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Production potential of linseed (*Linum usitatissimum*) in rice fallows under rainfed condition

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ABSTRACT

Results of the field experiment conducted during *rabi*, 2009-10 at Assam Agricultural University, Jorhat revealed that productivity of linseed grown after rice could be enhanced following conventional tillage practice, recommended dose of fertilizers (40-20-10 kg N, P_2O_5, K_2O/ha) and maintaining cutting height of rice stubble at 40 cm above the ground level.

Key words: Linseed, Production potential, Rice fallows.

INTRODUCTION

Rice is the staple food crop of Assam occupying an area of 23.84 lakh ha. Out of various rice grown (*ahu, sali,* boro and bao), *sali* rice (*kharif*) occupies an area of 16.36 lakh ha and considered as the most important rice crop in Assam. After harvesting *sali* (*kharif*) rice majority of land remains fallow for a period of 4-5 months and those lands can be utilized for growing certain *rabi* crops. Linseed is an important *rabi* oilseed crop occupies an area of 0.07 lakh ha with a productivity of 5.16 q/ha and gaining popularlity in recent years. It can be grown very well in rice fallows and productivity can be increased by adoption of improved practices such as, proper cutting height of rice stubbles and tillage practice as well as application of fertilizers are considered important for linseed cultivation in rice fallows. Hence, the present investigation was initiated.

MATERIALS AND METHODS

A field experiment was conducted on linseed crop in rice fallows under rainfed condition at the Instructional cum-Research Farm of Assam Agricultural University, Johat during *rabi* season of 2009-10. The treatments comprised of 2 stubble heights of rice (cutting at ground level and at 40 cm above ground), 2 tillage practices (zero and conventional tillage) and 3 levels of fertilizers (0-0-0, 20-10-5 and 40-20-10 kg N,P_2O_5, K_2O/ha) laid out in randomized block design with three replications. The soil was sandy clay loam in texture, acidic in reaction (pH 4.6), medium in organic carbon (0.67%), available N (298.7 kg/ha), P_2O_5 (28.4 kg/ha) and K_2O (192.4 kg/ha). Application of P_2O_5 (SSP) and K_2O (MOP) was done as per treatment as basal one day ahead of sowing. Nitrogen was applied in the form of urea in two equal splits as per treatment, first half along with phosphorous and potassium as basal and the remaining half after 25 days of sowing. In zero tilled plots, shallow furrows were made at a distance of 25 cm with a garden hoe. In case of conventional tilled plots, repeated hoeing and levelling were done to obtain a fine tilth. The seeds of linseed variety T-397 were sown @ 20 kg/ha at a row distance of 25 cm on 9 December, 2009 and harvested on 26 April, 2010. Total rainfall received during the crop growing period was 386.5 mm.

RESULTS AND DISCUSSION

Effect of stubble height of rice: Cutting height of rice stubble at 40 cm above the ground level resulted in significant increase in seed and stover yields of linseed over the cutting height of rice stubble at ground level (Table 1). Significant increase in all the growth and yield attributing parameters under cutting height at 40 cm resulted in higher seed and stover yields. This might be due to higher moisture content in soil where rice stubbles were cut at 40 cm height. The uptake of nutrients N, P and K was significantly higher under this treatment (Table 2) which has direct influence on yield. Das *et al.* (1999) also reported similar results on paira cropped grasspea grown in rice fallows. Higher net return and benefit-cost ratio were also recorded with the same treatment.

Effect of tillage practice: Out of the two tillage practices, conventional tillage recorded significantly higher seed and stover yields over the zero tillage. Maintenance of proper tilth under conventional tillage practice encouraged better root and shoot growth, yield attributes and uptake of nutrients which ultimately reflected on yield. Higher seed yield with conventional tillage as compared to zero tillage in winter oilseed crops have also been reported by Mandal *et al.* (1994) and in linseed crop grown after winter rice by Kalita *et al.* (2005).

