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nfluence of amendments on the yield of sorghum + greengram ntercropping system in salt affected soil

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Abstract: Two field experiments were conducted during *kharif* season of 1999 and 2000, to find out the effect of different amendments on the yield of sorghum + greengram intercropping system in sodic soil under irrigated condition at Anbil Dharmalingam Agricultural College and Research Institute, Tiruchirappalli. The sorghum CO 26 and greengram KM 2 were the test crops in the study. The experimental results revealed that under sodic soil, application of gypsum 2.0 t ha^{-1} (50% GR) + raw coirpith 10 t ha^{-1} along with the recommended dose of fertilizer (90:45:45 kg NPK ha^{-1}) recorded the highest sorghum grain yield (5522 kg ha^{-1}), greengram yield (388 kg ha^{-1}) with a benefit cost ratio of 2.78, when raised under paired row intercropping system.

Key Words: Sorghum, Greengram, Intercropping system, Salt affected soil, Amendments.

ntroduction

In Tamil Nadu about 4.2 lakh hectare : affected by salinity and sodicity. In Trichy istrict the salt affected soil accounts for 42,000 hectare. In these areas atleast one sorghum crop is raised annually depending on the rainfall received. Application of amendment to soil, apart from improving the physical properties, improved the availability of nutrients, organic carbon and cation exchange capacity of soil, thus providing an optimum soil environment and increase the yield of crops (Nagarajan *et al.* 1986; 1987). Application of raw coirpith @ 10 t ha^{-1} favourably improved the soil physical condition thereby increased the maize and finger millet yield (Singaram, 1994). Organic manure application especially poultry manure @ 5 t ha^{-1} and FYM @ 12.5 t ha^{-1} increased the sorghum and soybean yield, besides improving the physical properties of soil and organic carbon status (Appavu and Saravanan, 1999). Addition of pressmud @ 10 t ha^{-1} and coirpith @ 5 t ha^{-1} improved the soil physical environment and recorded higher yield in sorghum crop (Mathan and Ramanathan, 1999). The present study was taken to find out the effect of different amendments on the yield of sorghum and greengram raised in intercropping system under salt affected soil.

Materials and Methods

Field experiments were conducted for two years during *kharif* season of 1999 and 2000 at Anbil Dharmalingam Agricultural College and Research Institute, Tiruchirappalli under irrigated condition. The experiments were laidout in randomised block design with three replications. The treatments were, T_1: (Control) No amendments, T_2: Gypsum 2.0 t ha^{-1} (50 GR), T_3: Pressmud 5 t ha^{-1}, T_4: FYM 12.5 t ha^{-1}, T_5: Raw coirpith 10 t ha^{-1}, T_6: Rice husk ash 10 t ha^{-1}, T_7: Gypsum 2.0 t ha^{-1} + Pressmud 5 t ha^{-1}, T_8: Gypsum 2.0 t ha^{-1} + FYM 12.5 t ha^{-1}, T_9: Gypsum 2.0 t ha^{-1} + Raw coirpith 10 t ha^{-1} and T_{10}: Gypsum 2.0 t ha^{-1} + Rice husk ash 10 t ha^{-1}. The recommended dose of fertilizer 90:45:45 kg NPK ha^{-1} was applied to all the treatments. Nitrogen (50%) and full dose of phosphorus and potassium were applied basally and the remaining 50% nitrogen dose was applied 25 days after sowing. The soil type of the experimental field was clay loam with pH 8.7, EC 0.46 dSm^{-1} and ESP 20. Available nitrogen was 110 kg ha^{-1} (low), while phosphorus 9.5 kg ha^{-1} (medium) and potassium 162 kg ha^{-1}) (low). The sorghum (CO 26) and greengram (KM 2) were raised in paired row intercropping system (60/30 x 15 cm).

