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Original Research Article

Management of Nitrogen Levels and Harvesting Time under Sorghum (*Sorghum Bicolor*)-Legumes Intercropping System

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A B S T R A C T

A field experiment was conducted during the rainy (Kharif) season of 2004 and 2005 to study the effect of inter-crops, Levels of Nitrogen and harvesting time on yield and quality of forage sorghum [*Sorghum bicolor* (l) Moench] under irrigated condition. Sorghum intercropped with cowpea [*Vigna unguiculata* (l) Walp.] recorded significantly higher yield (578.1) and quality of forage (24.0 mean p.) as compared with sorghum as a sole crop or when Sorghum intercropped with clusterbean [*Lyampsis tetragonoloba* (l) Taubert]. Nitrigen @ 80kg + 2 tonnes vermi compost (V.C)/ cluster bean significantly increased the yield (549.5) and quality of forage over the 40kg N + 2t V.C./ha and 60kg N + 2t V.C./ha. Forage and crude protein yields of sorghum were increased when the harvesting was done at 70 days after sowing (DAS) over harvesting at 50 DAS and at par with harvesting at 60 DAS. On farm trials were repeated in 2010-11 for soil health evaluation.

Keywords

Nitrogen levels, Sorghum, Intercropping, Legumes

Introduction

Livestock sector plays an important role in rural economy of India. In this regard, Availability of Nutritious feed and Fodder is vital for the development of Livestock. Presently available feed and fodder resources of the country are able to meet about 40% of the total requirement. Intercropping of Cereal fodder with legumes is a prospective way to get quality forage in appreciable quality which adds advantages of soil enrichment. Harvesting time is also important management practice which influences yield and quality of forage. Nitrogen application is directly related to plant growth and forage production, keeping in view the above study was conducted.

Materials and Methods

The field experiment was conducted during rainy season of 2004 and 2005 on Farmers' field in Bithari Development Block of Bareilly district of Uttar Pradesh. The experiment was laid out in split plot design with3 intercrop combination as--sorghum sole, Sorghum + cowpea and sorghum + clusterbean; and 3 harvesting times as – harvesting at 50 days after sowing (DAS),

60DAS and 70DAS, keeping these in main plots ; and 3 levels of nitrogen as – 40kg N +2 tonnes vermi compost (V.C.)/ha, 60 kg N+2 t V.C./ha and 80 kg N + 2t V.C.)ha in sub plots with 3 replication. Sorghum hybrid variety – (SSG), intercropped with cowpea – Russian gaint and cluster bean (Bundel Guar 2) in 1:1 row ratio. Having seed rate 40 kg, 30kg, and 25kg/ha for sorghum, cowpea and clusterbean, respectively. The crop was raised with 30kg P2O5 and 30 kg K2O/ha along with 2tonnes of Vermi compost in the treatment.

Results and Discussion

Sorghum intercropped with cowpea recorded significantly higher green forage and dry matter yield over sorghum sole and sorghum + cluster bean. The results are similar to Das, SK *et al.,* (1995). Intercropping of Sorghum with cluster-bean also found significantly higher in green forage and dry matter productivity over sole crop of sorghum or cluster bean. This sorghum + cowpea higher yield may be attributed to complementary effect of cowpea which supplemented nitrogen to sorghum and better utilization of natural resources. Results are in correspondence to Singh & Singh (1987). Intercropping of sorghum with cowpea gave significantly higher crude protein and lower crude fiber than sorghum sole/intercropping with clusterbean. Sorghum as sole and sorghum + Clusterbean were found at par with each other for these quality parameters. The results are conformity with the findings of Ram *et al.,* (2001), Das S.K. *et al.,* (1995).

Sorghum harvested at 70 DAS yielded significantly higher green forage and dry matter of sorghum, sorghum + legumes than that harvested at 60 DAS. This might be due to longer duration which increased the value of growth parameters due to more synthesis of metabolites. Harvesting sorghum at 50 DAS produced significantly higher crude protein content and lower crude fibre content than harvesting at 70 DAS and 60 DAS. This may be ascribed to younger and succulent plants with higher nitrogen content. Results are similar to Tomar *et al.,* (2001).

Application of nitrogen @ 80kg N + 2 t V.C./ha significantly increased forage and dry matter yields of sorghum over all sorghum + legumes with N + 2t V.C./ha and 60 kg N + 2t V.C./ha. Nitrogen 60 kg N + 2 t V.C./ha also proved significantly superior to the treatment 40kg N + 2 + V.C./ha for green forage yield and dry matter yield (table 1A).

A Northern Ghana, planting fields with cowpea, suppress weeds before maize, yields a nutritious food at a time when other crops are not yet mature and provides nitrogen to the soil. In Panama planting maize in josh bean saved nitrogen application. All beans are planted along with maize. America where lands is limited and rainfall is low, Maize is often intercropped with Fawa beans. When maize and beans are intercropped, their yields are generally lower than those of maize or beans grain as in monoculture. However, under intercropping, production costs per unit of output are usually lower and because of beans sales up to four times higher price of maize. Farmer's income is higher and more stable (FAO, 2010).

Being drought tolerant, pigeon pea is often intercropped with cereals in small holder farming systems in India. Pigeon pea is also deep rooting, so does not competes with maize for water and is slow-growing in this early stages, which allows maize to establish properly. As with maize and beans, both maize and pigeon produce, 25 q of forage and residues that supply from 10 to 22 kg of nitrogen. The systems maize yield are more than double those of monocropping (Das *et al.,* 1995).

Table.1 Effect of intercropping and fertilization on forage yield and soil health

Treatment	Fertilization				Soil Health		
	40kg+ 2t VC	60kg+ 2t VC	80kg +2t VC	Mean	50 DAS Soil pH	60 DAS OM%	70 DAS Seed Protein %
Sorgh + Cowpea	525.2	578.7	630.3	578.1	7.3	0.65	24.3
Sorgh + Cluster.	505.4	530.3	612.9	549.5	7.1	0.59	35.2
Sorgh. Sole	498.9	517.4	602.4	539.6	7.4	0.52	12.5
Mean	509.8	542.1	615.2	-	7.3	0.6	24.0
Cd 0.05	6.07	7.12	5.44	-	-	0.55	0.67

Table.2 Effect of intercropping and fertilization on forage yield and soil health

Treatment	Fertilization				Soil Health		
	40kg + 2t VC	60kg+ 2t VC	80kg +2t VC	Mean	40kg+ 2t VC	60kg+ 2t VC	80kg +2t VC
	50 DAS	60 DAS	70 DAS		Soil pH	OM%	Seed Protein %
Sorgh + Cowpea	480.6	507.3	592.4	526.8	7.2	0.68	15.5
Sorgh + Cluster.	472.7	498.1	535.3	502.0	7.3	0.61	37.3
Sorgh. Sole	465.5	485.9	520.7	490.7	7.3	0.56	13.0
Mean	472.9	497.1	549.5	-	7.3	0.6	21.9
Cd 0.05	4.88	6.31	4.95	-	-	0.51	0.81

Fig.1 Figures on farm trials of farmers' field




Application of nitrogen @ 80 kg + 2 tonnes vermi compost/ha increased sorghum forage yield and harvest at 70 DAS improve the quality of forage. Protein content in seeds of cowpea, clusterbean and sorghum increased slightly with the increase of nitrogen fixation in root zone by the legume crops. Soil organic matter% was also improved after 5 years of cultivation on farmers field.

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