yield obtained in the two or three component system could be due to the additional nutrients gthat were made available for the crop growth.

So it could be concluded that the increased availability of nutrients through three component system viz., FA plus compost plus fertilisers increased the uptake of essential nutrients which in turn increased the yield of groundnut. The results also clearly borught out that Pand K could be reduced to the tune of 25% of the blanket recommendation when FA was integrated with compost and fertilisers.

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EFECT OF ORGANIC MANURES AND TILLAGE PRACTICES ON SOIL PHYSICAL PROPERTIES AND CROP YIELDS UNDER SORGHUM-SOYBEAN CROPPING SEQUENCE

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ABSTRACT

A field experiment was conducted to study the effect of organic manure application on soil physical properties at the harvest of the sorghum crop and its residual effect on the succeeding crop of soybean. The residual effect was studied in combination with tillage treatments that the addition of organic manures to the first crop especially poultry manure and farm yard manure increased the yield besides improving the physical properties of soil and organic carbon status. The residual effect of organic manures was well pronounced in soybean yield. Though the improvement in soil physical properties as influenced by different organic manures did not significantly vary among themselves, the physical fertility increased markedly over control. Disc ploughing and stubble management without irrigation enhanced the total porosity and hydraulic conductivity of the soil significantly.

KEY WORDS: Soil physical properties, Bulk density, Porosity, Hydraulic Conductivity, Organic manures, Sorghum-Soybean sequence.

Organic manures have direct and indirect effect on crop production. They replenish the soil available nutrients depleted by cultivation besides improving the soil physical environment for crop production. The changes in physical properties as influenced by tillage practices and organic manuring pertaining to sorghum-soybean cropping sequence were aimed in the present study.

MATERIALS AND METHODS

Field experiment was conducted under sorghum-soybean cropping sequence at TNAU Farm, Coimbatore. The following were the treatments in the main test crop of sorghum. 1. Composted coir pith (CCP) at 12.5 tha^{-1}, 2. Raw coir pith (RCP) at 12.5 tha^{-1}, 3. Poultry manure (PM) at 5 tha^{-1}, 4. Goat manure (GM) at 5 tha^{-1}, 5. Farm yard manure (FYM) at 12.5 tha^{-1}, 6. Control.

The treatments were replicated three times in split plot design the experimental field soil was sandy loam in texture with neutral reaction (pH 8.0). The bulk density of soil was 1.45 mg m^{-3}, hydraulic conductivity, 3.15 cm h^{-1} and total porosity, 51.76%. The available N status was low with organic carbon content of 0.420%. The test crop of Co.26 was grown first (main crop) with recommended doses of major nutrients. The post harvest soil samples were analysed for soil physical properties, viz., bulk density, hydraulic conductivity, infiltration rates and porosity. A residual crop of soybean was raised after imposing the following tillage treatments.

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.

Besides recording the yield of soybean, the post harvest soil samples were analysed for physical properties. All the data were subjected to statistical scrutiny and presented.

RESULTS AND DISCUSSION

Application of poultry manure at 5 t ha- recorded the maximum grain yield of 3137 kg ha which was significantly superior to control (253 kg ha^{-1}) and raw coir pith applied plots (2604 kg ha^{-1}). However the yield at poultry manure applied plot was on par with the yield of composted coir pith, goat manure and farm yard manure applied

Table 1. Effect of organics on physical properties and the yield of sorghum Co. 26

