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Yield and quality of dual purpose sorghum -fodder cowpea cropping system as influenced by integrated nutrient management

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Introduction

Integrated nutrient management in cropping system ensures higher fertilizer use efficiency through balanced combination of organic manures and chemical fertilizers. INM is required to stimulate sustainability in production of crops in cropping sequence. Sorghum is commonly grown for grain and fodder in different agro-climatic regions of Andhra Pradesh. The crop can be grown both in *kharif* and *rabi* season. In our country, sorghum provides a cheap source of dietary carbohydrate and energy. Sorghum is a C_4 plant species however grain and fodder yields are low mainly because of low inputs. Since it is not precisely known that what would be the most advantageous combination of organic manure and inorganic nitrogen fertilizer to get maximum yield from sorghum crop, this experiment was formulated. Fodder cowpea is also included as *rabi* crop to quantify residual effect of nutrients in the system.

Materials and Methods

A field experiment was conducted at Livestock Research Institute farm, AICRP on Forage Crops, Rajendranagar, Hyderabad from 2005-2009 with nine treatments tested in randomized block design replicated thrice. Dual purpose sorghum variety PSV-1 was sown during *kharif* season and cowpea variety Co FC-8 was raised purely on residual fertility during *Rabi* season *i.e.*, immediately after the harvest of sorghum. In *kharif* sorghum 100 % nitrogen supplied through urea/ the manures *viz.*, FYM and Poultry Manure and VAM. Vesicular arbuscular mycorrhiza (VAM) @ 10 kg ha^{-1} as per the treatments were applied at the time of last ploughing. Recommended plant protection measures and irrigation and other agronomic practices were followed as and when required. *Kharif* sorghum was harvested at physiological maturity. The grain was used for consumption while the rest of the plant was used as fodder. The forage cowpea grown on residual fertility was harvested at 50 % flowering. The soil of experimental site was sandy loam in texture with pH 7.5, E.C. 0.26 dSm^{-1} and organic carbon 0.20 per cent. The available nitrogen, phosphorus and potassium were 144, 18.5 and 188.2 kg. ha^{-1}, respectively.

Results and Discussion

***Kharif* Sorghum:** The higher sorghum grain yield of 27.94 q/$ha^{-1}$was obtained when 25% NPK was substituted with PM, however, the treatment receiving 100% inorganic NPK (26.69 q/ha^{-1}) as well as the treatment receiving 100% inorganic NPK + VAM (25.20 q/ha^{-1}) was also on par with this best treatment. The 100% FYM and 100% PM receiving treatments were on par with each other recording 24.59 q ha^{-1} and 24.10 q ha^{-1} respectively.

The increase in the best performing treatments *viz*., T_6 – 75% NPK through inorganic fertilizer + 25% N through Poultry manure, T_2 – 100% NPK through inorganic fertilizer and T_9 – 100% NPK through inorganic fertilizer + VAM when compared with the absolute control (no NPK) was 138, 127 and 114 % respectively.

The green and dry fodder yields increased with increasing substitution of FYM and VAM because their application also increased growth parameters like plant height, dry matter accumulation etc.This increased dry matter production provides a better source sink relationship enhancing greater synthesis and translocation of metabolites to reproductive organs, leading to improved seed yields. Increased yields due to application of poultry manure were also reported by Madhavi *et al*., (1995).

***Rabi* Cowpea:** The green fodder yield of cowpea grown merely on residual fertility was significantly affected by various INM treatments. The 100 % NPK through inorganic fertilizers performed on par with 50 % inorganic NPK + 50 % N through FYM, 75 % NPK+25 % N through PM and 100 % inorganic NPK + VAM. Their green fodder yield varied between 166.24 and 180.34 q ha^{-1}. The yield increase in the best treatment (180.34 q ha^{-1}) was more than 200 % when compared to absolute control (81.5 q ha^{-1}). Similar trends were reflected in the dry fodder yields (Table 1) an increased yield of forage cowpea with residual fertility of FYM/PM was reported by Chandra *et al.,* (2008).

Quality: The crude protein content which is an important fodder quality parameter varied significantly with various INM treatments. Higher crude protein values of sorghum were recorded with 25% substitution of poultry manure and it was on par with 100 % N through inorganic fertilizers. Highest CP % of cowpea (16.87) was registered when 25% of inorganic NPK was substituted with PM, while all the treatments receiving 100% inorganic NPK or any substitution by any form of organic manure either FYM/PM or VAM recorded on per crude protein values

Table-1: Yield and yield attributes of dual purpose sorghum

Treatments	***Kharif* sorghum**			***Rabi* cowpea**		
	Grain yield (q/ha)	**Dry matter yield (q/ha)**	**Crude protein (%)**	**Green fodder yield (q/ha)**	**Dry fodder yield (q/ha)**	**Crude Protein (%)**
T_1 – Control (No.N)	11.76	96.81	5.73	81.59	16.46	13.43
T2 – 100% N through inorganic fertilizer	26.69	150.47	6.47	177.51	36.79	16.25
T3 – 75% N through inorganic fertilizer + 25% N through FYM	24.02	134.36	5.67	163.92	34.57	16.86
T4 – 50% N through inorganic fertilizer + 50% N through FYM	23.69	144.65	5.13	166.24	34.23	15.69
T5 – 100% N through FYM	24.59	135.26	5.73	136.92	27.21	15.40
T6 – 75% N through inorganic fertilizer + 25% N through Poultry manure	27.94	149.72	6.74	180.34	37.87	16.87
T7 – 50% N through inorganic fertilizer + 50% N through Poultry manure	23.20	135.16	5.79	155.95	33.02	16.54
T8 – 100% N through Poultry manure	24.10	130.08	5.89	150.84	30.77	16.31
T9 – 100% N through inorganic fertilizer + VAM	25.20	140.78	6.02	176.53	35.62	16.62
S Em ±	1.01	4.77		5.59	1.23	
CD (0.05)	2.83	13.42		15.73	3.47	

Conclusion

Crop production with Integrated Nutrient Management involving substitution of nitrogen through FYM/ PM/ VAM has positively influenced yields of the first crop of dual purpose sorghum and its residual effect on forage cowpea was also significant. Though their influence was positive, however, there was insignificant difference between the organic sources on the yield and quality.

References

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