

System Equivalent, Monetary returns and Soil Nutrient Status as Influenced by Organic Farming Package under Sweet Corn-Rajma-Onion Crop Sequence



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Abstract

A long term experiment was conducted at the Research Farm of Integrated Farming System Research Project, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS) during 2003-04 to 2011-12 for nine years. The objective was to study the effect of organic farming package on system equivalent yield, monetary returns and soil nutrient status under irrigated sweet corn - rajma - onion crop sequence. Pooled results showed that the treatment of 100% NPK + secondary and micronutrients based on soil test recorded significantly higher sweet corn green cobs yield (98.51 q ha⁻¹), rajma seed yield (8.25 q ha⁻¹) and onion bulb yield (94.92 q ha⁻¹), system equivalent yield (221.61 q ha⁻¹), gross monetary returns (Rs. 132966 ha⁻¹) and soil nutrient status (286.0 N, 22.91 P, 464.0 K kg ha⁻¹) at the end of 2011-12.

Keywords: System Equivalent Yield, Monetary Returns, Sweet Corn, Rajma, Onion, Crop Sequence, NPK, Soil Nutrient Status, Organic Farming Package, PSB, Lucaena Loppings.

Introduction

Individual crops are cultivated under rainfed situation of Vidarbha region in Maharashtra. Success or failure of crop is depends on weather and seasonal rainfall. Under changing scenario of climate, chances of crop failure are more likewise to save the crop and get the yield to extent possible is a difficult task. Therefore, the farmers prefer intercropping so that they could get some yield. Under assured irrigated condition, cash crops like cotton, sugarcane, banana and vegetables are taken as pure or intercrops or in sequence cropping. The cash crops require more inputs and increase cultivation cost also. To minimize the expenses on fertilizers, sustain the crop yield and soil productivity by adopting INM is necessary to not only increase the yield but also to improve physical, chemical and biological properties of soil (Shashidhar et al., 1995). Among the organic manures FYM is the most important source. Now a day availability of FYM has become scarce therefore, it is essential to find out alternative to FYM. Considering this fact the long term experiment was conducted on sweet corn - rajma - onion high value crops in sequence with organic farming package under irrigated condition during 2003-04 to 2011-12.

Materials and Methods

Nine years long term field trial was conducted at Research Farm of Integrated Farming System Research Project, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS) during 2003-04 to 2011-12. The field site was uniform and leveled, soil type was medium to black belongs to vertisol. The soil contents of clay-52.0%, silt-12.8%, sand - 35.2%, bulk density-1.32 Mg/m³, field capacity-30.45% and permanent wilting point-16.30%. As far as nutrient content status is concern, initially it was having 177.0 N, 13.0 P and 285.0 K kg ha⁻¹. There were eight treatment combinations viz., T₁ - 100% NPK + 50% N through lucaena loppings + inorganic source of micronutrients as per oil test, T₂- one third of RDN each through FYM, leucaena lopping and neem cake, T₃ - T₂ + intercropping of green gram in sweet corn, fenugreek in rajma and clusterbean in onion, T₄- T₂ + Agronomic practices for weed and pest control (No chemical pesticides and herbicides and polythelene linings in between two rows), T₅- 50% N through lucaena loppings + Azotobactor seed treatment + balanced P dose through rock phosphate + phosphate solubilizing bacterial culture, T₆ - T₂ + Azotobactor + PSB seed treatment, T₇- 100% NPK + secondary and micronutrients based on soil test and T₈- Absolute control. It was a non-

replicated trial where plots were fixed at one location since its start with plot size of 15.0 m × 10.80 m. The crops and varieties were viz., sweet corn-sugar-75, rajma- VL- 63 and onion- Akola safed and local varieties of intercrops were used for this trial. Sowing of different crops was done at the spacing of 60 cm × 30 cm row to row distance for corn, 45 cm × 10 cm for rajma and 15 cm × 15 cm for transplanted onion. The recommended dose of fertilizers were 120:60:30 NPK kg ha⁻¹ for sweet corn, 90:60:00 NPK kg ha⁻¹ for rajma and 100: 50:00 NPK kg ha⁻¹ for onion with no fertilizers to intercrops. FYM was applied one month before sowing and thoroughly mixed with soil whereas, lucaena loppings were applied after last interculture based on N content, tender twigs of green loppings contains 3.30-3.90% N, 0.14-0.17% P and 0.12-0.15% K (Suchita Shrikhande et al., 2009). Kharif rainfed sweet corn was sown in the month of June and July after receipt of sufficient rainfall but when needed protective irrigation was applied. Subsequently rabi rajma and summer onion were sown in sequence after harvest of previous crop under irrigated condition. All other agronomic package of practices was adopted as per University recommendation. The treatment wise data on yield and monetary returns were pooled analysed for nine years. Soil samples were collected from each individual plots separately and analysed chemically with standard international methods for estimation of available NPK in soil and mean values were calculated based on four years data.

