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Branching Out: Relay Grass Pea (*Lathyrus sativa* L.) Production on Rice Fallows in the Eastern Indo-Gangetic Plains

B. Biswas*

Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, West Bengal (741252), India

**Corresponding author*

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A B S T R A C T

Cultural management practices in relay (*paira /utera*) grass pea (*Lathyrus sativa* L.) on rice-fallows may intensify pulse production in the Eastern Ingo-Gangetic plains, but choice to be made, requires assessment of appropriate rice stubble and micro nutrient management. A field experiment was conducted at the Central Research Farm of the Bidhan Chandra Krishi Viswavidyalaya, the State Agricultural University, Gayeshpur, India ($22^0 58^/$N latitude; $88^0 31^/$E longitude; 9.75 amsl, Inceptisol, tropical sub-humid region)during winter seasons of2015-16, 2016-17 and 2017-18 to evaluate opportunity of improving yield of relay grass pea (variety Biol 212) with conservation agriculture practices. The experiment was laid out in a split-split design with three replications having two levels of sowing method (relay crop sown 10 days before rice harvesting and sowing with multi crop zero cum fertiliser drill on the day of rice harvest), four levels of rice residue (rice cut at ground level, residue kept at the height of 6 inch, 9 and 12 inch) and four levels of micronutrient spray (control, boron 0.2% at pre flowering stage, molybdenum 0.05% at pre flowering stage and boron +molybdenum at pre flowering stage). Zero tillage produced more nodules, more seed and bio yield as compared to relay cropping. Retention of rice residue at 12 inch above soil surface recorded highest seed yield (1074 kg/ha) as well as bio yield (4120 kg/ha). Boron along with Molybdenum had produced highest number of pods / plant, seed yield (1099 kg/ha) and bio yield (4149 kg/ha). Application of boron and molybdenum at pre flowering stage and relay sowing of lathyrus and 12 inch anchored residue may increase overall pulse production on rice -fallow areas of eastern IGP.

Introduction

Farmers of eastern Indo-Gangetic Plains are facing many constraints in crop production like, small and scattered holdings, lack of irrigation facilities, poor infrastructure, poor marketing and storage facilities, etc. Rainfed risk prone cropping with costly inputs and paucity of credits do not encourage them to go for second crop during winter season, as a result most of the *aman* rice fields remain fallows. Conservation Agriculture practices help in efficient use of resources by reducing tillage, conserving soil organic matter and moisture, retaining crop residues, introducing legume crops in cropping sequences. Surface seeding with zero tillage offers opportunities for relay cropping in rice fallows (Das, 2003). There is a huge scope for cultivation of low water-requiring and short duration crops like grass pea (Lathyrus) using conservation technologies (Gupta and Bhowmick, 2005, Singh *et al*., 2012). Relay cropping of grass pea is gaining popularity again with the introduction of low ß–ODAP content varieties. To study the opportunity of improving grass pea yield for rice fallow systems with conservation technologies.

Materials and Methods

Field experiments were conducted in three consecutive years at Pulses and Oilseeds Research Station, Berhampore, Murshidabad, West Bengal, India situated at $24^0$60'N latitude, $88^0$15' E longitude at an elevation of 19.0 meters above the mean sea level (MSL) during winter seasons of 2012-13, 2013-14 and 2014-15. The soil of the experimental field was sandy loam in texture and almost neutral in reaction (pH 7.5) having an organic carbon content of 0.31%, available P_2O_5 and K_2O of 72 kg and 110 kg / ha, respectively. The experiment was laid out in a split-split design with three replications having two levels of sowing method (relay crop sown 10 days before rice harvesting and sowing with multi crop zero cum fertiliser drill on the day of rice harvest), four levels of rice residue (rice cut at ground level, residue kept at the height of 6 inch, 9 and 12 inch) and four levels of micronutrient spray (control, Boron 0.2% at pre flowering stage, Molybdenum 0.05% at pre flowering stage and Boron + Molybdenum at pre flowering stage). The variety *Nirmal* was broadcasted on the standing rice 10 days before rice harvest in relay crop treatment within first week of November and sowing with zero till seed cum fertiliser drill was done on the date of rice harvest with 40 kg per ha seed rate and basal fertilizer @ 20, 40, 40 kg N, P_2O_5, K_2O per ha.

Results and Discussion

Sowing method had significant influence on nodule formation, number of pods per plant and yield. Zero tillage produced more nodules, more seed and bio yield as compared to relay cropping. Retention of rice residue at 12 inch above soil surface recorded highest seed yield (1074 kg/ha) as well as bio yield (4120 kg/ha). Boron along with Molybdenum had produced highest number of pods / plant, seed yield(1099 kg/ha) and bio yield (4149 kg/ha).However, Molybdenum alone produced highest number of nodules per plant.

It is concluded with the adoption of appropriate management practices, relay (*paira /utera*) cropping of grass pea in rice-fallows may be able to increase overall pulse production in West Bengal. Being a leguminous crop it can also sustain productivity of the rice-based cropping systems; further cropping intensity for a considerable areas may be increased which generally remain fallow after *aman* rice in the state.

Table.1 Yield and yield attributes of grass pea (cv. *Nirmal*) as influenced by sowing method, rice residue and micronutrient (Pooled over 3 years)

	Seeds/ plant	Pods/ plant	Test wt. of seed (g)	Nodules/ plant	Seed yield (kg/ha)	Bio- Yield (kg/ha)
Sowing method						
Zero Tillage	3.80	29.2	7.43	12.36	1097	4083
Relay Cropping	2.60	20.9	7.41	7.04	827	3298
SEm (±)	**0.10**	**0.32**	**0.04**	**0.06**	**16**	**66**
LSD (5%)	**0.28**	**0.95**	**NS**	**0.17**	**47**	**194**
Residue retention						
Ground level	2.73	2.9	21.99	7.35	836	3167
6 inch	3.37	24.0	7.44	9.28	904	3501
9 inch	3.26	26.5	7.50	10.39	1034	3974
12 inch	3.23	27.9	7.43	11.56	1074	4120
SEm (±)	**0.14**	**0.46**	**0.05**	**0.10**	**22**	**94**
LSD (5%)	**0.39**	**1.34**	**NS**	**0.28**	**63**	**270**
Micronutrient Spray						
Control	3.04	23.15	7.39	8.73	770	3047
Boron	3.11	23.25	7.47	9.16	957	3665
Molybdenum	3.28	26.12	7.44	10.62	1024	3901
Boron + Molybdenum	3.37	27.88	7.42	10.14	1099	4149
SEm (±)	**0.11**	**0.31**	**0.03**	**0.07**	**15**	**64**
LSD (5%)	**0.30**	**0.90**	**NS**	**0.20**	**45**	**191**

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