Effect of fertilizer: Seed and stover yield increased significantly and consistently with increasing levels of fertilizers from control upto 40-20-10 kg N, P_2O_5 and K_2O/

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Table 1: Growth, yield attributes, yield and economics of linseed as influenced by stubble height of rice, tillage practice and levels of N, P_2O_5 and K_2O

Treatment	Plant height (cm)	Branches/ plant	Plant population/ m row length	Capsules/ plant	Seeds/ capsule	1000 Seed weight (g)	Seed yield (kg/ha)	Stover yield (kg/ha)	Harvest Index (%)	Net return (Rs/ha)	Benefit-cost ratio
Stubble height of rice											
Cutting at ground level	49.40	4.30	36.40	14.80	8.10	5.40	531.39	830.75	39.01	7031.70	1.78
Cutting at 40 cm above ground	51.20	4.40	34.10	16.10	8.60	5.80	645.09	1003.19	39.14	10442.80	2.16
CD (P=0.05)	0.60	NS	1.00	1.10	0.20	0.10	65.25	96.68	-	-	-
Tillage practice											
Zero tillage	49.90	4.20	36.30	14.60	8.20	5.50	540.41	845.40	38.99	8052.50	1.98
Conventional tillage	50.60	4.40	34.30	16.20	8.60	5.60	636.06	988.53	39.15	9422.00	1.96
CD (P=0.05)	0.70	NS	1.20	1.30	0.30	NS	79.92	118.41	-	-	-
N-$P_2$0$_5$-$K_2$0 levels (kg/ha)											
0-0-0	49.60	4.20	34.50	14.10	8.20	5.40	463.44	727.42	38.92	6013.50	1.78
20-10-5	50.10	4.40	34.80	16.00	8.30	5.60	593.04	927.51	39.00	8881.50	1.99
40-20-10	51.10	4.40	36.50	16.20	8.70	5.80	708.23	1095.99	39.25	11316.75	2.14
CD (P=0.05)	0.70	NS	1.20	1.30	0.30	NS	79.92	118.51	-	-	-

NS-Non-significant

Table 2: Total N, P, K contents (%) and uptake (kg/ha) by linseed as influenced by stubble height of rice, tillage practice and levels of N, P_2O_5 and K_2O

Treatment	Nutrient Content (%)			Nutrient uptake (kg/ha)		
	N	P	K	N	P	K
Stubble height of rice						
Cutting at ground level	2.31	0.98	2.45	19.31	8.09	20.62
Cutting at 40 cm above ground	2.31	1.03	2.50	23.56	10.64	25.33
CD (P=0.05)	NS	NS	NS	2.79	1.41	3.01
Tillage practice						
Zero tillage	2.24	0.99	2.41	19.12	8.44	20.49
Conventional tillage	2.38	1.03	2.55	23.75	10.29	25.47
CD (P=0.05)	NS	NS	NS	3.41	1.73	3.69
N-$P_2$0$_5$-$K_2$0 levels (kg/ha)						
0-0-0	2.14	0.88	2.34	15.55	6.35	16.98
20-10-5	2.36	1.05	2.46	21.94	9.77	23.01
40-20-10	2.43	1.09	2.63	26.83	11.98	28.94
CD (P=0.05)	0.18	0.12	0.18	3.41	1.73	3.69

NS-Non-significant

ha (Table 1). Increase in seed and stover yield with higher dose of fertilizers might be ascribed to the synergistic effects of growth and dry matter accumulation of the crops. The uptake of N, P and K was highest at the level of fertilizers, 40-20-10 kg N, P_2O_5, K_2O/haigher seeds which might be due to better translocation and mobility of the nutrients. The highest net return and benefit-cost ratio were also recorded highest with the same level of fertilizers. Similar results were reported by Awasthi *et al.* (1989), Khare *et al.* (1996) and Kumar and Badiyala (2001) on linseed crop.

Based on the results, it can be concluded that the productivity and profitability of linseed grown after rice could be enhanced by adopting conventional tillage and recommended fertilizer dose of 40-20–10 kg N, P_2O_5, K_2O/ ha along with cutting height of rice stubble at 40 cm above the ground.

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