harvest. The dried samples were ground in willey mill. The powdered material collected was used for chemical analysis of N, P and K content as suggested by Subbiah and Asija (1973) for N, Olsen *et al*. (1954) for P and Jackson (1973) for K. Total N, P and K uptake was calculated for each treatment separately by multiplying per cent content in the tissue with their respective dry matter values and expressed as kg/ha.

Density and biomass of weeds

The crop field was infested with complex weed flora comprising grasses, sedges and broad-leaved weeds. The predominant weeds were the predominant weeds were *Cynodon dactylon* (8.30/m^2), *Dactyloctenium aegyptium* (7.68/m^2), *Digitaria sanguinalis* (7.01/m^2) and *Panicum repens* (6.24/m^2) among the grasses. *Cyperus rotundus* (5.38/m^2) was the dominant sedge. *Amaranthus viridis* (5.03v), *Celosia argentea* (4.86/m^2), *Commelina benghalensis* (4.33/m^2), *Digera arvensis* (3.92/m^2), *Euphorbia hirta* (3.43/m^2) and *Trichodesma indicum* (3.03v) were the major broad-leaved weeds.

The maximum weed density and biomass were recorded under weedy check as compared to all weed management treatments. Pendimethalin (1000 g/ha) 2 DAS *fb* 1 hand weeding at 20 DAS was found to be the most effective with significantly lower weed density and biomass at 20 and 40 DAS than pendimethalin (1000 g/ha) 2 DAS and weedy check (**Table 1**).The better performance of combination of chemical and physical method might be due to synergistic effect between the two methods are reducing the weed population as well as dry matter. Raman and Krishnamurthy (2005) have also reported pre-emergence application of pendimethalin at 0.75 kg/ha+ 1HW at 30 DAS as most effective treatment of weed control.

Weed control efficiency

The weed control efficiency at 20 and 40 DAS was more with 15 march sowing (**Table 1**). The maximum weed control efficiency was recorded under pendimethalin (1000 g/ha) 2 DAS *fb* 1 hand

Table 1. Effect of different sowing dates and weed management treatments on weed density, biomass and weed control efficiency in summer greengram.

Treatment	Weed density (no./ m^2)				Weed biomass (g/m^2)				WCE (%)			
	20 DAS		40 DAS		20 DAS		40 DAS		20 DAS		40 DAS	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Sowing dates												
15 March	7.88 (63.1)	7.80 (61.8)	10.98 (121.6)	10.91 (120.0)	6.06 (37.7)	6.54 (43.8)	13.00 (170.0)	12.69 (162.0)	70.9	65.7	55.7	55.3
25 March	7.97 (64.5)	7.89 (63.2)	11.37 (130.3)	10.99 (121.8)	6.64 (45.1)	6.64 (45.1)	13.01 (170.3)	12.99 (169.7)	65.2	64.7	55.6	53.1
05 April	8.07 (66.1)	8.01 (65.2)	11.69 (137.6)	11.51 (133.5)	6.98 (49.7)	7.01 (49.1)	13.11 (172.9)	13.08 (172.1)	61.6	61.5	54.9	52.5
15 April	8.55 (74.1)	8.40 (71.6)	11.88 (142.1)	11.80 (140.2)	7.99 (64.8)	7.81 (62.0)	13.61 (186.2)	13.66 (187.6)	50.0	51.4	51.4	48.2
LSD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	-	-	-	-
Weed management												
Pendimethalin (1000 g/ha) 2 DAS *fb* 1 HW at 20 DAS	6.11 (38.3)	6.02 (37.2)	8.33 (70.4)	8.11 (66.8)	5.90 (35.8)	5.83 (35.0)	9.11 (84.0)	9.02 (82.4)	72.4	72.6	78.1	77.3
Pendimethalin (1000 g/ha) 2 DAS	8.87 (79.7)	8.71 (76.9)	12.56 (158.7)	12.47 (156.5)	7.99 (64.8)	7.92 (63.7)	13.32 (206.1)	13.24 (176.3)	5.0	50.7	46.3	51.3
Two hand weeding 20 and 40 DAS	3.40 (12.6)	3.36 (12.3)	5.47 (30.9)	5.39 (30.0)	2.70 (8.3)	2.28 (6.2)	6.19 (39.3)	6.11 (38.3)	93.6	95.1	89.7	89.4
Weedy check	12.97 (169.2)	12.81 (165.9)	18.90 (358.2)	18.62 (347.7)	11.34 (129.6)	11.30 (127.7)	19.56 (383.6)	19.01 (362.4)	0	0	0	0
LSD (p=0.05)	2.21	2.20	2.61	2.58	2.06	2.05	2.91	2.90	-	-	-	-

*Data subjected to square root ($\sqrt{x+1}$) transformation and figures in parentheses are original value, DAS - Days after sowing; *fb*-followed by, WCE- Weed coefficient efficiency; NS- Non significant; HW=Hand weeding

weeding at 20 DAS and two hand weeding 20 and 40 DAS during both years of experimentation. These above are in accordance with those of Chand *et al.* (2003) and Gangwar *et al.* (2013).

