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Effect of different summer green manures on soil characteristics and rice yield

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Abstract
A field experiment was conducted at Agricultural Research farm, B.R.D.P.G College Deoria (UP) during the year 2019 and 2020 to study the response of rice to summer green manuring and soil characteristics. The soil was sandy loam typic Ustochrept (Inceptisols). Green gram (*Phaseolus aureus* Raxb) Sunnhemp (*Crotalaria juncea* Linn) and Dhaincha (*Sesbania aculeata* Poir.) were grown for summer green manure during May l to June. The summer green manuring alone and in combination with N fertilizer resulted in higher grain yield. The highest grain yield of rice was obtained through incorporation of Sunnhemp in combination with 120 kg N ha^{-1} applied as urea followed by Dhaincha and Green gram. Increased due to green manuring along with 120 kg N ha. The physio-chemical properties of soil such as BD and pH decrease and EC, OC, CEC were enhanced due to incorporation of green manures and combined use of inorganic fertilizer.

Keywords: Green manures, rice, pH and soil properties

Introduction
Rice (*Oryza sativa* L.) is grown usually as lowland crop. Flooding and pudlling of rice soil bring in series of physical, chemical, biological and microbiological changes under submerged conditions. Green manuring has been successfully adopted to improve the soil productivity especially the available nitrogen (Mehta *et al*. 1996) [8]. In a country like India the combined use of organic matter and chemical fertilizer is essential for sustaining soil productivity. The continuous cultivation of cereal-cereal system might have an adverse effect on physio-chemical properties and fertility status of soil and inclusion of legumes / green manures crop in the cropping sequence may improve the soil fertility (Yadav 1985) [7]. In addition organic source of nutrients also have cumulative and residual effect in improving physical, chemical and biological environment of soil which further reduce the need of chemical fertilizer (Sharma *et al.* 2001) [9]. The application of organic materials to different rice based cropping system and their ability to incorporate N as well as organic matter may offer opportunities to increase and sustain productivity of double cropping system the organic material having narrow C: N ratio such as compost, FYM, green manures etc. get decomposed rapidly after incorporation into soil resulting in release of nutrient for the use of succeeding crops (Bhandari *et al*. 1992) [2]. In the irrigated belt of eastern plain zone of U.P. with double cropping system more than 70% land remain follow for about two and half month after the harvest of Rabi (winter) crops and before the transplantation of next rice crop (Ghosh and Sharma 1996) [3]. This period may be utilized for growing green manure crops and their incorporation in soil.

Material and Methods
Field experiment was conducted during 2019 and 2020 at Agricultural Research farm. The experimental soil was sandy loam (Typic Ustochrept). Twenty treatment combination with four main plot viz. (i) Green gram (*Phaseolus aureus* Roxb.) (ii) Sunnhemp (*Crotalaria juncea* Linn.) (iii) Dhaincha (*Sesbania aculeata* Poir.) and (iv) Fallow, five levels of N applied (subplot) to rice (0, 30, 60, 90 and 120 kg ha^{-1}) having three replication in split plot design were grown. Plot size was kept 4 X 2.5 m. Summer Green gram was shown in first week of May and others two crop Sunnhemp and Dhaincha in mid of May. The crop was grown with 40 kg. P_1O_5 ha^{-1} and incorporated into the soil before rice transplanting. Seedling of Sarju -52 were planted at a spacing of 20 X10 cm. 120 kg N was applied as per treatment through urea ($^1/_2$ at transplanting and $^1/_4$ at tillering and $^1/_4$ at panicle initiation stage). A basal application of 60 kg P_2O_5 ha^{-1} through single superphosphate and potassium chloride were done, respectively all soil samples were collected before shown of green manure crops and after harvest of rice

crops. The organic carbon of soil samples was estimated by wet chromic acid digestion method (Walkley and Black 1934) [5] Bulk Density (BD) by core cutter method pH and Electrical Conductivity (EC) in 1:2.5 soil and distilled water suspension with the help of pH and EC meters and CEC by neutral normal ammonium acetate extract (Jackson 1973) [10] method. Total N, P and K in plant (grain straw) samples were estimated by sulphuric salicylic acid selenium powder +H_2O2 digestion method (Wallinga *et al.* 1989) [6] 02 digestion method (Wallinga).

Results and Discussion

Crop Yield

The fresh weight added to soil through Sunnhemp, Dhaincha and Green gram were 30.62, 33.15 and 16.30 tonnes ha^{-1} and dry matter added 5.11, 5.71 and 3.14 tonnes ha^{-1} respectively (Table 1). The green manures were analyzed for N, P and K content which reveal that total N supplied to soil by Sunnhemp, Dhaincha and Green gram were 115.6, 102.7 and 63.7 kg ha^{-1}, P 20.9, 27.6 and 13.2 kg ha^{-1}, and K 118.3, 128.3 and 76.0 kg ha^{-1} respectively.