Table 1. Effect of amendments on the yield of sorghum and greengram raised under intercropping system (*kharif* 1999)

Treatments	Sorghum grain yield (kg ha^{-1})	Sorghum straw yield (kg ha^{-1})	Greengram grain yield (kg ha^{-1})	B:C ratio
T1 – Control (No amendments)	3572	5474	177	1.90
T2 – Gypsum @ 2 t ha^{-1} (50% GR)	4434	6794	330	2.03
T3 – Pressmud @ 5 t ha^{-1}	4079	6527	309	1.91
T4 – FYM @ 12.5 t ha^{-1}	4515	6773	261	2.15
T5 – Coirpith @ 10 t ha^{-1}	4478	6717	292	2.15
T6 – Rice husk ash @ 10 t ha^{-1}	4385	6578	279	2.12
T7 – Gypsum 2 t ha^{-1} + pressmud 5 t ha^{-1}	5263	8072	347	1.99
T8 – Gypsum 2 t ha^{-1} + FYM 12.5 t ha^{-1}	5418	8184	382	2.08
T9 – Gypsum 2 t ha^{-1} + coirpith 10 t ha^{-1}	5675	8631	400	2.29
T10 – Gypsum 2 t ha^{-1} + rice husk ash 10 t ha^{-1}	5473	8004	392	2.22
CD (P=0.05)	173.8	475.7	49.8	0.09

Table 2. Effect of amendments on the yield of sorghum and greengram raised under intercropping system (*kharif* 2000)

Treatments	Sorghum grain yield (kg ha^{-1})	Sorghum straw yield (kg ha^{-1})	Greengram grain yield (kg ha^{-1})	B:C ratio
T1 – Control (No amendments)	3840	6653	260	2.75
T2 – Gypsum @ 2 t ha^{-1} (50% GR)	4256	6653	260	2.75
T3 – Pressmud @ 5 t ha^{-1}	4410	7015	283	2.64
T4 – FYM @ 12.5 t ha^{-1}	4317	6646	278	2.17
T5 – Coirpith @ 10 t ha^{-1}	4508	7056	270	2.93
T6 – Rice husk ash @ 10 t ha^{-1}	4475	7083	273	2.48
T7 – Gypsum 2 t ha^{-1} + pressmud 5 t ha^{-1}	5037	7943	334	2.77
T8 – Gypsum 2 t ha^{-1} + FYM 12.5 t ha^{-1}	5109	8178	318	2.34
T9 – Gypsum 2 t ha^{-1} + coirpith 10 t ha^{-1}	5370	8541	376	3.26
T10 – Gypsum 2 t ha^{-1} + rice husk ash 10 t ha^{-1}	5193	8247	354	2.70
CD (P=0.05)	216.3	232.3	32.4	0.13

Table 3. Effect of amendments on the yield of sorghum and greengram raised under intercropping system (pooled mean for *Kharif* 1999 and 2000)

Treatment	Sorghum grain yield (kg ha^{-1})	Sorghum straw yield (kg ha^{-1})	Greengram grain yield (kg ha^{-1})	B:C ratio
T1 – Control (No amendments)	3706	5688	188	2.02
T2 – Gypsum @ 2 t ha^{-1} (50% GR)	4345	6724	295	2.39
T3 – Pressmud @ 5 t ha^{-1}	4244	6771	296	2.28
T4 – FYM @ 12.5 t ha^{-1}	4416	6710	269	2.09
T5 – Coirpith @ 10 t ha^{-1}	4993	6887	281	2.55
T6 – Rice husk ash @ 10 t ha^{-1}	4430	6831	276	2.30
T7 – Gypsum 2 t ha^{-1} + pressmud 5 t ha^{-1}	5150	8008	340	2.38
T8 – Gypsum 2 t ha^{-1} + FYM 12.5 t ha^{-1}	5263	8181	350	2.21
T9 – Gypsum 2 t ha^{-1} + coirpith 10 t ha^{-1}	5522	8586	388	2.78
T10 – Gypsum 2 t ha^{-1} + rice husk ash 10 t ha^{-1}	5333	8126	373	2.46
CD (P=0.05)	195	355	35	0.11

