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Performance of grass pea (*Lathyrus sativus* L.) varieties under different seed rates in rice (*Oryza sativa*) – *utera* situations

H. KALITA AND R. CHAKRABARTY

Regional Agricultural Research Station
Assam Agricultural University, Shillongani, Nagaon-782 002, Assam

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ABSTRACT

A field trial was conducted at RARS, Shillongani, Nagaon to study the performance of grass pea (Lathyrus sativus L.) varieties (Ratan, Nirmal, Prateek and Mahateora) under varying seed rates (50, 55 and 60 kg ha^{-1}) in winter rice (Oryza sativa L.) relay cropping situations during Rabi 2014-15 and 2015-16. The varieties were sown on November 15 and 17 in respective years in standing rice field (15 days after 50% flowering of the rice crop) when the soil was in moist conditions. Among the varieties, 'Prateek' performed very well under rice-utera conditions. It gave the highest grain yield (863.89 kg ha^{-1} in 2014-15 and 791.67 kg ha^{-1} in 2015-16). Seed rate 60 kg ha^{-1} accrued in better crop stand and thus, the highest grain yield (895.83 kg ha^{-1} in the first year and 842.36 kg ha^{-1} in the second).When seed rate was increased by 5 kg from 50 kg ha^{-1}, the yield increase was 14.2 (average) per cent. Further 5 kg increase in seed rate resulted in an average yield advantage of 13.2 per cent. Interaction of variety with seed rate showed that 'Nirmal' with 60 kg seed ha^{-1} (969.44 kg ha^{-1}) recorded the highest grain yield, closely followed by 'Prateek' with 60 kg seed ha^{-1} (955.55 kg ha^{-1}) in 2014-15. However, in the second year, 'Prateek' sown using 60 kg seed rate produced the highest grain yield (986.11 kg ha^{-1}), closely followed by 'Ratan' with 60 kg seed/ha^{-1} (877.78 kg ha^{-1}). Soil moisture conservation and microbial population build-up were considerably better under 'Prateek' and 'Nirmal' sown using the seed rate of 60 kg ha^{-1}. Higher populations of fungi (49 x 10^4 and 43 x 10^4 cfu/g^{-1} soil) and bacteria (52 x 10^7 and 48 x 10^{7}cfu g^{-1} soil) at harvest were recorded in soil where 'Prateek' was grown by seed rate of 60 kg ha^{-1} in both the years of experimentation. In this variety aphid and wilt incidence were the lowest.

Keywords : Grass pea, grain yield, incidence, pest, seed rate, soil moisture and soil microbes.

Grass pea or chick pea (*Lathyrus sativus* L.) was an extensively cultivated pulse crop in the state of Assam in the past. It is particularly important in areas that are prone to moisture deficit stress, and thought to be an 'insurance crop' as it produces reliable yields when all other crops fail. The seeds contain a neurotoxin named B-N-Oxalyl-L-á, â-diaminopropionic acid (ODAP) that causes a neurodegenerative disease when seeds are consumed as a primary source of protein for a prolonged period. The earlier varieties were high in ODAP content. In recent past, a number of grass pea varieties have been developed that are high yielder and contain very less ODAP ranging from 0.074 to 0.109 per cent (Project Coordinators Project, 2014-15). These varieties have once again opened the door of grass pea cultivation in a big way, and it can contribute hugely towards self sufficiency in pulse production. Almost 50 per cent of medium textured medium winter rice (*Oryza sativa* L.) lands remain fallow during *Rabi* season in the state. These areas bear tremendous potential for grass pea as a winter rice-relay crop under rainfed conditions. Hence, the present study was planned to evaluate four grass pea varieties with varying seed rates under rice-*utera* situations.

