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^{15}N RECOVERY OF SORGHUM IN A RED SANDY SOIL

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ABSTRACT

A field experiment was conducted to study the ^{15}N recovery of sorghum. Co.25. in a red sandy soil (Typic Haplustalf) at the Millet Breeding Station of Tamil Nadu Agricultural University, Coimbatore. The total ^{15}N recovered by the sorghum was very less. The FUE calculated based on the total ^{15}N recovery was 21.62 percent after havest. A negative N balance was obtained at the end of each physiological stage. The amount of ^{15}N unaccounted at the end of crop period was 25.81 kg ha^{-1}.

KEY WORDS : Labeled urea, ^{15}N recovery, Mass spectrometer, N-balance, Fertilizer use efficiency

Urea is one of the main inputs in agricultural production.Studies conducted with sorghum indicated very high N losses and low plant recovery for N fertilisers. In a two year study in Northern Australia, Myers (1979) reported, only 13-31 percent of the ^{15}N labeled fertiliser applied either as ammonium sulfate, ammonium nitrate or urea was taken up by grain sorghum. In a ^{15}N balance study, Buresh *et al.*, (1984) reported that the recovery of labeled fertiliser N by sorghum ranged from 38.2 to 58.7 percent for various N sources. Rao and Shinde (1984) reported that sorghum utilised 25.5 percent of applied ^{15}N which was more through weeding than by crop uptake. The application of ^{15}N techiniques in agricultural research is a tool to evaluate the use of fertiliser with better precision. This study was undertaken to find out the ^{15}N recovery and fertiliser use efficiency of N by sorghum crop in a red sandy soil.

MATERIALS AND METHODS

A field experiment was conducted in the summer (Jan- may, 1987) in a red sandy soil (Typic Haplustalf) at the Millet Breeding Station of Tamil nadu Agricultural University. The test crop used in the study was two sorghum cultivars, viz., Co. 25 and Co.26. Four levels of N (0, 50, 100 and 150 kg N ha^{-1}) where tried with a common dose of 45 kg ha^{-1} of P_2O_5 and K_2O. Among the four levels of N applied, ^{15}N labeled urea was used only at 100 kg N ha^{-1}. Application of labeled urea was restricted to the microplots and the remaining area of the treatment was supplied with ordianry prilled urea. Phosphorus and potassium were applied basally at the time of sorghum sowing. The N use efficiency was worked out with ^{15}N techniques only in one sorghum variety *via.*, Co.25.

The ^{15}N analysis was carried out using a VG Micromass 622 Mass spectrometer available in the

Table 1. Surface and sub - surface total ^{15}N content at different physiological stages (Tagged at 100 kg N ha^{-1} level)

Stage	Surface				Sub-Surface			
	% Excess	% NdfF	Total amount of N (kg ha^{-1})	kg NdfF	% Excess	% NdfF	Total amount of N (kg ha^{-1})	kg NdfF
Vegetative Stage	0.671	6.71	646.35	43.078	0.539	5.39	524.29	28.387
Flowering Stage	0.604	6.04	628.53	38.147	0.736	7.36	324.54	23.650
Harvest Stage	0.489	4.89	637.65	30.863	0.498	5.07	430.72	21.711

Table 2. ^{15}N recovered by sorghum (Co.25) at different physiological stages (Tagged at 100 kg N ha^{-1} level)

Stage	% Excess	% NdfF	N uptake (kg ha^{-1})	kg NdfF	FUE
Vegetative stage					
Shoot	2.7937	27.937	55.053	15.564	15.56
Flowering stage					
Shoot	1.6650	16.650	99.067	16.314	16.31
Earhead	0.0321	0.321	11.509	0.037	0.04
Total	1.6970	16.971	110.577	18.584	18.58
Harvest Stage					
Straw	1.2618	12.618	52.507	6.624	6.62
Grain	0.4769	4.769	71.875	3.419	3.41
Total	1.7387	17.387	124.383	21.623	21.62

Soil Science and Agricultural Chemistry Department, Tamil Nadu Agricultural University, Coimbatore, according to the method of Rittenberg (1948) as described by Bremner (1965) and standardised by Manickam (1987).

