Short Communication
Range Mgmt. & Agroforestry 39 (1) : 130-133, 2018
ISSN 0971-2070

Productivity and quality of rice bean [*Vigna umbellate* (Thumb)] fodder as influenced by sowing date and spacing

R. Joseph Koireng*, N. Rakesh Singh and Kh. Priya devi
Central Agricultural University, Imphal - 795004, India
*Corresponding author e-mail: josephkoireng@rediffmail.com
Received: 30th September, 2017 Accepted: 31st March, 2018

Abstract
To study the performance of fodder rice bean as influenced by dates of sowing and spacing, the field trial was conducted during *kharif* season of 2012, 2013 and 2014, based on a factorial randomized block design with three replications, under rainfed condition at experimental research farm, Andro, Central Agricultural University, Imphal. The treatments comprised combination of three dates of sowing (26th May, 4th June and 14th June) three-row spacing (25 cm, 35cm and 45 cm). Significantly higher green fodder yield and plant height (302.6 q/ha and 163.9 cm, respectively) were recorded in rice bean sown in 26th May as compared to 4th June and 14th June sowing. Higher quality and growth parameters at harvest *viz*., crude protein content (11.67%), crude protein yield (7.51q/ha) and dry matter yield (64.2 q/ha) were also recorded in 26th May sowing but found insignificant. Significantly higher growth and yield attributes (green fodder yield of 251.4 q/ha) were recorded in row spacing of 35 cm. The proximate qualities of fodder rice bean were not influenced significantly by the row spacing. May 26th sowing with 35 cm row spacing had higher green fodder yield (323.5 q /ha) and showed significantly higher interaction in fodder rice bean.

Keywords: Fodder yield, Growth parameters, Quality parameters; Rice bean

India is a house to 15% of world cattle population and 16% of human population, those needs to be sustained and progressed on 2% of world geographical areas. Throughout the last decade, the dairy industry in the country has experienced impressive growth and now India is the largest producer of milk. But the estimated green fodder and dry fodder availability are 664.73 and 355.93 million tonnes, respectively (Anonymous, 2017), which are much lower than the requirements. Owing to this feed/fodder shortages which lean to be even more severe during natural calamities, efforts to boost livestock productivity also suffers. In view of the priority for food grains, oilseeds and pulses, there is a little scope for increasing the area under fodder cultivation. Therefore, augment in the productivity of available forage resources per unit of land area and time was necessitated. Rice bean [*Vigna umbellate* (Thumb)] is a multipurpose legume, sometimes considered as neglected and underutilised. It is a locally important contributor to human nutrition in parts of India and Southeast Asia (Joshi *et al*., 2008). In different countries, it is esteemed for its varied uses as food, green manure, nitrogen fixing crop (through root nodules) etc. As a forage crop, it is drought/shade tolerant, quick growing, high yielding with substantially quality rich biomass production, grows well with associated crops. For fodder production, it is mainly grown as mixed/ inter crop with cereals. Nevertheless, in forage legumes, quality seed production and its availability are lacking. Rice bean in North East part of India, especially in Manipur, is one of the important *kharif* forage legumes. However, the cultivation package accessible for its better production (green fodder) is nearly lacking. Keeping this locale in view, the present study was conducted to determine the optimum time/ date of sowing and spacing for higher quality green fodder production in rice bean.

The field experiment was conducted at experimental research farm, Andro, Central Agricultural University, Imphal, Manipur under rainfed conditions during *kharif* season of 2012, 2013 and 2014 based on a factorial randomized block design with three replications. The soil at experimental site was clayey in texture (80.3%) and medium in organic carbon (0.75%), nitrogen (285.38 kg/ ha), phosphorous (20.67 kg/ha) and potassium (188.16 kg/ha) contents. The soil was also acidic in reaction. Nine treatment combinations consisting of three dates of sowing (D_1: 26th May, D_2: 4th June and D_3: 14th June) and three-row spacing (S_1: 25 cm, S_2: 35cm and S_3: 45 cm) were undertaken. With profuse branching, broad leaves and leafier, plant grows to a height of 163.94 cm.

