The study shows genetic variation among 126 varieties consisting 119 Desi Varieties including one double seeded genotype and few kabuli types. An apparent feature emerges from the analysis that most of kabuli genotype formed separate constellations in cluster III with exception of some desi genotypes. The cluster III genotypes posses the outstanding character of high number primary and secondary branches, 100 seed weight and yielding potential. It has been found that genotypes within cluster (III) are genetically divergent. These genotypes could be well utilized for evolving varietal improvement programme. Other clusters are also having divergent characters. In cluster VI. ICHRN-1 genotype possessed the higher number of branching habit, cluster VII, ICC 16340 genotype having highest number of pods/ plant among the entries, cluster V possessing genotype BG 256 for the highest 100 seed weight and cluster II genotype PLS 5433-2 for plant vigor. So, the divergent characters may be well utilized in hybridization programme for widening genetic base and also for selection. Cluster I varieties are having moderate yield component characters for all the genotypes.

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Effect of organics and irrigation levels on soil physical properties and yield of crops under sorghum-soybean cropping system

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Abstract : Field experiment was conducted to study the effect of addition of organic manures on physical properties, yield of Sorghum and the residual effect on the succeeding Soybean with different tillage treatments for residue management at TNAU under Sorghum-Soybean cropping sequence. The results revealed that the addition of organic manures to the first crop of Sorghum improved the soil physical properties such as bulk density, hydraulic conductivity, capillary and non capillary porosity besides yield enhancement. The residual effect of organics on Soybean yield was also noticed. However, the level of irrigation had no effect on the physical properties studied. *(Key Words : Sorghum - Soybean cropping system, organic manures, Bulk density, Hydraulic conductivity and Porosity)*

Crop yields are mainly controlled by physical, chemical and biological properties of the soil. Besides chemical and biological properties, the soil physical environment, especially bulk density, hydraulic conductivity and pore size distribution of the soil play a major role in providing good soil health. Further, physical properties are directly influenced by the application of organics. Addition of organics helps to have higher water retension by soils. The present study was made with the objective of studying the interactive effect of organics and irrigation levels on soil physical properties and to study the residual effect of organics on the residual crop of soybean under sorghum-soybean cropping sequence.

Materials and Method

A field experiment under sorghum-soybean cropping sequence was conducted at TNAU Farm, Coimbatore. The experimental soil was a clay loam with neutral reaction having low available N and P and medium available K. The hydraulic conductivity and bulk density were 3.86 Cmh^{-1} and 1.32 Mg m^{-3}. The total porposity of the soil was 47.3% of which 28.6% capillary and 16.15 non cappillary porosity. The main plot treatments for the first crop of sorghum were, three irrigation levels viz., 45%, 60% and 75% available soil moisture whereas the following were the sub plot treatments:

1. Composted Coir Pith (CCP) at 12.5 t/ha.
2. Raw Coir Pith (RCP) at 12.5 t ha^{-1}.
3. Poultry Manure (PM) at 5 t ha^{-1}.
4. Goat Manure (GM) at 5 t ha^{-1}.
5. Farm Yard Manure (FYM) at 12.5 t ha^{-1}.
6. Control.

The treatments were replicated thrice in a split plot design with the test crop of Co.26. Sorghum as the main crop. Recommended dose of N, P & K were applied and routine cultural practices followed and the yield of sorghum grain and straw were recorded at harvest. The post harvest soil samples were analysed for the physical properties (Gupta & Dhakshinamoorthy, 1981). The above sub plots treatments were tested for their residual effect on soybean, Co1 as a residual crop.

The following ploughing treatments were imposed for soybean crop for stubble management.

C1 - Ploughing with country plough followed by collection and burning of stubbles in situ.

C2 - Ploughing with country plough followed by collection and decomposition of stubbles using pleurotus

C3 - Disc ploughing after irrigation and incorporation of stubbles.

C4 - Disc ploughing without irrigation and incorporation of stubbles.

All the data were subjected to statistical scrutiny and presented (Table 1-5).