Treatments	Sorghum yield (kg/ha)		Bulk density (Mg m^{-3})			Hydraulic conductivity (cm h^{-1})			Infiltration rate	Organic Carbon
	Grain	Straw	0-15 cm	15-30 cm	Mean	0-15 cm	15-30 cm	Mean	Cm hr^{-1}	%
T1	2953	20767	1.325	1.485	1.405	4.085	3.968	3.891	2.575	0.586
T2	2604	18517	1.433	1.573	1.503	4.493	3.818	4.155	2.293	0.664
T3	3137	32084	1.413	1.540	1.473	4.088	3.650	3.869	2.783	0.589
T4	3097	21883	1.443	1.540	1.481	4.043	3.853	3.948	2.993	0.678
T5	3065	21648	1.318	1.488	1.403	4.325	3.823	4.084	2.973	0.509
T6	3531	18068	1.525	1.720	1.623	3.688	3.315	3.501	2.088	0.449
Mean	-	-	1.406	1.558	-	4.122P	3.694	-	-	-
	Organics (O)		Depth (D)	OXD	O	D	OXD			
SED	102	718	0.021	0.017	0.030	0.26	0.104	0.181	0.065	0.041
CD	218	1534	0.043	0.035	NS	0.260	0.212	NS	0.139	0.088

Table 2. Effect of organics and tillage treatments on the yield of residual crop of soybean (kg ha^{-1})

Organics	Tillage				
	C1	C2	C3	C4	Mean
Composted coir pith	622	600	778	711	678
Raw coir pith	566	622	511	556	567
Poultry manure	511	577	578	555	555
Goat Manure	600	756	822	689	717
Farm Yard manure	733	577	933	889	783
Control	467	489	511	533	500
Mean	583	604	689	656	-

	Tillage	Manures
SED	83	18
CD	169	45

plots. Similar trend was also observed in the case of straw yield (Table 1.) Higher grain and straw yield due to the addition of organic manure might be attributed to the favourable effect of organics on soil physical and chemical fertility status.

The bulk density of both surface and subsurface depths were greater for control plots (1.525 & 1.720 mg m^{-3} at 0-15 & 15-30 cm depth repetitively). Application of organics generally reduced the bulk density to a considerable extent particularly the farm yard manure applied plots has significantly lower bulk density (1.31mg m^{-3} at 0-15cm) followed by composted coir pith. Application of other organic manures has intermittent values but had lower values as compared to control. The improvement in bulk density of soil due to the addition of organics was earlier reported (Anon,1995).

Similar to bulk density the capillary and *non-capillary* porosity improved by the addition of organics as compared to control. Among the organics, composed coir pith applied plots recorded the maximum porosity. With regard to the hydraulic conductivity, as could be expected the raw coir pith had very high values followed by other organics. It is evident that the addition of organic manures had positive influence on the above soil physical properties (Tiwari *et al.*, 1988).

The organic carbon content of the soil enhanced significantly by the addition of organics especially goat manure followed by poultry manure and farm yard manures. It was as expected that the addition of organics improved the soil fertility (Bellakki *et al.*, 1988 and Misra and Sharma, 1998)

The residual effect of organic manure addition on the succeeding soybean yield (Table 2 indicated that all the organic treatments had improved the yield as compared to control. The

Table 3. Effect of organics and tillage treatments on the bulk density (Mg m^{-3})

Organics	Tillage								Mean
	C1		C2		C3		C4		
	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	
CCP	1.32	1.40	1.30	1.39	1.30	1.38	1.23	1.37	1.34
RCP	1.27	1.36	1.38	1.42	1.33	1.42	1.30	1.42	1.36
PM	1.27	1.37	1.30	1.38	1.31	1.32	1.28	1.38	1.33
GM	1.30	1.38	1.30	1.38	1.31	1.40	1.32	1.46	1.35
FYM	1.31	1.39	1.34	1.39	1.28	1.38	1.35	1.48	1.36
Control	1.31	1.47	1.33	1.44	1.28	1.41	1.35	1.41	1.38
Mean	1.30	1.40	1.33	1.40	1.30	1.39	1.30	1.42	-

	SED	CD
Depth	0.009	0.02

Table 4. Effect of organics and tillage treatments on the total porosity of soil (%)

