

Productivity and Profitability As Influenced by Integrated Nutrient Management in Sorghum- Wheat Crop Sequence



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Abstract

Sorghum- wheat sequence is a popular double cropping system under irrigated condition in semi arid tract of Vidarbha region of Maharashtra. This cereal- cereal based crop sequence is fairly exhaustive but giving 3.1 to 3.7 t/ha grain yield of sorghum and 2.0 to 2.3 t/ha of wheat. Long term studies being carried out at several location in various cropping system throughout the country indicates that the application of all essential nutrients through chemical fertilizers alone has bad effect on response of sorghum and wheat crops individually. However, limited information is available on INM in cereal – cereal based sorghum-wheat crop sequence

Keywords: Productivity, profitability, INM, RDF, FYM, SEY, Monetary returnsetc.

Introduction

It has been realized that system based optimum use of different plant nutrient supply sources of organic, inorganic and in combination which will be more affordable, sustainable and remunerable for getting higher monetary return with fertilizer economy and better soil health with an object to identify the sustainable INSS for sorghum- wheat crop sequence in Vidarbha. Keeping this fact in view, the present investigation was undertaken to study the effect of chemical fertilizers alone and in combination with organics on productivity and profitability of productivity and profitability of sorghum- wheat crop sequence.

Materials and Methods

A field trial was conducted during 2011-12 at AICRP on IFSR Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS). The experimental site was leveled and uniform medium black cotton soil of an order inceptisol with carbon content of 0.40 %, available NPK (209,11, 350 kg ha⁻¹), P^H 7.4 and EC 0.20 dSm⁻¹. The experiment was laid out in RBD and replicated four times with 12 treatment combination indicating treatment T₁ and T₁₂ were control and farmers practice, treatments T₂ to T₅ were of reduced RDF and treatments T₆ to T₁₁ with INM used for *kharif* sorghum and wheat with 100, 75 & 50 % RDF alone. To fulfill the required dose of nutrient N to sorghum was made available through different organic sources viz., FYM, wheat straw and leucana loppings. Sorghum hybrid CSH-14 and wheat variety AKW-3722 were used for sowing along with University recommended package of practice for field operations. All organic and chemical fertilizers were applied treatment wise to individual plots before sowing and incorporated in soil except leucana loppings after inter-cultivation in sorghum. The treatment details are given below.

Treat	Kharif sorghum	Rabi wheat
T ₁	Control	Control
T ₂	50 % RDF through fertilizers	50%RDF through fertilizers
T ₃	50% RDF through fertilizers	100% RDF through fertilizers
T ₄	75% RDF through fertilizers	75% RDF through fertilizers
T ₅	100% RDF through fertilizers	100% RDF through fertilizers
T ₆	50 % RDF through fertilizers + 50% N through FYM	100% RDF through fertilizers
T ₇	75 % RDF through fertilizers +25% N through FYM	75% RDF through fertilizers
T ₈	50 % RDF through fertilizers +50% N through wheat straw	100% RDF through fertilizers
T ₉	75 % RDF through fertilizers +25% N through wheat straw	75% RDF through fertilizers
T ₁₀	50%RDFthroughfertilizers +50% N through leucana loppings	100% RDF through fertilizers
T ₁₁	75%RDFthrough fertilizers +25% N through leucana loppings	75% RDF through fertilizers
T ₁₂	Farmers practice (50:20:00 kg NPK ha ⁻¹)	Farmerspractice(40:20:12.5kgNPK ha ⁻¹)
RDF	120 :60 :60 kg NPK ha ⁻¹	120 :60 :60 kg NPK ha ⁻¹

Results and Discussion

Yield of Sorghum and Wheat (Productivity)