Results and Discussion

The grain yield of sorghum is presented in Table 1. Application of poultry manure @ 5 t ha^{-1} recorded the highest grain yield (1994 kg ha^{-1}) which was significantly superior to all the other treatments and the increase was 15.26 per cent over control. Next to poultry manure, farm yard manure recorded the maximum grain yield (1896 kg ha^{-1}) which was also significantly higher than raw coir pith (1786 kg ha^{-1}). This yield increase was quite expected since the addition of organics would have created better soil physical environment besides the nutrient addition. This reasoning could be confirmed from the analytical data on soil physical properties. However, there was no significant variation observed among irrigation levels in influencing the grain yield of sorghum. This could be explained as there may not be significant difference in moisture retention of the soil due to the addition of organics beyond 55-75 days after application as a result of rapid mineralisation. The effect due to the organics and irrigation treatment was not so marked with regard to straw yield.

The bulk density of the soil varied from 1.307 to 1.367 Mg m^{-3} at 0-15 cm depth and 1.403 to 1.469 Mg m^{-3} at 15-30 cm depth (Table 2). A slight increase in bulk density of surface soil might be due to clay compaction. In general application of organics improved the bulk density of the soil in both the surface and subsurface. The favourable effect of organics was earlier reported in the same soil (Anon, 1995). The effect of different irrigation levels on bulk density was not well pronounced.

The hydraulic conductivity (Table 3) of the soil varied from 4.20 to 4.80 cm h^{-1} Irrigation levels had no impact on hydraulic conductivity of the soil at post harvest stage of the first crop. As in bulk density, application of organic manures significantly increased the hydraulic conductivity of the soil.

Table 1. Effect of organics and irrigation levels on the grain and straw yield of sorghum

Treatments	Grain yield (kg ha^{-1})				Straw yield (kg ha^{-1})			
	Available Soil Moisture				Available Soil Moisture			
	45%	60%	75%	Mean	45%	60%	75%	Mean
CCP @ 12.5 t ha^{-1}	1847	1827	1917	1863	5748	5742	4987	5498
RCP @ 12.5 t ha^{-1}	1697	1807	1800	1768	5742	5579	5471	5597
PM @ 5 t ha^{-1}	2017	1937	2028	1994	5634	5471	5038	5381
GM @ 5 t ha^{-1}	1857	1867	1867	1863	5688	5688	5471	5616
FYM @ 12.5 t ha^{-1}	1883	1902	1903	1896	5146	5580	5959	5562
Control	1740	1720	1730	1730	5579	5688	5678	5648
Mean	1840	1843	1874	-	5590	5625	5434	

	SE_d	CD	SE_d	CD
Irrigation levels	10.4	N.S	195	NS
Organics	45.8	94	341	NS
Irrigation levels x organics	56.1	N.S	590	NS

Table 2. Effect of organics and irrigation levels on the bulk density ($Mg\ m^{-3}$)

Treatments	45% ASM		60% ASM		75% ASM		Mean
	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	
CCP	1.360	1.420	1.353	1.407	1.367	1.433	1.390
RCP	1.310	1.403	1.307	1.403	1.313	1.400	1.356
PM	1.343	1.437	1.343	1.443	1.333	1.440	1.390
GM	1.327	1.443	1.327	1.443	1.337	1.460	1.389
FYM	1.360	1.420	1.350	1.420	1.367	1.420	1.389
Control	1.347	1.433	1.313	1.440	1.327	1.447	1.384
Mean	1.341	1.428	1.332	1.426	1.341	1.433	-

	Irrigation levels	Organics	Depth	Org. x Depth
SE_d	0.003	0.005	0.003	0.007
CD	NS	0.010	0.006	0.015

Table 3. Effect of organics and irrigation levels on the hydraulic conductivity of the soil at different depth ($cm\ h^{-1}$)

Treatments	45% ASM		60% ASM		75% ASM		Mean
	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	
CCP	4.497	4.193	4.463	4.197	4.540	4.210	4.350
RCP	5.170	4.333	5.220	4.383	5.240	4.423	4.795
PM	4.873	4.100	4.837	4.103	4.750	4.157	4.470
GM	4.437	4.000	4.433	4.002	4.330	3.997	4.200
FYM	4.297	4.217	4.290	4.250	4.373	4.253	4.280
Control	4.500	4.110	4.513	4.083	4.517	4.150	4.312
Mean	4.629	4.159	4.626	4.626	4.625	4.198	-

	Irrigation levels	Organics	Depth	Org. x Depth
SE_d	0.015	0.025	0.015	0.036
CD	NS	0.025	0.015	0.036

Table 4. Effect of organics and irrigation levels on the total porosity (capillary and non capillary) of the soil (percent)