Results and Discussion

Seed Yield, System Equivalent and Monetary Returns of Sweet Corn Based Crop Sequence

Significantly highest seed yield, system equivalent yield and gross monetary returns were recorded by the treatment where 100% NPK + secondary and micronutrients were applied based on soil test (T₇) which was nearly followed by treatment of 50% NPK + 50% N through lucaena loppings + inorganic sources of micronutrients as per soil test and found superior over rest of treatments. Increased fertility levels had increased grain yield, straw/fodder yield, equivalent yield, monetary returns, it might be due to better nutrient supply to crop in sweet corn based crop sequence (Singh et al., 2010). Treatment T₃ and T₅ had recorded significantly higher yield over treatment T₆, T₂ and T₄. Where as, treatment T₂ and T₄ were comparable. The

lowest seed yield, system equivalent yield and monetary returns were recorded by the treatment of absolute control (Table1).

Available Nutrient Status of Soil at the End of 2011-12

Based on four years data (Table2) results showed that the treatment of 100% NPK + secondary and micronutrients was applied based on soil test (T₇) recorded numerically maximum available NPK content in soil every year from 2008-09 - to 2011-12. The average mean values of nutrients were 286.0N, 22.91 P, 464.0 K kg ha⁻¹ at the end of 2011-12 as against initial values of 177.0N, 13.0 P, 285.0 K kg ha⁻¹. It means there was an increase in availability of NPK in soil by 109.0 N, 9.91 P, 179.0 K kg ha⁻¹ after nine years of long experimentation. Increase in fertility levels increased available NPK content in soil. This might be due to increased availability of nutrients to plant in adequate amount and remained in soil in substantial quantity after fulfilling the crop requirement that ultimately improved soil fertility (Singh et al., 2010). The second best position of nitrogen content in soil was recorded by treatment of 50% NPK + 50% N through lucaena loppings + inorganic sources of micronutrients as per soil test. In case of P the second best position was found in treatment of T₆ and T₄. Whereas, K content was noted numerically maximum in treatment T₆ and T₂. The lowest values for all nutrients were recorded in absolute control.

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Table1

Crop Yield, System Equivalent Yield and Monetary Returns of Sweet Corn Based Crop Sequence as Influenced by Different Treatments (9 Years Pooled)

Treatments	Crop yield (q ha ⁻¹)			Equivalent yield (q ha ⁻¹)			System equiv. yield (q ha ⁻¹)	GMR (Rs ha ⁻¹)
	Sweet Corn	Rajma	Onion	Sweet Corn	Rajma	Onion		
T1	88.60	8.17	81.19	88.60	43.57	67.66	199.83	119899
T2	65.97	6.14	71.00	65.97	32.75	59.17	157.88	94730
T3	77.44 (2.38)	6.71 (23.23)	66.10 (15.38)	77.44	35.79	55.08	168.31	100986
T4	62.84	6.53	73.06	62.84	34.83	60.88	158.55	95130
T5	76.83	7.25	78.85	76.83	38.67	65.71	181.21	108723
T6	72.20	7.27	84.25	72.20	38.77	70.21	181.18	108709
T7	98.51	8.25	94.92	98.51	44.00	79.10	221.61	132966
T8	39.99	3.68	44.98	39.99	19.63	37.48	97.10	58260
SE m (±)	4.42	0.52	4.52	4.42	0.52	4.52	9.46	6576
CD@5%	12.41	1.45	12.69	12.41	1.45	12.69	26.55	18431

©Figures in parenthesis indicates the yield of intercrops.

©Selling price (Rs^q): sweetcorn-600, rajma-3200, onion-500, greengram-3400, fenugreek- 800 and clusterbean-1200.

Table 2
Available Nutrients in Soil After Harvest of Summer Onion in Sweet Corn Based Crop
Sequence During 2011-12

Treats	2008-09			2009-10			2010-11			2011-12			Average (4 years)		
	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K
T1	265	17.5	523	215	12.5	336	240	15.0	421	265	15.8	365	246	15.2	411
T2	215	13.6	448	253	14.3	448	244	13.9	418	238	20.4	525	238	15.6	160
T3	225	19.1	507	188	9.0	370	224	16.0	430	256	19.2	475	223	15.8	446
T4	197	14.6	440	256	17.9	437	210	14.2	410	209	19.1	420	218	16.5	427
T5	193	16.4	386	192	10.7	302	191	16.4	360	216	18.5	402	198	15.5	363
T6	230	18.5	480	225	12.5	481	235	17.3	468	223	17.8	420	228	16.5	462
T7	296	24.3	583	268	21.5	392	278	23.8	480	300	22.	400	286	22.9	464
T8	170	8.2	295	134	5.4	280	154	7.1	272	175	8.1	198	158	7.2	261
Initial value	177	13.0	285	-	-	-	-	-	-	-	-	-	-	-	-