Plants were also bushy and compact. With maturity range of 110 days from seed to 50% flowering, it was considered under category of medium maturity group. The data obtained by various observations were subjected to Fisher's method of analysis of variance following Gomez and Gomez (1984).

Time of sowing significantly influenced growth and yield of fodder rice bean, and delayed sowing reduced the yield of green fodder and plant height. Compared to 4th June and 14th June sowing, 26th May sowing produced significantly higher green fodder yield (302.63 q /ha). Even sowing on 4th June had significant higher fodder yield over 14th June. Sowing on 26th May produced 36 and 70% higher green fodder yield compared to 4th June and 14th June sowing, respectively. The plant height was also significantly higher on 26th May sowing (163.94 cm). Similarly 4th June sowing had significant higher plant height over 14th June. Ravinder and Singh (1998) in mungbean, Yadav (2003) in cowpea, Sharma (2007) in barley and Sharma *et al* (2017) in oat, also observed similar results of higher yield in early sowing compared to late sowing. Mainly due to significant improvement in growth attributes, there was increase in green fodder yield with early sowing compared to late sowing of 4th and 14th June. Higher quality attributes at harvest *viz*., dry matter accumulation (64.22 q/ha), crude protein yield (7.51 q/ha) and crude protein content (11.67%) were also recorded in 26th May sowing but found insignificant (Table 1 & 2). These findings were in agreement with the earlier findings of Sreelatha *et al*. (1997) in french bean.

Compared to wider row spacing of 45 cm, the closer row spacing of 35 cm produced significantly higher green (251.40 q/ha) and dry fodder (51.35 q/ha) yields, which was 18 and 8% higher compared to 45 and 25 cm row spacing, respectively (Table 1). This was due to significantly higher performance of all the growth and yield attributes and these findings were in conformity with the earlier findings in field bean (Mc Ewen, 1973), french bean (Dwivedi *et al*., 1994; Singh and Tripathi, 1994) and cowpea (Angne *et al*., 1993; Arora *et al*., 1971; Yadav, 2003). Significantly higher plant height (137.95 cm, Table 2) was recorded in 25 cm row spacing. Katung (2003) also reported that plant height was increased with increasing plant population. Decrease in inter-row spacing increased plant density, which probably increased competition for crop growth resources. These findings were in conformity with the results of Arora *et al*. (1971) for plant height in cowpea and Mc Ewen (1973) in field bean. However, row spacing did not significantly

Table 1. Effect of sowing date and spacing on productivity and quality of fodder rice bean

Treatment	Sub-class	Green fodder yield (q/ha)				Dry matter yield (q/ha)				Crude protein yield (q/ha)			
		2012	2013	2014	Pooled	2012	2013	2014	Pooled	2012	2013	2014	Pooled
Sowing date	26th May	279.78	312.74	315.37	302.63	56.40	63.77	71.15	64.22	6.71	7.21	8.62	7.51
	4th June	243.00	201.21	225.89	223.37	49.64	42.77	48.79	47.06	5.56	5.16	5.44	5.39
	14th June	187.78	170.04	117.04	178.29	40.89	32.56	34.66	36.04	4.55	3.46	3.92	3.98
SEm±		7.57	3.19	2.38	2.38	2.60	2.26	1.10	1.05	0.26	0.84	0.29	0.30
CD at 5%		22.69	9.58	7.13	7.12	NS	6.79	3.30	NS	0.77	2.53	NS	NS
Spacing (cm)	25	235.67	233.06	248.59	239.11	41.78	50.04	52.98	48.27	4.89	4.92	6.48	5.43
	35	283.45	230.59	240.15	251.40	55.00	45.11	52.61	51.35	6.23	5.76	6.02	6.00
	45	191.44	220.33	229.55	213.78	50.15	43.95	49.00	47.70	5.70	5.16	5.48	5.45
SEm±		7.57	3.19	2.38	2.38	2.60	2.26	1.10	1.05	0.26	0.84	0.29	0.30
CD at 5%		22.69	9.58	7.13	7.12	7.80	6.79	3.30	3.14	0.77	2.53	0.86	0.90
Interaction: DxS													
SEm±		13.11	5.53	4.12	4.11	4.51	3.65	1.91	1.81	0.45	1.46	0.49	0.52
CD at 5%		NS	16.59	12.35	12.33	13.52	NS	5.72	NS	1.33	NS	NS	NS