MATERIALS AND METHODS

The field experiment was conducted at Regional Agricultural Research Station, Shillongani, Nagaon, Assam during *Rabi* 2014-15 and 2015-16 to study the yield performance of four grass pea varieties (Ratan, Nirmal, Prateek and Mahateora) with varying seed rates (50, 55 and 60 kg ha^{-1}) and their effect to insect-pests, diseases, soil microbial build up and soil moisture availability. The winter rice variety was 'Gitesh' which was transplanted in the second week of July in medium land situation. The grass pea varieties were broadcast on November 15 and 17 in respective years in standing rice field 15 days after 50 per cent flowering of the rice crop when the soil was in moist condition. The experiment was laid out in a randomized block design with three replications. The varieties took 125-128 days to mature. Aphid (*Aphis crassivora*) incidence was recorded at pod formation stage and wilt (caused by *Fusarium* spp.) incidence at late vegetative stage. Immediately after observation, recommended control measures were adopted. Soil moisture was recorded at the flowering stage of the crop. Fungal and bacterial populations in soil (at the time of sowing and at harvest) were estimated by standard plate count method using Marten's for fungi (Martin, 1950), and nutrient agar medium for bacteria (Allen, 1959). Microbial population was calculated and expressed as number of cells x10^n/g^{-1} soil.

RESULTS AND DISCUSSION

Among the varieties, 'Prateek' established better under rice-*utera* conditions, and gave the highest grain yield (863.89 and 791.67 kg ha^{-1}). Though the yields of the other three varieties were lower than that for 'Prateek', they were statistically at par (Table 1 & 2). Better performance of 'Prateek' was also reported in the Annual Report (2012-13) when the crop was sown

Email: ranjana_74@yahoo.co.in

Table 1: Grain yield (kg ha^{-1}) of grass pea varieties under different seed rates (2014-15)

Variety	Seed rate (kg ha^{-1})			Mean
	50	55	60	
Ratan	633.33	783.33	825.00	**747.22**
Nirmal	644.45	783.33	969.44	**799.07**
Prateek	752.78	883.33	955.55	**863.89**
Mahateora	669.44	736.11	833.33	**746.29**
Mean	**657.00**	**796.53**	**895.83**	**–**
LSD (0.05)	**Variety : NS**	**Seed rate : 114.45**		**Interaction :228.90**

Table 2: Grain yield (kg ha^{-1}) of grass pea varieties under different seed rates (2015-16)

Variety	Seed rate (kg ha^{-1})			Mean
	50	55	60	
Ratan	675.00	713.89	986.11	**791.67**
Nirmal	586.11	750.00	791.67	**709.26**
Prateek	752.78	619.45	877.78	**750.00**
Mahateora	666.67	875.00	713.89	**751.85**
Mean	**670.14**	**739.58**	**842.36**	
LSD (0.05)	**Variety : NS**	**Seed rate : 76.08**		**Interaction : 152.15**

Table 3: **Insect-pests and disease incidence in grass pea varieties (mean over seed rates)**

Variety	% aphid incidence		% wilt incidence	
	2014-15	2015-16	2014-15	2015-16
Ratan	9.80	8.20	8.50	7.64
Nirmal	10.56	11.08	9.83	9.27
Prateek	8.35	7.46	6.76	5.52
Mahateora	9.08	9.75	8.74	7.93

Table 4: **Soil moisture (%) at flowering stage of grass pea (2014-15)**

Variety	Seed rate (kg ha^{-1})		
	50.0	55.0	60.0
Ratan	16.9	17.5	19.2
Nirmal	18.5	19.0	20.4
Prateek	17.8	20.1	22.7
Mahateora	19.0	19.6	20.0

Table 5: **Soil moisture (%) at flowering stage of grass pea (2015-16)**

Variety	Seed rate (kg ha^{-1})		
	50.0	55.0	60.0
Ratan	15.5	16.2	18.6
Nirmal	16.7	18.0	19.9
Prateek	19.3	20.5	21.5
Mahateora	17.8	19.7	20.0

Table 6a: Microbial population (x 10^4 cfu g^{-1} of soil) of fungi (2014-15)

Variety	Seed rate (kg ha^{-1})					
	50		55		60	
	Initial	At harvest	Initial	At harvest	Initial	At harvest
Ratan	20	28	21	31	22	42
Nirmal	22	31	23	35	23	45
Prateek	18	35	20	41	21	49
Mahateora	23	30	22	32	22	40

Table 6b: Microbial population (x 10^4 cfu/g^1 of soil) of fungi (2015-16)

Variety	Seed rate (kg ha^{-1})					
	50		55		60	
	Initial	At harvest	Initial	At harvest	Initial	At harvest
Ratan	21	25	20	29	21	40
Nirmal	20	29	18	33	19	41
Prateek	24	31	21	39	20	43
Mahateora	20	24	22	30	18	37

