

Effect of Integrated Nutrient Management and Cropping System on the Yield and Economics of Mustard (*Brassica Juncea L. Czern & Cosson*)

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ABSTRACT: The experiment was conducted during rabi season of 2009-2010 and 2010-11 on sandy loam soil at RVSKVV, Krishi Vigyan Kendra, Farm, Ashoknagar (M.P.) to study the effect of different cropping systems and fertility levels on yield, yield attributes and economics of mustard (var. Pusa bold). Results showed that the maximum seed yield (33.05 q ha⁻¹), oil content (40.39%), net return (Rs. 23661 ha⁻¹) and B.C. ratio (3.19) were observed in Blackgram – mustard followed by Pearl millet-mustard cropping system. Fertilizer application of 50% RD + Azotobacter + PSB @ 20g kg⁻¹ seed, resulted in maximum net return (Rs. 20797 ha⁻¹) and B.C. ratio (2.99) as compared to higher application of fertilizers.

INTRODUCTION

Mustard crop is grown under mono cropping system in the northern M.P. Nearly 2.85 lakh hectares of land is kept fallow in *Kharif* followed by mustard in *rabi*, resulting in low cropping intensity and productivity. Therefore, to replace this traditional practice and to increase the cropping intensity as well as profit per unit area. Under sufficient irrigated system through canal, tube well and other resources, there exists enormous possibility of enhancing cropping intensity of the northern Madhya Pradesh in double cropping system of cultivation.

Thus, biofertilizers can make significant contribution towards the development of strategies this for productivity improvement, which do not lead to an exponential rise in consumption of non renewable forms of energy. Nutrient supply through the biofertilizers is dependent on energy from renewable resources, such as products of photosynthesis and organic matter in the soil. Therefore, it is the need of the time to evolve and adopt a strategy of integrated nutrient management for improving the productivity of farmlands by using a judicious combination of chemical fertilizers, organic manures and bio fertilizers. The experiment were conducted to study the effect of cropping system and integrated nutrient management on yield, yield attributes and economics of mustard in northern Madhya Pradesh.

MATERIAL AND METHODS

A Field experiment was conducted at RVSKVV, Krishi Vigyan Kendra, Farm, Ashoknagar during *rabi* season of 2009-10 and 2010-11. The experiment was laid out in a split plot design with three replications. The plot size was 4.5m x 3.6 m. The three cropping system (C₁ : Blackgram – mustard, C₂ : Soyabean – mustard and C₃ : Pearl millet – mustard) were kept as main plots, and three fertility levels (F₁ : 50% Recommended dose of Fertility (RDF) + Azotobacter + Phosphorous Solubilising Bacteria (PSB), F₂ : 175% RDF + Azotobacter + PSB and F₃ : 100% RDF through chemical fertilizers as sub plots. The soil was sandy loam having 175 Kg. ha⁻¹ available N, 16 Kg. ha⁻¹ P₂O₅ and 211 kg. ha⁻¹ available K₂O. A basal dose of 40 kg. N: 40 kg. P₂O₅ and 20 kg. ha⁻¹ was applied. The crop was sown on 11 October (Blackgram – mustard & pearl millet – mustard) and 4 November (Soybean-mustard) during 1999-2000 and 19 October (Blackgram – mustard & Pearl millet – mustard) and 9 November (Soybean – Mustard) during 2000-01. All the treatments were sown at 30 cm row spacing and maintained a uniform plant population of about 3.3 lakh ha⁻¹ by thinning. The crop received three irrigations including on pre-sowing. A dose of 40 kg. N ha⁻¹ was applied as top dressing at 40 days after sowing (Pre-flowering stage) Plant protection measures were undertaken as and when found

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necessary. The crop was harvested at maturity. Data on yield attributing parameters and seed yield were collected and statistically analysed.

RESULTS AND DISCUSSION

There was significant effect of cropping system on the yield attributing characters and yield of mustard (Table 1). It was also found that there was no significant effect of fertility levels on the yield of mustard except oil content which showed significant of cropping system and fertility levels. There was significant effect of cropping system number of branches plant⁻¹, number of siliquae plant⁻¹, seed yield plant⁻¹, stover yield plant⁻¹ and oil content. Number of branches 15.73 plant⁻¹ and 15.70 plant⁻¹ in Blackgram - mustard followed by Pearlmillet - mustard 175.71 plant⁻¹. Seed yield of 12.81 g. plant⁻¹ was maximum with Blackgram - mustard cropping system followed by Pearlmillet - mustard cropping system 12.39 g plant⁻¹. Maximum oil content of 4.30 per cent was recorded with blackgram - mustard followed by Pearlmillet - mustard cropping system (40.10%). In case of fertility levels whether 50% RD + Azotobacter + PSB or 75% RD + Azotobacter + PSB or 100% RD through chemical fertilizer had no significant effect on yield contributing factors except oil content, with increase fertility level oil content in mustard seed decreased (41.04 to 39.15%) similar finding are reported by Gangwar and Kumar 1986.

