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Effect of different date of sowing and weed management on nutrient uptake and economics of summer moong varieties

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Abstract
A field experiment was conducted during summer 2015-16 at Agronomy Main Research Farm, Odisha University of Agriculture and Technology, Bhubaneswar to find out the effect of date of showing and weed management on nutrient uptake and economics of green gram (*Vigna radiata L.)* of 2 varieties viz (V1- Summer Moong Ludhiana-668, V2-Nayagarh local). From the experiment it was revealed that in all cases the SML-668 variety was superior to the Local variety i.e. Nayagarh Local. Sowing the crop on 31 January resulted higher yield (568 and 2139 kg/ha seed and haulm yield respectively) as well as higher nutrient uptake (39.68, 6.88 and 43.27 kg/ha N, P and K respectively) as compared to early and late date of sowing. The weed management study also found out to be in favour of application of pendimethalin 1.0kg/ha as pre-emergence(PE) enhancing the yield (582 and 2159 kg/ha seed and haulm yield respectively) along with nutrient uptake of (38.81, 6.91 and 42.47 kg/ha N, P and K respectively).All the 3-treatment discussed above recorded highest benefit cost ratio i.e. nearly 2.0 (2.21 when sowing on 31 January, 2.24 on application of pendimethalin and 1.95 with the variety SML-668) as compared to other treatments in the experiment.

Keywords: Green gram, Split split plot design**,** Pre-emergence (PE), Benefit cost ratio (B: C), Nutrient uptake

Introduction
India stands first in production and consumption of pulses. They are the main source of dietary protein for vegetarian population and contains high amount of vitamins and minerals. A legume crop plays a vital role as they provide food, feed and also maintains the soil environment by biological nitrogen fixation. Green gram like other legume crops enrich the soil nutrient status as it possesses root nodules which contain nitrogen fixing bacteria. Green gram is grown mainly as a *Kharif* season crop, though in certain states it is grown in summer and *Rabi* seasons mainly as a second crop after paddy (Singh *et al*., 1970). Pandya (1973) opined that green gram can be grown successfully during spring as well as summer under irrigated conditions.

Sowing time is one of the most important non-monetary agronomic factors for realizing the yield potential of improved varieties as its helps in achieving complete harmony between vegetative and reproductive stages of the crop. Sowing of the crop at optimum time therefore, play a key role in obtaining the high seed yields (Rathore *et al*., 2010). So, to get a good crop yield, the sowing should be in optimum time.

Infestation of weeds causes a great loss in yield of green gram in summer season. The loss of mungbean yield due to weeds ranges from 65.4% to 79.0% (Shuaib 2001; Dungarwal *et al.* 2003). Weed management at early stages of crop growth is essential on emerging weeds in pulses begins simultaneously with the crop, leading to severe competition between the crop and weeds (Kandasamy, 2000). (Sheoran *et al.*, 2008) reported that the weed infestation if not checked within 20 DAS there would be a severe yield reduction to an extent of 38 per cent in contrast to 20 per cent yield reduction with unchecked weed infestation till 20 DAS in green gram.

As varieties may differ in respect of growth and maturity, thereby influencing the seed yield, optimum time of sowing may also vary with different varieties of mungbean (Singh and Sekhon, 2007). For any yield improvement programme selection of superior parents is a prerequisite i.e., possessing better heritability and genetic advance for various traits (Ahmad *et al*., 2008).

The present investigation was therefore, undertaken to identify the optimum sowing time, better weed management practice and suitable variety of summer mungbean.

Materials and methods

The field experiment was carried out in the Agronomy Main Research Farm of the Orissa University of Agriculture and Technology, Bhubaneswar during summer 2015-16. The soil of the experimental site was sandy loam and slightly acidic in reaction, low in available N (106.6 Kg per ha) and high in available P (60.28 Kg per ha) and low in available K (57.12 Kg per ha). Experiment was laid out in split split plot design (3 x 4 x 2) and replicated thrice. Among the 3 treatments *viz* dates of sowing, weed management and varieties, 3 dates of sowing viz (D1-16 January, D2-31 January, D3-15 February); 4 weed management practices (W1- Pendimethalin 1.0 kg/ha as pre-emergence (PE), W2- Quizalofop-p- ethyl 50g/ha as post emergence(POE), W3-Hoeing and weeding, W4-Weedy check) and 2 varieties viz (V1- SML 668, V2-Nayagarh local). The recommended dose of fertilizer @ 20:40:20 NPK Kg/ ha was applied as basal application. The weed control treatments were imposed as per the schedule. The crop was irrigated at critical stages. Need based plant protection measures were taken. During harvesting randomly ten plants were taken for oven drying and were subjected to destructive analysis of major nutrients following standard procedure. The yields from the net plots were taken into account for yield estimation. The economics for the production of green gram under different treatment combinations were worked out on hectare basis by considering the cost of various inputs at the prevailing market rates and the interest on capital. Net profit for each treatment was calculated by deducting the total cost of cultivation from the gross value of produce (seed + haulm). The benefit cost ratio (B: C) was worked out by dividing the gross return by the total cost of cultivation.