Table 2. Effect of sowing date and spacing on growth and quality of fodder rice bean

Treatment	Sub-class	Plant height (cm)			Crude protein (%)				Leaf stem ratio			
		2012	2013	2014	Pooled	2012	2013	2014	Pooled	2012	2013	2014	Pooled
Sowing date	26th May	143.78	185.11	162.93	163.94	11.90	11.05	12..05	11.67	0.56	0.48	0.71	0.59
	4th June	82.00	128.49	119.96	110.15	11.27	11.84	11.15	11.42	0.60	0.70	0.92	0.74
	14th June	61.78	115.49	112.74	96.67	11.17	10.75	11.32	11.08	0.75	0.70	0.84	0.77
SEm±		5.45	1.31	2.19	1.61	0.31	1.56	0.40	0.57	0.04	0.05	0.03	0.03
CD at 5%		16.33	3.92	6.57	4.84	NS	NS	NS	NS	0.12	0.15	0.09	0.08
Spacing (cm)	25	113.11	156.31	144.44	137.95	11.71	10.05	12.00	11.25	0.66	0.55	0.74	0.65
	35	99.22	137.89	130.00	122.37	11.40	12.23	11.39	11.68	0.65	0.69	0.94	0.76
	45	75.22	134.89	121.18	110.43	11.22	11.36	11.14	11.24	0.61	0.64	0.80	0.68
SEm±		5.45	1.31	2.19	1.61	0.31	1.56	0.40	0.57	0.04	0.05	0.03	0.03
CD at 5%		16.33	3.92	6.57	4.84	NS	NS	NS	NS	NS	0.15	0.09	0.08
Interaction: DxS													
SEm±		9.43	2.27	3.79	2.79	0.53	2.71	0.69	0.98	0.07	0.09	0.05	0.04
CD at 5%		28.28	6.79	11.37	8.38	NS	NS	NS	NS	NS	NS	NS	NS

influence the content and yield of quality parameters like crude protein content and crude protein yield, which ranged from 11.24 to 11.68% and 5.43 to 6 q/ha, respectively.

There were significant interactions of inter-row spacing and plant density on fodder rice bean agronomic parameters. Pool data showed that green fodder yield was significantly higher, when rice bean was sown on 26th May with an inter row spacing of 35cm (Table 3). The lowest values were observed when rice bean was sown on 14th June with an inter row spacing of 45cm, respectively. Early sown crop showed better growth habits and yields, so highest green fodder yield was obtained when crop was sown on 26th May with a closer spacing of 35 cm.

Mean of three years data indicated that when rice bean was sown on 26th May recorded higher net monetary return of Rs. 30002/ha. Amongst the spacing, 35 cm recorded higher net monetary return (22317 Rs/ha, Table 3). The higher net monetary return was probably due to higher green forage yields. This was in conformity with the earlier findings in fodder oat (Shekara and Lohithaswa, 2012).

It was concluded that 26th May sowing with an inter row spacing of 35 cm had significantly higher green fodder yield (323.51 q/ ha) with maximum net profit (Rs. 30002/ ha) over rest of treatments. It is therefore, recommended that sowing may be done on 26th May with spacing of 35 cm for better green fodder yield during *kharif* season at Imphal and other NEH regions of India.