Effect on crop

The maximum plant height, pods/plant, seeds/ pod and seed index were recorded with sowing of greengram on 15th March **(Table 2)** and was found at par with sowing of greengram on 25th March during both year of experimentation. Pendimethalin (1000 g/ ha) 2 DAS *fb* 1 hand weeding at 20 DAS gave significantly higher plant height, pods/plant, seeds/ pod and seed index over weedy check, and was found at par with two hand weeding at 20 and 40 DAS during both years of experimentation. The higher yield was obtained in timely sowing, due to owing favorable temperature and humidity during their growth period and nodulation formation stage resulting in better growth. Both the years' data indicated significant decrease in seed yield of summer greengram with the delay in sowing period. The maximum seed yield was recorded under sowing of greengram on 15th March and was found at par with sowing of greengram on 25th March. The application of pendimethalin (1000 g/ha) 2 DAS *fb* 1 hand weeding at 20 DAS gave significantly higher seed yield and was found at par with two hand weeding 20 and 40 DAS. This was in agreement with Malik *et al.* (2000), Chhodavadia *et al.* (2013).

Economics

The net returns and B:C ratio were the highest with the sowing of greengram on 15th March than sowing of greengram on 5th and 15th April. It was at par with sowing of greengram on 25th March **(Table 3)**. The application of pendimethalin (1000 g/ ha) 2 DAS *fb* 1 hand weeding at 20 DAS gave significantly higher net return and B: C ratio over weedy check and it was on par with two hands weeding 20 and 20 DAS. These observations are in accordance with those of others (Srinivasan *et al.* 1992, Chand *et al.* 2003 and Gangwar *et al.* 2013).

Table 2. Effect of different sowing dates and weed management treatments on yield of summer greengram

Treatment	Yield attribute								Seed yield (kg/ha)	
	Plant height (cm)		Pods/plant		Seeds/ pod		100-seed weight (g)			
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Sowing date										
15 March	49.10	51.70	12.17	12.21	9.91	10.04	3.98	4.01	1251	1290
25 March	46.15	48.07	11.36	11.43	9.33	9.69	3.96	4.00	1156	1199
05 April	40.02	42.10	9.04	9.18	6.85	7.09	3.77	3.80	918	962
15 April	35.61	37.95	7.99	8.07	6.55	6.74	3.68	3.72	801	841
LSD (p=0.05)	5.08	5.43	2.38	2.42	1.81	1.77	0.13	0.15	149	155
Weed management										
Pendimethalin (1.0 kg/ha) 2 DAS *fb* 1 HW at 20 DAS	44.80	44.97	11.72	11.84	9.99	10.03	4.02	4.04	953	966
Pendimethalin (1.0 kg/ha) 2 DAS	40.49	40.54	9.46	9.68	9.03	9.04	3.89	3.90	821	829
Two hand weeding 20 and 40 DAS	47.41	47.60	12.25	12.63	10.76	10.81	4.07	4.08	1018	1044
Weedy check	33.45	34.04	6.04	06.14	5.17	5.42	3.15	3.16	637	652
LSD (p=0.05)	4.30	4.31	1.90	2.05	0.81	0.86	0.11	0.12	131	134

Table 3. Effect of different sowing dates and weed management treatments on economics and nutrient uptake of summer greengram

Treatment	Economics				Nutrient uptake (kg/ha)					
	Net return (x10^3 `/ha)		B:C ratio		Nitrogen		Phosphorus		Potassium	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Sowing date										
15 March	31.22	33.74	1.76	1.94	40.01	40.72	6.81	6.95	42.83	43.73
25 March	27.72	29.77	1.59	1.78	33.97	34.89	6.09	6.11	38.51	39.33
05 April	20.65	23.31	1.12	1.29	30.46	31.04	5.27	5.37	31.79	32.38
15 April	13.59	15.83	0.86	0.98	24.02	24.92	4.51	4.61	26.77	27.31
LSD (p=0.05)	5.48	5.73	0.28	0.35	2.98	3.01	0.69	0.72	3.57	3.66
Weed management										
Pendimethalin (1.0 kg/ha) 2 DAS *fb* 1 HW at 20 DAS	20.53	23.98	1.21	1.38	35.10	35.18	5.61	5.65	37.64	37.92
Pendimethalin (1.0 kg/ha) 2 DAS	19.65	22.77	1.10	1.20	32.03	32.08	4.76	4.87	32.35	32.82
Two hands weeding 20 and 40 DAS	21.03	23.63	1.03	1.11	39.12	39.44	6.96	7.00	44.22	42.99
Weedy check	12.34	12.90	0.75	0.72	15.02	15.13	2.42	2.45	16.38	16.72
LSD (p=0.05)	5.02	5.12	0.34	0.36	4.00	4.05	0.91	0.93	5.19	5.24

