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NUTRIENT AND DROUGHT MANAGEMENT PRACTICES FOR RAINFED SORGHUM UNDER VERTISOL

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ABSTRACT

Field experiments were conducted during north east monsoon seasons of 1994-95 and 1995-96 under vertisol of Tamil Nadu Agricultural University, Coimbatore to evolve suitable nutrient and drought management practices with combined use of inorganic fertilizers and organic manures along with various seed hardening materials in rainfed sorghum (Co 26). The results of the present study revealed that the enriched pig manure @ 875 kg with 40 Kg N ha^{-1} along with 2 per cent Calotropis leaf extract seed hardening for sorghum recorded higher growth attributes which inturn resulted in higher grain yield as compared to other treatments.

KEY WORDS : Rainfed sorghum, Growth, Yield, Inorganic fertilizer, Organic manure, Seed hardening

In India, Sorghum is cultivated in an extent of 12.59 million hectares with an annual production of 8.36 million tonnes (Anon., 1995). The major constraints for higher productivity of crops in drylands are the inadequacy of soil moisture and poor fertility status of the soil. Though lot of research evidences are available on the use of inorganic fertilizers, organic manures and various seed hardening materials for increasing the productivity of rainfed sorghum, information is limited on the combined use of enriched organic manure and seed hardening materials. Hence, the present investigation was carried out to evolve suitable nutrient and drought management practices for rainfed sorghum under vertisol.

MATERIALS AND METHODS

Field experiments were conducted in the vertisol of Tamil Nadu Agricultural University, Coimbatore on rainfed sorghum during north-east monsoon season of 1994-95 and 1995-96. The pH of the experimental field was 7.6 with low in available soil nitrogen (148.25 kg ha^{-1}), medium in available phosphorus (13.12 kg ha^{-1}) and high in available potassium (578 kg ha^{-1}). The experiments were laid out in split plot design with three replications. The different treatments for main plot (nutrient management) consisted of enriched farm yard manure @ 875 kg + 40 kg N ha^{-1}, enriched goat manure @ 875 kg + 40 kg N ha^{-1}, enriched coir pith @ 875 kg + 40 kg N ha^{-1} and enriched pig manure @ 875 kg + 40 kg N ha^{-1}, well decomposed powdered farm yard manure, goat manure, pig manure each of them @ 750 kg ha^{-1} was used with the recommended dose of phosphorus as single super phosphate viz., 125 kg ha^{-1}. The sub plot treatment (seed hardening) consisted of cowdung extract at 15 per cent, garlic (*Allium sativum)* bulb extract at 2 per cent, *Calotropis gigantea* leaf extract at 2 per cent, *Morinda tinctoria* leaf extract at 2 per cent and potassium dihydrogen phosphate at 2 percent. Sorghum seeds were soaked separately in these solutions in the ratio of 1:0.6 (wt/vol) seed : solution for 16 hours and then dried in shade to original moisture content. These hardened seeds were used for sowing as sub plot treatments. The nitrogen was given in two splits, of which half of the dose of of nitrogen was given at the time of sowing and the remaining half of the dose of nitrogen was applied 30 days after sowing ie., at the time of receipt of adequate rains.

RESULTS AND DISCUSSION

The data on growth attributes such as plant height, root length and dry matter production (Table 1) and the yield attributes such as earhead weight, grain weight per earhead and grain yield (Table 2) were more when enriched pig manure @ 875 kg with 40 kg N ha^{-1} was applied. Application of enriched farm yard manure @ 875 kg with 40 kg N ha^{-1} recorded lesser plant height, root length, dry matter production, lower earhead weight, grain weight per earhead and grain yield during both the years of study.

Maximum growth and yield attributes and grain yield of sorghum obtained by the enriched pig

Table 1. Effect of nutrient management and seed hardening on growth attributes of sorghum during 1994-96.

Treatments	Plant height (cm)		Root length (cm)		Drymatter production (Kg ha^{-1})	
	94-95	95-96	94-95	95-96	94-95	95-96
Main plot						
Enriched farm yard manure @875 kg +40 kg N ha^{-1}	149.8	148.7	27.7	27.0	12636	12508
Enriched goat manure @ 875 kg+40 kg N ha^{-1}	159.3	158.4	30.1	29.4	13423	13349
Enriched coirpith @ 875 kg+40 kg N ha^{-1}	174.7	174.0	34.4	33.8	14431	14350
Enriched pig manure @ 875 kg+40 kg N ha^{-1}	188.7	187.6	39.7	39.1	16121	15954
CD (P = 0.05)	8.5	8.0	1.8	1.5	687.1	666.6
Sub plot						
Cow dung extract 15%	177.5	176.3	35.0	34.4	14355	14256
Garlic bulb extract 2%	166.2	165.5	33.0	32.3	14104	14040
Calotropis leaf extract 2%	193.8	193.2	37.0	36.4	14925	14779
Morinda tinctoria leaf extract 2%	155.7	155.0	31.0	30.3	13804	13701
Potassium dihydrogen phosphate 2%	147.3	146.2	29.0	28.3	13576	13425
CD (P = 0.05)	8.0	7.7	1.6	1.2	454.9	508.4
Interaction	NS	NS	NS	NS	NS	NS

manure @ 875 kg with 40 kg N ha^{-1} might probably be due to the regular and balanced release of nutrients (Gonzalex *et al.*, 1992) and adequate availability of macronutrients, particularly nitrogen with enriched pig manure as compared to other organic manures. Application of enriched pig manure also resulted in enhanced root length to a maximum of 39.7 and 39.1 cm over others recorded during 1994-95 and 1995-96 respectively. The increased root length could have resulted in the

Table 2. Effect of nutrient management and seed hardening on yield attributes and grain yield of sorghum during 1994-96.