Organics	Tillage								Mean
	C1		C2		C3		C4		
	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	
CCP	51.02	49.98	48.72	48.22	50.82	49.96	52.66	51.36	50.47
RCP	49.49	49.36	49.73	48.93	50.60	50.92	51.79	50.26	50.02
PM	49.97	49.55	49.21	47.22	50.48	49.09	51.36	48.95	49.48
GM	50.48	48.79	49.95	47.83	51.45	50.63	50.23	49.89	49.91
FYM	49.82	49.40	49.15	49.14	50.45	49.55	50.39	49.13	49.50
Control	48.73	48.64	47.96	46.89	49.13	46.63	48.94	47.30	48.03
Mean	49.92	49.29	49.12	48.04	50.49	49.31	50.90	49.48	-

	SED	CD
Organics	0.035	0.76
Depth	0 19	0.37
Tillage	0.26	0.58

plots which received farm yard manure addition had significantly recorded higher yield (738 kg ha^{-1}) than the other treatments. The residual effect of goat manure, composed coirpith on soybean yield was similar but was significantly superior to control. Similar results were reported earlier by Mathur (1997). Among different tillage treatments, ploughing the field with disc plough after irrigation and incorporation of stubbles had significantly more soybean production (689 kg ha^{-1}). It is quite evident from the table that the addition of farm yard manure to sorghum crop and disc ploughing

Table 5. Effect of organics and tillage treatments on the hydraulic conductivity of soil (cm h^{-1})

Organics	Tillage								Mean
	C1		C2		C3		C4		
	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	
CCP	4.10	3.85	3.92	3.66	4.10	3.90	4.12	3.95	3.95
RCP	4.49	3.80	4.06	3.75	4.02	3.83	4.16	3.91	4.00
PM	4.07	3.66	3.95	3.59	4.03	3.81	4.29	3.98	3.92
GM	4.21	3.69	3.97	3.92	4.05	3.85	4.37	4.07	4.01
FYM	3.34	3.85	3.99	3.88	4.18	3.88	4.18	3.99	3.89
Control	3.84	3.35	3.82	3.57	3.82	3.68	3.97	3.89	3.74
Mean	4.01	3.80	3.95	3.71	4.03	3.83	4.18	3.97	-

	SED	CD
Organics	0.074	0.17
Depth	0.047	0.09
Tillage	0.067	0.13

for incorporation of sorghum stubbles to soybean crop had the highest soybean production. The above tillage treatment might have provided better soil physical and chemical environment for increased yield. (Anon, 1995).

The bulk density of the soil samples collected at post harvest stage of soybean (Table 3) which varied from 1.27 to 1.48 Mg m^{-3} was not influenced either by the addition of organics to the I crop or by tillage treatments. However, the total porosity was significantly increased by the addition of composted as well as raw coir pith as compared to control (Table 4). Disc ploughing and incorporation of sorghum stubbles had higher porosity when compared with other tillage treatments. This might be due to the incorporation of stubbles slightly to deeper depth and better soil aeration. The disc ploughing for stubble incorporation increased the hydraulic conductivity over the other tillage treatment (Table 5). The reason again attributed could be increased capillary and non capillary porosity of the soil.

Though there was not much variation in hydraulic conductivity among the organic manures, application of organics improved the hydraulic conductivity as compared to control without any organic matter addition.

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HETEROSIS FOR SEED YIELD AND ITS COMPONENTS IN SUNFLOWER (*Helianthus annus.* L.)

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ABSTRACT

Heterosis for seed yileld and ilts components was estimated in 56 crosses obtained by crossing 4 cytoplasmic male sterile lines with 14 testers in L x T fashion. Co 4 and KBSH-1 were used as checks. The positive heterosis value ranged from 18.11 to 93.28 and 13.68 to 96.97 for seed yield respectively over mid parent and better parent. About 10 hybrids are recommended for further breeding work. It is inferred that parents with high mean values give high heterosis in combination.

KEYWORKS: Heterosis, Sunflower, Yield

The phenomenon of hybrid vigour has been exploited extensively for plant improvement in many crops. Though sunflower cultivation has gained momentum in India due to its wider adaptability, short duration and anti-cholestral properties, it has not attained its anticipated growth. This may be because of lack of yield potential in varieties. One of the ways to achieve quantum jump in crop yields is to utilize the dominance and over dominance gene effects