DAS = Days after seeding; *fb* = followed by; HW = Hand weeding

Nutrient uptake

Nutrient (N, P and K) uptake was more in 15th March sowing and was significantly superior than sowing on 25th March, 5th April and 15th April **(Table 3)**.The application of pendimethalin (1000 g/ha) 2 DAS *fb* 1 hand weeding at 20 DAS recorded the highest nutrient uptake N, P and K and was at par with of pendimethalin (1000 g/ha) 2 DAS during both the years of experimentation. The results are in accordance with finding of Choudhary *et al.* (2012) in blackgram. Kaur *et al*. (2010) reported the maximum amount of N uptake with hoeing and weeding twice, the P uptake with two hoeings by wheel toe and K uptake with pendimethalin 0.75 kg/ ha.

It may be concluded that, the sowing of greengram from 15th March resulted significantly higher seed yield and monetary return. Application of pendimethalin (1000 g/ha) 2 DAS *fb* 1 hand weeding at 20 DAS was found effective in managing weeds in summer greengram.

REFERENCES

Chand R, Singh NP and Singh VK. 2003. Effect of weed management practices on productivity of late planted urdbean during *Kharif* season. *Indian Journal of Pulses Research* **16**(2): 163–164.

Chhodavadia SK, Mathukiya RK and Dobariya VK. 2013. Pre and post-emergence herbicides for integrated weed management in summer greengram. *Indian Journal of Weed Science* **45**(2): 137–139.

Choudhary VK, Kumar PS and Bhagawati R. 2102. Integrated weed management in blackgram (*Vignamumgo*) under midhills of Arunachal Pradesh. *Indian Journal of Agronomy* **57**: 382–385.

Dungarwal HS, Chaplot PC and Nagda BL. 2003. Chemical weed control in mungbean (*Plaseolusradiatus*L.). *Indian Journal of Weed Science* **35**: 283–284.

Gangwar A, Jadhav TA and Sarvade S. 2013. Productivity, nutrient removal and quality of urdbean varieties planted on different dates. *Bioinfolet* **10**(1A): 139–142.

Jackson ML. 1958. *Soil Chemical Analysis*. Prentice Hall Engleword Cliffs NJ 151-157.

Kaur G, Brar HS and Singh G. 2010. Effect of weed management on weeds, nutrient uptake, nodulation, growth and yield of summer mungbean (*Vignaradiata*). *Indian Journal of Weed Science* **42**(1&2): 114–119.

Lawn RJ. 1995. The Asiatic Vignaspecies.Vigna spp. (V. radiata, V. mungo, V. angularis, V. umbellata and V. acontifolia) (Leguminosae-Papilionoideae). pp. 321–326. In: *Evolution of Crop Plants*, (Eds. Smartt J, Simmonds NW), 2nd edn. Longman, London.

Malik RS, Yadav A and Malik RK. 2000. Efficacy of trifluralin, linuron and acetachlor against weeds in mungbean (*Vigna radiata* L.). *Indian Journal of Weed Science* **32**: 181–185.

Olsen, SR, Cole CV, Watanabe FS and Dean LA. 1954. Estimation of available phosphorus in soil by extraction with sodium biocarbonate. US Department *Agronomy Circular* **939**: 19-23.

Raman R and Krishnamoorthy R. 2005. Nodulation and yield of mungbean (*Vignaradiata* L.) influenced by integrated weed management practices. *Legume Research* **28**(2): 128–30.

Rathore SS, Dshora LN and Kaushik MK. 2010. Effect of sowing time and fertilization on productivity and economic of urdbean genotypes. *Food Legumes* **23**: 154–155.

Shuaib OSB. 2001. Critical period for weed competition in greengram. University of Aden. *Journal of Natural and Applied Science* **5**: 11–18.

Singh HB, Joshi S and Thomas TA. 1970. *Pulse Crops of India*. ICAR Publication, New Delhi.

Subbiah BW and Asija GL. 1973. A rapid procedure for estimation of available nitrogen in soil. *Current Science* **25**(8): 259-260.