Results and Discussion

The first year trial (*kharif* 1999) results revealed that application of all the amendments have brought marked improvement in the yield of sorghum grain, sorghum straw and greengram (Table 1). Application of gypsum 2 t ha^{-1} (50% GR) + coirpith 10 t ha^{-1} recorded significantly higher yield of sorghum grain (5675 kg ha^{-1}) and straw yield (8631 kg ha^{-1}). The next best effect was observed with gypsum + rice husk ash and gypsum + FYM which were on par. In the case of greengram the treatment gypsum 2 t ha^{-1} (50% GR) + coirpith 10 t ha^{-1} recorded the highest grain yield (400 kg ha^{-1}) and it was on par with the treatment gypsum 2.0 t ha^{-1} + rice husk ash 10 t ha^{-1} and gypsum 2.0 t ha^{-1} + FYM 12.5 t ha^{-1}. The treatment gypsum 2.0 t ha^{-1} + raw coirpith 10 t ha^{-1} recorded the highest benefit cost ratio (2.29).

The second year trial (*kharif* 2000) results confirmed the findings of the first year trial. Application of amendments favourably increased the sorghum grain, straw and greengram yield (Table 2). Application of gypsum 2 t ha^{-1} (50% GR) + raw coirpith 10 t ha^{-1} recorded the highest sorghum grain yield (5370 kg ha^{-1}) and straw yield (8541 kg ha^{-1}). This was followed by the treatment gypsum 2.0 t ha^{-1} + rice husk ash 10 t ha^{-1}, which recorded the grain yield of 5193 kg ha^{-1} and straw yield 8247 kg ha^{-1} and it was on par with treatment gypsum 2.0 t ha^{-1} + FYM 12.5 t ha^{-1}. In the case of intercrop greengram also, application of gypsum 2 t ha^{-1} (50% GR) + coirpith 10 t ha^{-1} favourably influened the grain yield (376 kg ha^{-1}) and it was on par with gypsum 2 t ha^{-1} + rice husk ash 10 t ha^{-1} which recorded 354 kg ha^{-1}. The treatment gypsum 2.0 t ha^{-1} + raw coirpith 10 t ha^{-1} recorded the highest benefit cost ratio of 3.26.

The two years pooled data (Table 3) revealed that application of gypsum @ 2.0 t ha^{-1} (50% GR) + coirpith 10 t ha^{-1} (T_9) recorded the highest sorghum grain yield (5522 kg ha^{-1}), straw yield (8586 kg ha^{-1}) and greengram yield (388 kg ha^{-1}). The crop yield increase by gypsum + coirpith application could possibly be due to improved soil physical properties, organic carbon and better availability of nutrients. The coirpith might have improved the soil moisture holding capacity thereby prevented the capillary rise of salt and thus accumulation of salts aound the root zone was avoided. Similar observation was reported in maize and finger millet by Singaram (1994). The treatment gypsum 2.0 t ha^{-1} + raw coirpith 10 t ha^{-1} was on par with the treatment gypsum (50% GR) + rice husk ash 10 t ha^{-1}. The next best treatments were gypsum 2.0 t ha^{-1} + FYM 12.5 t ha^{-1} and gypsum 2.0 t ha^{-1} + pressmud 5 t ha^{-1}.

Bhagat and Acharya (1988) reported that application of organic wastes favourably modified the hydrothermal regimes, soil structure and nutrient dynamics thereby increased crop yield. Application of coirpith 5 t ha^{-1} was found to alter the soil physical condition thereby increased sorghum and soybean yield (Mathan and Ramanathan, 1999).

When comparing the benefit cost ratio, application of gypsum (50% GR) + coirpith 10 t ha^{-1} (T_9) recorded the highest value of 2.78 and followed by application of coirpith 10 t ha^{-1} which was on par with gypsum 2 t ha^{-1} (50% GR) + rice husk ash 10 t ha^{-1}.

Based on the above results, it could be concluded that application of gypsum 2.0 t ha^{-1} (50 GR) + coirpith 10 t ha^{-1} along with recommended fertilizer dose of 90:45:45 kg NPK ha^{-1} were found to increase the sorghum grain and straw yield and greengram yield in sorghum + greengram intercropping system under sodic soil condition.

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