RESULTS AND DISCUSSION

The results (Table-1) of the ^{15}N assay revealed that the sub-surface total ^{15}N contents were less when compared to the surface soils. Similar decrease in total ^{15}N contents with increase in depth was reported by Cleemput et al., (1981) in sandy loam soil. In the surface layer the total ^{15}N contents decreased from vegetative stage (6.71% NdfF; Nitrogen derived from fertilizer) to post - harvest stage (4.89% NdfF). Similar trend was noticed in the sub-soil also from 5.39 to 5.07% NdfF. The decreasing trend of applied ^{15}N may be attributed to the continuos removal by the growing crop due to its enhanced growth and also by the natural losses that might have occurred during that period of crop growth.

The total ^{15}N (Table-2) recovered by the sorghum (Co.25) crop exhibited a decreasing trend from 27.94% NdfF to 17.39% NdfF with age of the crop. This may be attributed to the dilution effect of applied ^{15}N as a result of increased dry matter production. The quantity of ^{15}N translocated from shoots to earheads was 4.77% NdfF at the end of the maturity stage. The FUEcalculated based on the total ^{15}N recovery was 21.62% after harvest. Such low recovery in sorghum crop was also obtained by Ayoub (1986) in the Sudan Gezira soil.

The nitrogen budget worked out with the ^{15}N data (Table-3) indicated a negative balance in all the stages which corresponds to the unaccounted ^{15}N at the end of the vegetative, flowering and harvest stages. The unaccounted ^{15}N at the end of the crop period was 25.81 kg ha^{-1}.

The ^{15}N assay of total ^{15}N contents showed a higher concentration of applied fertilizer N in the surface soil than sub-soil. The trend in the concentration was a decreasing one at different

Table 3. Nitrogen - 15 balance for sorghum (Co.25) at different stages (Tagged at 100 kg N ha^{-1} level) (Depth 0 - 30 cm)

No.	Stage	Initial Total ^{15}N Kg ha^{-1}	Final Total ^{15}N kg NdfF	Crop uptake kg NdfF	^{15}N Balance Kg ha^{-1}
1.	Vegetative stage	100	71.465	15.56	-12.98
2.	Flowering stage	100	61.797	18.58	-19.62
3	Harvest stage	100	52.574	21.62	-25.81

growth stages. The total ^{15}N recovered by the sorghum (Co.25) was very less. The FUE calculated based on the total ^{15}N recovery was 21.62 percent after harvest.

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ASSESSMENT OF STABILITY PERFORMANCE IN PIGEONPEA

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ABSTRACT

Fifty three genotypes of pigeonpea grown over four different environments were analysed for stability of 10 biometrical traits. The pooled analysis of variance showed the presence of enough diversity among genotypes and among environments. Based on three stability parameters, MSPrabhatDT / Vamban1, QMS1 / ICPL161 and MST21 / ICPL 161 recorded stable performance for seed yield along with desirable mean.

KEY WORDS : Genotypes, Diversity, Stability, Seed yield

Exploitation of hybrid vigour is one of the potential avenues for quantum jump in the grain yield of crop plants. The indetification of genetic male sterility and the presence of a considerable degree of natural outcrossing have made it possible to exploit non-additive genetic variation through, economical production of heterotic hybrids in pigeonpea. It is commonly observed that the performance of different genotypes varies in different environments. The occurrence of genotype x environment interactions has provided a major challenge in obtaining a complete understanding of genetic control of variability. The study of genotype-environment interaction in biometrical aspects is thus important from the genetical and evolutionary point of view. In the present study, the phenotypic stability of 13 parents and 40 hybrids was assessed and the stability performance of different characters in pigeonpea was computed.

MATERIALS AND METHODS

The experimental material comprised of eight geenetic male sterile lines *viz*. MSPrabhatDT and five testers viz. ICPL151, ICPL161, Vamban1, ICPL87 and ICPL84032 (totally 13 parents) and fourty hybrids of pigeon pea generated by 13 parents

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