Results and Discussions

Grain Yield

Grain yield was significantly influenced by date of sowing, weed management and variety (Table 1). Sowing on 31 January gave the highest grain yield of 568 kg/ha among three dates of sowing which was significantly higher than sowing on February 15 and sowing on 16 January gave significantly less grain yield than 15 February sowing. Superiority of sowing on 12 March over 20 February and 1 April by Kumar *et al*. (2008) at Kurukshetra (Haryana), 2 March over 20 February and 12 March by Miah *et al*. (2009) at Mymensingh, Bangladesh shows that optimum sowing time differs from place to place and it has significant impact on crop yield.

Pre–emergence application of pendimethalin gave the highest grain yield of 582 kg/ha which was significantly higher than post emergence application of quizalofop-p-ethyl and hoeing and weeding. Weedy check recorded the minimum grain yield. Kundu *et al*. (2009) reported efficacy of quizalofop-p-ethyl in controlling weeds and giving higher gram yield at Nadia (West Bengal). Choudhary *et al*. (2016) reported that maximum pods/plant with weed free check followed by pendimethalin 1 kg/ha as PE and quizalofop-p-ethyl 0.075 kg/ha as POE at Navsari, Gujurat.

Between varieties, SML 668 gave higher grain yield of 502 kg/ha and Nayagarh local recorded significantly less grain yield

Table 1: Effect of date of sowing, weed management, variety on seed yield, haulm yield

Treatments	Grain yield(kg/ha)	Haulm yield (kg/ha)	Harvest index (%)
Date of sowing			
D_1- 16 January	344	1288	21.24
D_2-31 January	568	2139	21.93
D_3-15 February	440	1664	21.21
SEm±	19	46.1	0.03
CD(P=0.05)	76	180.9	NS
Weed management			
W_1-Pendimethalin	582	2159	21.32
W_2-Quizalofop-p-ethyl	498	1953	20.55
W_3-Hoeing and weeding	491	1873	20.84
W_4-Weedy check	232	803	23.37
SEm±	27	63.4	0.08
CD(P=0.05)	79	188.4	NS
Variety			
V_1-Summer moong Ludhiana 668	502	1864	21.5
V_2-Nayagarh local	399	1530	21.5
SEm±	17	54.2	0.11
CD(P=0.05)	49	158.3	NS

Haulm Yield

Among dates of sowing, sowing on 31 January recorded the maximum haulm yield of 2139 kg/ha. Sowing on 15 February and 15 January recorded significantly less haulm yield than sowing on 31 January. Among weed management practices, pendimethalin 1.0 kg/ha recorded the maximum haulm yield of 2159 kg/ha. Both quizalofop-p-ethyl and hoeing and weeding were at par, but both recorded significantly less Stover yield. Weedy check proved the least efficient with the maximum value of haulm yield. Between SML 668 and Nayagarh, local SML 668 recorded significantly higher haulm yield than Nayagarh local. The former recorded 21.83% higher haulm yield than the latter. (Table 1)

Harvest index

The harvest index did not vary between the treatments significantly (Table 1). There were only numerical differences (20.55- 23.37%.) in harvest due to the various date of sowing, weed management treatments and varieties.

Nutrient uptake

The data on nutrient uptake showed significant difference (Table 2). Nutrient uptake of 39.68, 6.88, 43.27 kg/ha N, P and K was seen in sowing on 31 January which was significantly higher than sowing on 16 January and 15 February.