Data presented in table 2 showed that maximum seed yield of 23.05 q ha⁻¹ was recorded in Blackgram

- mustard cropping system followed by Pearlmillet-mustard cropping system. The lowest seed yield of 16.53 q ha⁻¹ was recorded with Soybean mustard cropping system. The similar pattern in stover yield was also observed. Maximum gross return (Rs. 31057 ha⁻¹), net return (Rs. 23661 ha⁻¹) and B.C. ratio (3.19) was found in Blackgram - mustard cropping system. The lowest gross return (Rs. 2231 ha⁻¹), net return (Rs. 14830 ha⁻¹) and B:C ratio (1.98) were recorded in Soybean - mustard cropping system. There was no significant effect of fertility levels whether that 50% RD + Azotobacter + PSB or 75% RD + Azotobacter + PSB or 100% RD through chemical fertilizer. Maximum gross return (Rs. 27757 ha⁻¹), net return (Rs. 20797 ha⁻¹) and B:C ratio (2.99) were observed with 50% RD + Azotobacter + PSB as compared to 75% RD + Azotobacter + PSB and 100% through chemical fertilizer. Over all cropping system of Blackgram - mustard with fertility level 50% RD + Azotobacter + PSB resulted in maximum yield resulting in highest net return and B:C ratio.

Low yield of mustard after soybean might be due to late sowing of mustard as soybean take 105 days for full maturity. As regard with the influence of different fertility levels upon yield and yield attributing characters of mustard crop, the treatment differences were non significant. This shows that bio fertilizers played their unique role with respect to the addition of more nitrogen and availability of more phosphorous to the crop plants and thus proved the best substitute of chemical fertilizer up to extent of 25 to 50 per cent.

Table 1
Growth and yield attributing character as affected by cropping system and fertility levels on mustard (pooled data of 2009-10 and 2010-11)

Treatments	No. of branches Plant ⁻¹	No. of siliquae Plant ⁻¹	Length of siliqua (cm)	No. of Seeds siliqua ⁻¹	Seed yield plant ⁻¹ (g)	Stover yield plant ⁻¹ (g)	1000 seed weight (g)	Oil% in seed
Cropping Systems								
Blackgram - mustard (C ₁)	15.73	177.34	4.94	13.23	12.81	48.78	5.85	40.39
Soybean - mustard (C ₂)	12.42	135.33	4.52	12.60	9.04	35.51	5.86	39.73
Pearlmillet - mustard (C ₃)	15.70	175.71	4.91	13.09	12.39	48.32	5.86	40.10
SEm ±	0.40	1.06	0.35	0.77	0.17	0.51	0.35	0.09
CD at 5%	1.15	3.07	NS	NS	0.50	1.54	NS	0.31
Fertility levels								
50% RD + Azoto. + PSB (F ₁) @ 20 g kg ⁻¹ seed	14.32	161.48	4.78	12.95	11.43	43.09	5.77	41.04
75% RD + Azoto. + PSB (F ₂) @ 20 g kg ⁻¹ seed	14.57	162.77	4.79	12.90	11.47	44.41	5.80	40.02
100% RD (F ₃) (Through chemical fertilizers)	14.96	164.04	4.80	13.06	11.34	44.20	5.81	39.15
SEm ±	0.11	0.41	0.06	0.39	0.04	0.12	0.12	0.31
CD at 5%	NS	NS	NS	NS	NS	NS	NS	0.91

Table 2
Yield and economics as affected by cropping system and fertility levels on mustard
(pooled data of 2009-10 and 2010-11)

<i>Treatments</i>	<i>Seed Yield (q ha⁻¹)</i>	<i>Stover Yield (q ha⁻¹)</i>	<i>Harvest Index (%)</i>	<i>Cost of cultivation (Rs. ha⁻¹)</i>	<i>Gross return (Rs. ha⁻¹)</i>	<i>Net return (Rs. ha⁻¹)</i>	<i>B:C ratio</i>
Cropping Systems							
Blackgram - mustard (C ₁)	23.05	72.86	25.09	7396	31057	23661	3.19
Soybean - mustard (C ₂)	16.53	54.47	23.29	7480	22310	14830	1.98
Pearlmillet - mustard (C ₃)	20.21	67.72	22.99	7291	27288	19997	2.74
SEm ±	0.85	1.75	0.92	-	-	1187	0.31
CD at 5%	2.47	5.05	NS	-	-	3459	0.87
Fertility levels							
50% RD + Azoto. + PSB (F ₁) @ 20 g kg ⁻¹ seed	20.62	63.00	24.16	6954	27751	20797	2.99
75% RD + Azoto. + PSB (F ₂) @ 20 g kg ⁻¹ seed	20.29	64.86	23.75	7444	27349	19905	2.67
100% RD (F ₃) (Through chemical fertilizers)	20.35	67.20	23.46	7959	27463	19504	2.45
SEm ±	0.42	0.91	0.40	-	-	649	0.23
CD at 5%	NS	NS	NS	-	-	NS	NS

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