Treatments	45% ASM		60% ASM		75% ASM		Mean
	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	
CCP	52.34	51.33	52.93	51.13	51.82	51.31	51.81
RCP	49.55	50.27	49.54	49.47	51.08	49.28	49.86
PM	54.87	56.63	51.12	56.28	55.24	56.28	55.57
GM	59.95	88.87	59.34	58.47	59.59	58.21	59.07
FYM	57.32	59.07	57.31	58.40	57.30	57.13	57.76
Control	44.16	43.00	44.48	42.50	44.47	41.85	43.41
Mean	53.03	53.19	52.95	52.71	53.25	52.34	-

	Irrigation levels	Organics	Depth	Org. x Depth	Org. x Depth	Irri. levels x Depth
SE_d	0.09	0.18	0.10	0.25	0.31	0.18
CD	NS	0.35	0.21	0.50	0.61	0.35

Table 5. Effect of ploughings and organic residue management on the grain yield of soybean ($kg\ ha^{-1}$)

Organics	Ploughings				Mean
	C1	C2	C3	C4	
CCP	981	837	883	760	838
RCP	704	797	839	760	775
PM	1037	948	965	870	955
GM	800	853	822	798	818
FYM	899	952	965	898	929
Control	638	641	661	647	647
Mean	827	836	856	789	-

	SE_d	CD
Ploughings	32.5	NS
Organics	19.7	40
Ploughings & organics	39.3	80

The porosity (Table 4) viz., capillary, non capillary and total porosity of the soil was also increased due to the addition of organics. The improvement in all the above soil physical properties were quite explainable since the reduced bulk density which caused an increase in the porosity of soil and improvement in hydraulic conductivity might have provided good physical environment for crop growth which in turn reflected in grain yield of sorghum.

In the residue management studies, different tillage treatment did not have any influence on the grain yield of soybean. However, organic manure applied plots recorded significantly higher yield as compared to control. (Table 5). The residual effect of organic manure in terms of physical and chemical fertility maintenance would have resulted in high yield of soybean.

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Direct and residual effect of combined application of basic slag with green leaf manure on soil available nutrients and yield of rice

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Abstract : Field experiments were conducted on sandy clay loam soil (Udic Haplustalf) at Central Farm of Agricultural College and Research Institute, Madurai to study the effect of added levels of basic slag with green leaf manure on ADT 36 rice. Addition of graded levels of basic slag viz., 500, 750 and 1000 kg/ha significantly increased the soil available P, Ca, Mg, Fe, Si and the grain and straw yield of rice. Application of 1000 kg of basic slag with 12.50 or 18.75 t/ha of green leaf manure recorded the highest soil available nutrients as well as grain and straw yield of rice over rest of the treatments. The residual crop yield was also significantly increased over NPK treated control by conjunctive use of basic slag with green leaf manure at higher level (1000 kg of basic slag with 18.75 t/ha of green leaf manure). The superiority of basic slag with green leaf manure in increasing the soil available nutrients was proved only at higher doses. ***(Key Words : Basic slag, Green leaf manure, Residual effect)***

A safe disposal of several industrial wastes possesses a great problem. These waste materials and by-products of industries contain some amount of plant nutrients besides it's soil ameliorative properties. These properties can be well utilized for better crop production. In India basic slag, a by-product of steel industry containing calcium silicophosphate, is produced to the tune of 1.5 million tonnes annually. Basic slag has been in use as an phosphatic fertilizer in European countries. In India the use of basic slag is no way comparable to the situation prevailing in Europe due to its low P_2O_5 content which varies from 2-6 per cent as against the maximum of 12 per cent P_2O_5 content in European basic slag. Several attempts have been made in India as well as in abroad to study the fertilizer value of basic slag. However, the reported results are not always in agreement. The value of material depends on its composition, soil characteristics, crop species and crop succession. The liming effect of basic slag was demonstrated in many research attempts, however work on neutral and alkaline soils are not adequate. Hence, the present study was undertaken to assess the direct and residual effect of basic slag along with green leaf manure on soil available nutrients, grain and straw yield of rice in neutral soils.

Materials and Methods

Field experiments were conducted on sandy clay loam soil (Udic Haplustalf) at the Central Farm of Agricultural College and Research Institute, Madurai. Analytical values of initial soil and chemical composition of basic slag and green leaf manure used in the studies are presented in Table-1. Four levels of basic slag (0, 500, 750 and