Data presented in Table 1 revealed that the treatment of T₇ being par with T₅, T₁₁, T₉ and T₆ recorded significantly superior grain and fodder yield (29.77 and 91.10 q ha⁻¹) of sorghum. Treatment T₁₀ being par with T₄ and T₈ registered significantly higher values for yields over the rests. Whereas, treatment T₃ being par with T₁₂ and T₂ recorded maximum grain and fodder yield of sorghum over control. Increase in productivity due to application of organic manures in combination of inorganic chemical fertilizers NPK (Pawar and Patil, 2007). In case of wheat, treatment T₇ being par with T₅, T₃ and T₁₀ recorded significantly higher grain and straw yield of wheat. Treatment T₆ being par with T₁₁, T₄ and T₉ and found significantly superior in recording higher grain yield over control. Whereas, treatment T₂ being par with T₁₂ and T₈ and recorded significantly more grain yield of wheat over control. Comparatively farmers practice had also recorded more grain yield than control. Similar trend was also observed for fodder yield of sorghum. It might be due to some amount of chemical fertilizers along with organics is desirable so as to supplement the nutrient demand of crop in initial stage of growth. However, in the later stage of growth the release of nutrient through decomposition and mineralization by soil microorganisms would help to sustain nutritional requirement of crop. Similar results were reported by several workers in different crops (Kale et al., 1991). Thus there is a scope of substituting 25 to 50 % N through used organic sources like, farm yard manure, wheat straw and leucana loppings etc.

Sorghum grain equivalent yield

Treatment of 75 % RDF + 25 % N through FYM to sorghum and 75 % RDF to wheat being par with treatment of 100% RDF to both the crops recorded significantly highest sorghum equivalent yield and found superior over rests (Table 1). Increased equivalent yield might be due to higher yield potential, price of produce and efficient use of space and time (Chaudhary et al., 2000). Thus there is a possibility to substitute 25 to 50 % N through fertilizers. Similar findings were narrated by Hegde (1998).

Monetary Returns (Profitability)

In sorghum- wheat crop sequence, significantly higher GMR, NMR and B: C ratios were recorded by treatment T₇ followed by T₅. From the results (Table 1), it can be concluded that there is a

scope of reducing the quantity of chemical fertilizers by 25 to 50 % and thereby saving of money expenditure on purchase of expensive inputs from market ultimately increase the income of farmers. These findings were in conformity of Bellaki and Badnaur, (2000) and Balaji, (1994).

Sustainable Yield Index, Sustainable Value Index and Agronomic Efficiency

Substitution of 50 % N through FYM + 50 % RDF to sorghum and 100 % RDF to wheat produced highest SYI (0.33) and SVI (0.34). Negative values for these characters were observed in control. While, higher (28.35) agronomic efficiency was noticed in farmers practice followed by INM treatments (Table1).

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Table 1.
Grain and Straw Yield, Sorghum Equivalent Yield, Monetary Returns, SYI, SVI and Agronomic Efficiency As Influenced by Different Treatments in Sorghum- Wheat Crop Sequence

Treatmens	Sorghum yield (q ha ⁻¹)		Wheat yield (q ha ⁻¹)		SEY (q ha ¹)	GMR(Rsha ¹)	NMR(Rsha ¹)	B : Cratio	SYI	SVI	Agron. efficiency
	Grain	Fodder	Grain	Straw							
T ₁	5.98	27.24	4.4	11.22	10.76	17810	-3371	0.84	-0.11	-0.13	00.00
T ₂	18.43	60.57	19.1	33.75	40.02	58484	34683	2.46	0.17	0.13	26.19
T ₃	21.23	68.58	29.42	51.57	54.49	78107	52862	3.09	0.29	0.16	24.57
T ₄	25.11	79.57	22.07	34.97	50.06	73003	47817	2.9	0.25	0.21	22.19
T ₅	28.44	90.14	29.92	41.95	62.26	89320	62900	3.38	0.33	0.34	20.45
T ₆	25.73	80.22	24.65	35.6	53.6	77228	50985	2.94	0.33	0.32	20.58
T ₇	29.77	91.1	31.8	56.25	65.72	94867	69181	3.69	0.30	0.3	21.85
T ₈	23.77	64.68	16.52	42.95	42.45	62817	36874	2.42	0.27	0.28	17.56
T ₉	27.4	83.46	20.67	32.05	50.78	74116	48580	2.9	0.26	0.28	19.49
T ₁₀	25.52	79.05	28.65	42.9	57.9	82737	56994	3.21	0.31	0.29	19.49
T ₁₁	28.12	82.84	22.15	37.75	53.16	77330	51883	3.04	0.29	0.28	21.29
T ₁₂	20.83	75.62	17.12	32.52	40.19	60817	37629	2.62	0.12	0.13	28.35
SEm ±	1.43	5.52	1.41	5.44	2.16	2504	2504	-	-	-	-
CD @%	4.12	15.11	3.98	15.3	6.22	7205	7205	-	-	-	-