References

Angne, M.N., R.A. Patil, U.V. Mahadkar and S.A. Khanvilkar. 1993. Response of cowpea to nitrogen, phosphorus and stand geometry. *Journal of Maharashtra Agricultural Universities* 18: 121-122.

Anonymous. 2017. Agri min. http://indiatoday.intoday.in/story/govt-to-bring-national-fodder-policy-agri-min/1/527943.html. (accessed on March 13, 2017).

Arora, N.D., B.S. Malik and G.P. Lodhi. 1971. Studies on the effect of row spacing and seed rate on the grain yield of cowpea (*Vigna sinensis* L.). *Haryana Agricultural University Journal of Research* 3: 28.

Table 3. Effect of sowing date and spacing on growth and quality of fodder rice bean

Treatment	Pooled green fodder yield (q/ha)				Pooled net return (Rs./ha)			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean
D_1	303.45	323.51	280.93	302.63	30125	33133	26748	30002
D_2	232.29	246.72	191.09	223.37	19451	21615	13271	18112
D_3	181.59	183.97	169.31	178.29	11845	12203	10003	11350
Mean	239.11	251.40	213.78		20474	22317	16674	
	Date of sowing	**Spacing**	**Date of sowing x spacing**		**Date of sowing**	**Spacing**	**Date of sowing x spacing**	
SEm±	2.38	2.38	4.11		356	356	617	
CD at 5%	7.12	7.12	12.33		1068	1068	1850	

Dwivedi, D.K., H. Singh, K.M. Singh, B. Shahi and J.N. Rai. 1994. Response of french bean (*Phaseolus vulgaris*) to population densities and nitrogen levels under mid-upland situation in north east alluvial plains of Bihar. *Indian Journal of Agronomy* 39: 581-583.

Gomez, K.A. and A.A. Gomez. 1984. *Statistical Procedures for Agricultural Research*. Wiley-Inter Science Publication, New York, USA, pp. 680.

Joshi, K. D., B. Bhanduri, R. Gautam, J. Bajracharya and P.B. Hollington. 2008. Rice bean: a multi-purpose underutilized legume. In: J. Smartt, N. Haq (eds). *New Crops and Uses: Their Role in a Rapidly Changing World*. CUC, UK pp. 234-248.

Katung, P.D. 2003.The response of two varieties of sesame (*Sesamum indicum* L.) to different plant populations and sowing dates at Samaru, northern Guinea savanna. *Samaru Journal of Agricultural Research* 19: 17-27.

Mc Ewen, J. 1973. The effects of growth regulators, seed rates and row spacings on field beans (*Vicia faba* L.). *Journal of Agricultural Sciences*, Cambridge 80:37-42.

Ravinder, K. and N.P. Singh. 1998. Effect of date of sowing on growth and yield of cowpea [*Vigna unguiculata* (L.) walp]. *Legume Research* 21: 54-56.

Sharma, N.K. 2007. Effect of sowing time and cutting management on fodder yield of barley. *Range Management and Agroforestry* 28: 334-335.

Sharma, V., P. Singh and S. Sharma. 2017. Effect of sowing dates and initial cutting time on forage yield and quality of oat. *International Journal of Science, Environment and Technology* 6: 2030-2035.

Shekara, B.G. and H.C. Lohithaswa. 2012. Effect of time of sowing, seed rate and planting geometry on green forage yield and quality of fodder oat. *Forage Research* 38: 122-124.

Singh, D.N. and P. Tripathi. 1994. Effect of NPK fertilizers and spacing on growth and yield of french bean. *Vegetable Science* 21: 7-11.

Sreelatha, D., K. L Rao, R. Veeraraghavaiah and M. Padmaja. 1997. Physiological variations in french bean (*Phaseolus vulgaris* L.) cultivars as affected by sowing dates. *Annals of Agricultural Research* 18: 111-114.

Yadav, G. L. 2003. Effect of sowing time, row spacing and seed rate on yield of cowpea under rainfed condition. *Indian Journal of Pulses Research* 16: 157-158.