Table 2: Effect of date of sowing, weed management, variety on nitrogen, phosphorus and potassium uptake

Treatments	Nitrogen uptake (kg ha^{-1})	Phosphorus uptake (kg ha^{-1})	Potash uptake (kg ha^{-1})
Date of sowing			
D_1- 16 January	24.57	4.53	27.00
D_2-31 January	39.68	6.88	43.27
D_3- 15 February	31.00	5.30	32.07
SEm±	1.01	0.24	1.20
CD(P=0.05)	3.98	0.95	4.72
Weed management			
W_1-Pendimethalin	38.81	6.91	42.47
W_2-Quizalofop-p-ethyl	37.00	6.30	38.35
W_3-Hoeing and weeding	35.44	6.66	39.07
W_4-Weedy check	15.74	2.42	16.56
SEm±	1.46	0.33	2.07
CD(P=0.05)	3.34	0.99	6.16
Variety			
V_1-Summer moong Ludhiana 668	34.86	6.64	37.01
V_2-Nayagarh local	28.63	4.50	31.21
SEm±	1.01	0.27	1.84
CD(P=0.05)	2.95	0.79	5.37

Among weed management practices application of pendimethalin as pre-emergence(PE) recorded highest nutrient uptake of 38.81, 6.91, 42.47 kg/ha N, P and K but it was at par with the nutrient uptake of quizalofop-p-ethyl and hoeing and weeding. Kaur *et al.* (2010) reported the maximum amount of N uptake by the crop in case of hoeing and weeding twice, the maximum P uptake in case of two hoeings by wheel toe and the maximum K uptake in case of pendimethalin 0.75 kg/ha. Least nutrient uptake was observed in weedy check plot. Similar result was obtained by Choudhary *et al* (2012) in black gram. Among the varieties nutrient uptake of 34.86, 6.64, 37.01 kg/ha N, P and K by SML 668 was found to be significantly higher than the local variety. The superior performance of 31 January sowing, application of pendimethalin and the variety SML 668 may be attributed to the fact that because of the good plant growth and higher grain and haulm yield of the treatments.

Economics

Among economic indices (Table 3), gross return, net return and return/ rupee investment were significantly influenced by date of sowing, weed management and variety.

Table 3: Effect of date of sowing, weed management and variety on economics of green gram

Treatments	Cost of cultivation	Gross return (Rs.)	Net return(Rs.)	Return/rupees investment
Date of sowing				
D_1- 16 January	13463	18567	5104	1.35
D_2-31 January	13679	30688	17008	2.21
D_3- 15 February	13571	23797	10226	1.72
SEm±		976	944	0.06
CD (P=0.05)		3830	3705	0.24
Weed management				
W_1-Pendimethalin	14000	31375	17374	2.24
W_2-Quizalofop-p-ethyl	13850	27056	13206	1.94
W_3-Hoeing and weeding	14283	26598	12315	1.85
W_4-Weedy check	12150	12373	223	1.02
SEm±		1339	1319	0.09
CD (P=0.05)		3977	3917	0.27
Variety				
V_1-Summer moong Ludhiana 668	13618	27081	13463	1.95
V_2-Nayagarh local	13524	21620	8096	1.57
SEm±		844	824	0.06
CD (P=0.05)		2464	2403	0.17

Cost of Cultivation

Cost of cultivation due to date of sowing and variety did not differ much. Major variation was seen in cost of cultivation due to weed management. The cost of cultivation varied from the minimum of Rs.12150.00 in weedy check to the maximum of Rs. 14283.00 in hoeing and weeding.

Gross return

Gross return was computed by multiplying grain and haulm yield with price of produce. Sowing green gram on 31 January recorded the maximum gross return of Rs. 30688.00 per ha as compared to on 15 February and 16 January where gross return decreased by 39.4% and 22.4% respectively.

Among weed management practices, pendimethalin 1.0 kg/ha recorded the maximum gross return of Rs. 31375.00. Quizalofop-p-ethyl, hoeing and weeding and weedy check proved significantly inferior to pendimethalin with reduced gross return by 13.7, 15.2 and 60.5% respectively.

The variety SML 668 proved significantly superior to Nayagarh local and recorded higher gross return than later.

Net return

Within the treatments of sowing, 31 January proved the best with net return of Rs. 17008.00 per ha. Sowing on 15

February gave significantly less net return than 31 January sowing but higher than 15 February sowing. This was due to reduction in yield in both delayed sowing and early sowing.

Weed management practice i.e. pendimethalin (PE) 1.0 kg/ha proved to be most remunerative with return of Rs. 17374.00 per ha. Both quizalofop-p-ethyl and hoeing and weeding were at par with each other. Quizalofop-p-ethyl, hoeing and weeding and weedy check decreased net return by 23.9 and 29.1, 98.7% respectively compared to pendimethalin 1.0 kg/ha.

Between cultivars, SML 668 proved more remunerative with net return of Rs.13463.00 per ha as compared to Nayagarh local as grain yield decreased by 39.8% in later.