Treatments	Earhead weight (g)		Grain weight per earhead (g)		Grain yield (Kg ha^{-1})	
	94-95	95-96	94-95	95-96	94-95	95-96
Main plot						
Enriched farm yard manure @875 kg + 40 kg N ha^{-1}	31.94	31.91	27.89	27.85	933.0	890.0
Enriched goat manure @875 kg+40 kg N ha^{-1}	37.98	37.92	28.01	27.93	945.0	901.0
Enriched coirpith @875 kg+40 kg N ha^{-1}	41.04	40.84	31.09	31.05	1017.0	972.0
Enriched pig manure @875 kg+40 kg N ha^{-1}	43.86	43.75	34.28	34.24	1080.0	1035.0
CD (P = 0.05)	2.11	1.99	1.48	1.45	56.0	48.0
Sub plot						
Cow dung extract 15%	42.40	42.37	32.26	32.20	1044.0	999.0
Garlic bulb extract 2%	39.68	39.61	29.94	29.84	981.0	937.0
Calotropis leaf extract 2%	44.92	44.78	34.42	34.36	1113.7	1067.0
Morinda tinctoria leaf extract 2%	37.16	36.90	27.65	27.57	929.0	885.0
Potassium dihydrogen phosphate 2%	36.39	36.78	27.33	27.27	904.0	860.0
CD (P = 0.05)	2.10	1.96	1.43	1.45	43.0	42.0
Interaction	NS	NS	NS	NS	NS	NS

better absorption of both water and nutrients and for ultimate increased yield over others.

Seeds hardened with Calotropis leaf extract at 2 per cent produced taller plants, longer roots, more dry matter production, maximum yield attributes and grain yield as against other seed hardening materials. Application of 2 per cent Calotropis leaf extract resulted in maximum plant height of 193.8 and 193.2 cm and root length of 37.0 and 36.4 cm respectively during 1994-95 and 1995-96. The earhead weight (44.9 and 44.8 g) and earhead grain weight (34.4 and 34.3 g) obtained during the two seasons were also the maximum over other treatments. Among all the treatments maximum grain yield of 1113.7 and 1067.0 kg ha^{-1} was obtained during 1994-95 in the seed hardening method through Calotropis extract. Seed hardening with 2 per cent potassium dihydrogen phosphate reduced growth attributes, yield attributes and grain yield during two years of study. During the two years of study the interaction effect of nutrient management and seed hardening was not significant. Better growth characters such as plant height, root length, dry matter production and yield attributes such as earhead weight, grain weight per earhead and grain yield recorded with Calotropis leaf extract as a seed hardening material might be due to the better hardening effect over the other sources tried. Pre sowing seed hardening possibly might have resulted in the modification of the physiological and biochemical nature of the seed favourably for drought resistance. Eventually this resulted in the absorption of more water due to increase in the elasticity of cells and development of efficient root system (Karivaratharaju *et al.*, 1991).

Efficient root system thus might have helped in the absorption of more water and nutrients from soil improving various plant growth and yield attributes and finally the yield.

Hence, from the present study it is inferred that the application of enriched pig manure @ 875 kg with 40 kg N ha^{-1} as a nutrient source and seed hardening with Calotropis leaf extract at 2 per cent increased the rainfed sorghum growth and yield attributes and grain yield.

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EFFICIENCY OF DUAL CROPPING OF GREEN MANURES WITH MAIZE ON WEED MANAGEMENT

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ABSTRACT

Two field experiments were conducted at Tamil Nadu Agricultural University, Coimbatore during *rabi*, 1994 and *Kharif*, 1995 to investigate the weed suppressing effect of green manures grown with maize as dual crop. The results revealed that raising cowpea as a dual crop with maize at a spacing of 60 x 20 cm not only suppresses the weed growth but also supplies nutrient to the crop, resulting in highest grain yield, (62 q/ha) net return (Rs. 12,006/ha) and BC ratio (2.06) compared to 43.6 q/ha, Rs. 6376/- and 1.55 respectively under sole cropping of maize.

KEY WORDS : Green manure, Dual cropping

Maize is one of the important cereal crops of India and it ranks third after wheat and rice. It is a high yielding cereal crop which gives maximum tonnage per unit area and unit time. Maize is important not only for grain production but also for fodder production. In India the average yield of maize is only 11.25 q ha^{-1} against the world averge of 45 q ha^{-1}.