Table 6c: Microbial population (x 10^7 cfu g^{-1} of soil) of bacteria (2014-15)

Variety	Seed rate (kg ha^{-1})					
	50		55		60	
	Initial	At harvest	Initial	At harvest	Initial	At harvest
Ratan	25	33	27	41	29	42
Nirmal	29	35	30	45	31	49
Prateek	28	39	29	47	30	52
Mahateora	27	33	30	42	32	45

Table 6d: Microbial population (x 10^7 cfu g^{-1} of soil) of bacteria (2015-16)

Variety	Seed rate (kg ha^{-1})					
	50		55		60	
	Initial	At harvest	Initial	At harvest	Initial	At harvest
Ratan	22	30	25	39	27	40
Nirmal	21	32	28	43	29	45
Prateek	24	37	27	45	27	48
Mahateora	21	31	28	41	30	43

using a seed rate of 60 kg ha^{-1}. This seed rate gave the highest yield (895.83 and 842.36 kg ha^{-1}). It might be attributed to better plant stand and soil moisture conservation (Table 4 & 5). Interaction effect showed that the highest grain yield (969.44 kg ha^{-1} in 2014-15) was obtained for 60 kg ha^{-1} seed rate of 'Nirmal'. The finding was in conformity with that of Gupta and Bhowmick (2005). Under 60 kg ha^{-1} seed rate, the variety 'Prateek' yielded (955.55 kg ha^{-1}) almost similar to that with 'Nirmal' in the first year. However, in the second year 'Prateek' sown with 60 kg seed rate accrued in the highest grain yield (986.11 kg ha^{-1}). Better performance of *Lathyrus* varieties under higher seed rates was also reported by various researchers from West Bengal and Chattisgarh (Das, 2000; Bhowmick *et al.*, 2005; Annual Report, 2012-13).

All the test varieties reacted almost similarly to major insect-pest (aphid) and wilt disease (Table 3). However, 'Prateek' recorded the lowest values for aphid and wilt incidence. They conserved soil moisture very efficiently under higher seed rates (Table 4 & 5) because of better canopy coverage and minimized exposure of soil surface to sunlight. The maximum soil moisture at flowering stage of the crop was recorded under 'Prateek' sown using seed rate of 60 kg ha^{-1}.

The populations of fungi and bacteria at crop harvest were affected considerably due to varying seed rates (Table 6a, 6b, 6c, 6d). Microbial population significantly increased with increase in seed rate irrespective of varieties. However, among the varieties, 'Prateek' recorded higher microbial population of fungi (49 x 10^4 and 43 x 10^4 cfu g^{-1} soil) and bacteria (52 x 10^7 and 48 x 10^7 cfu g^{-1} soil) while sown using the seed rate of 60 kg ha^{-1} in both the years, respectively.

REFERENCES

Allen, O.N. 1959. *Experiments in soil bacteriology*. 3rd ed. Burgess publishing Co., Minneapolis, USA.

Bhowmick, M.K., Aich, A., Aich, S.S., Srivastava, M.P., Gupta, S. and Marc, G.C. 2005. Crop diversification through *paira* (*utera*) cropping with *Rabi* pulses. *SATSA Mukhapatra*- **9**: 43-60.

Das, N.R. 2000. *Lathyrus sativus* in rainfed multiple cropping system in West Bengal. *A review-Lathyrus and Lathyrism Newsletter.* **1**: 25.

Gupta, S. and Bhowmick, M.K. 2005. Scope of growing *Lathyrus* and lentil in relay cropping systems after rice in West Bengal, India. *Lathyrus and Lathyrism Newsletter*. **4**: 28-33.

Martin, J.P. 1950. Use of acid rose Bengal and streptomycin in the plate method for estimating soil fungi. *Soil Sci*. **69:** 215–232.

Project Coordinator's Report (*Rabi* Crops). 2012-13. All India Coordinated Research Project on MULLaRP, IIPR, Kanpur, pp. 131 & 195.

Project Coordinator's Report (*Rabi* Crops). 2014-15. All India Coordinated Research Project on MULLaRP, IIPR, Kanpur, p. 167.