Return/ rupee investment

Among date of sowing 31 January sowing recorded the maximum return/rupee investment of 2.21 followed by 15 February (1.72) and 16 January (1.35).

Among weed management, pendimethalin recorded the maximum return/ rupee investment of 2.24 due to higher yield and lower cost of cultivation compared to quizalofop-p-ethyl and hoeing and weeding. Both quizalofop-p-ethyl and hoeing and weeding proved significantly inferior to pendimethalin and both were at par. Weedy check recorded the minimum value of 1.02.

As per varietal comparison, SML 668 recorded the maximum return/rupee investment of 1.95 higher than Nayagarh local (1.57).

The cv. 'SML 668' recorded significantly higher gross return, net return and return/ rupee investment than cv. 'Nayagarh local'. Although the cost of cultivation for 'SML 668' was marginally higher than 'Nayagarh local' but the gross return, net return and return/rupee investment was higher in this variety due to higher yield potentiality than the latter.

In can be inferred that the maximum total N, P, K uptake was recorded with 31 January sowing and application of pendimethalin 1.0kg/ha. Among varieties, 'SML 668' accumulated the maximum total uptake of N, P, K. Sowing on 31 January earned the maximum monetary return and return/ rupee investment of 2.21 and application of pendimethalin recorded return/ rupee investment of 2.24 among weed management practices. Between varieties, 'SML 668' earned higher net monetary return and return /rupee investment than 'Nayagarh local'.

Reference

1. Singh HB, Joshi S, Thomas TA. Pulse crops of India. ICAR Publication, New Delhi, 1970.
2. Pandya BP. Moong varieties for summer. Indian Farmers Digest. 1973; 6(12):44-47.
3. Rathore SS, Dshora LN, Kaushik MK. Effect of sowing time and fertilization on productivity and economic of urdbean genotypes. Food Legumes. 2010; 23:154-155.
4. Shuaib OSB. Critical period for weed competition in green gram. University of Aden Journal of Natural and Applied Science. 2001; 5:11-18.
5. Dungarwal HS, Chaplot PC, Nagda BL. Chemical weed control in mungbean (*Plaseolus radiatus* L.). Indian Journal of Weed Science. 2003; 35:283-84.
6. Kandasamy OS. Cost effective weed management strategies in pulse production. Proc. Of CASon Recent Advances in pulse Production Technology, TNAU, Coimbatore, 2000, 116-119.
7. Sheoran P, Singh S, Sardana V, Bawa SS. Studies on critical period of crop-weed competition in greengram in kandi region of Punjab. Indian Journal of Dryland Agricultural Research and Development. 2008; 23(1):19-22.
8. Singh G, Sekhon HS. Effect of sowing date on growth and yield of mungbean varieties during *kharif* season. Journal of Food Legumes. 2007; 20(1):59-61.
9. Ahmad MSA, Hossain M, Ijaz S, Alvi AK. Photosynthetic performance of two mungbean (*Vigna radiata*) cultivars under lead and copper stress. International Journal of Agriculture and Biology, 2008*;* 10:167-172.
10. Kumar A. Abstracts; 61(9):11-42.
11. Singh NP, Singh VK, Rana NS, Singh A. Effect of planting dates on yield and nutrient uptake by mungbean (*Vigna radiata*(L.)Wilezek) and urdbean (*Vigna mungo* L. Hepper) varieties during spring season, Field Crop, 2008.
12. Miah KA, Anwar P, Begum M, Juraimi SA, Islam A. Influence of sowing date on growth and yield of summer mungbean varieties, Journal of Agricultural And Social Science. 2009; 5(3):73-76.
13. Kundu R, Bera PS, Brahmachari K. Effect of different weed management practices in summer mungbean [*Vigna radiata* L.] under new alluvial zone of West Bengal, Journal of Crop and Weed. 2009; 5(2):117-121.
14. Chaudhari VD, Desai LJ, Chaudhari SN, Chaudhari PR. Effects of weed management on weeds, growth and yields of summer green gram [Vigna radiata L.], The bioscan. 2016; 11(1):531-534.
15. Kaur G, Brar HS, Singh G. Effect of weed management on weeds, nutrient uptake, nodulation, growth and yield of summer mungbean (*Vigna radiata*), Indian Journal of Weed Science 2010; 42(1, 2):114-119.
16. Choudhary VK, Kumar PS, Bhagawati R. Integrated weed management in blackgram (*Vigna mumgo*) under midhills of Arunachal Pradesh. Ind Journal of Agronomy. 2012; 57:382-385.