Incorporation of green manures increased the grain yield over control (fallow) significantly (Table 2). The rice grain yield increased with incorporation of green manures over control. The rice grain yield was highest in Sunnhemp fallowed by Dhaincha and Green gram incorporated plats. The reason for highest rice grain yield with Sunnhemp may be due to the highest amount of dry matter added and N accumulation and addition as well as fast decomposition/ mineralization of Sunnhemp green manure as compared to Dhaincha and Green gram.

The application of 120 kg N ha^{-1} in combination with green manure gave highest grain yield of rice followed by 90, 60 and 30 kg. N ha^{-1}. This may be due to also favourable changes in physical properties of soils related to increase in fertilizer use efficiency.

Physio- Chemical properties of soil

The bulk density of soil decreased significantly with the incorporation of Sunnhemp followed by Dhaincha and Green gram after harvest of rice crop (Table 2). The possible reason for decrease in the bulk density may be due to the process of breakdown of organic matter, polysaccharides and humus produced during decomposition of crop which may be responsible for firm binding of soil particles reduction in more stable aggregate causing a reduction in bulk density (Thakur *et al.* 1995) [4]. The reduction of bulk density might be due to relatively higher organic matter content of the soil which would have improved physical properties of soil such as porosity (Bellakki and Dadanur 1997) [1].

Organic carbon content of surface soil (0-15 cm.) increased significantly with incorporation of green manures in combination with fertilizer over control. The highest organic carbon content was observed in Sunnhemp plot followed by Dhaincha and Green gram incorporation. It is generally accepted that green manuring maintains or increases organic matter status of soils. The maintenance or accumulation of organic matter in soil is dependent on a number of factors such as chemical nature of the added material soil and climatic factor as they influence microbial activity and cultural practices. (Datt and Bhardwaj 1995 and Katyal *et al.* 1998) [11, 12].

Table 1: NPK contribution through green manures (above ground portion mean of two years).

Parameters	Green gram (*Phaseolus aureus* Roxb.)	Sunnhemp (*Crotalaria juncea* Linn.)	Dhaincha (*Sesbania aculeate* Porir.)
Green matter (tonnes ha^{-1})	16.30	30.62	33.15
Dry matter (tonnes ha^{-1})	3.14	5.10	5.11
Nitrogen g kg^{-1} (dry weight basis)	20.3	22.6	20.1
Phosphorus g kg^{-1} (dry weight basis)	4.2	4.1	5.4
Potassium g kg^{-1} (dry weight basis)	24.2	23.2	25.1
NPK added (kg ha^{-1})			
N	63.7	115.6	102.7
P	13.2	20.9	27.6
K	76.0	118.3	128.3

Table 2: Effect of summer green manuring and level on physical properties of soil, yield and macronutrients uptake by rice grain. (Pool data of two years)

Treatments	BD (Mg m^{-3})	pH	EC(dSm^{-1})	OC (gkg^{-1})	Grain yield (kg ha^{-1})
Fallow	1.49	7.7	0.28	4.2	4652
Green gram	1.37	7.6	0.29	5.3	5230
Sunnhemp	1.32	7.5	0.30	5.5	5660
Dhaincha	1.34	7.5	0.31	5.4	5574
C.D (P=0.05)	0.03	NS	NS	0.6	126
N levels (Kg ha^{-1})					
0	1.42	7.6	0.28	6.0	4468
30	1.39	7.5	0.29	5.5	4962
60	1.38	7.5	0.28	5.2	5234
90	1.37	7.5	0.28	4.9	5572
120	1.36	7.6	0.31	4.8	5756
CD (P=0.05)	0.01	NS	NS	0.2	124

Reference

1. Bellakki MA, Badanur VP. Long term effect of integrated nutrient management on properties of Vertisols under dry land agriculture. Journal of the Indian Society of Soil Science. 1997;45(3):438-442.
2. Bhandari AL, Sood Anil, Sharma KN, Rana DS. Integrated nutrient management in arice-wheat system. Journal of the Indian Society of Soil Science.

1992;40(4):742-747.
3. Ghosh PK, Sharma KC. Direct and residual effect of green manuring in rice-wheat rotation. Crop Research. 1996;11:133-136.
4. Thakur RC, Bindra AD, Sood RD, Bhargava N. Effect of fertilizer application and green manuring on physico - chemical properties of soil and grain yield in rice (*Oryza sativa*) wheat (*Triticum aestivum*) crop sequence. Indian Journal of Agronomy. 1995 Mar 1;40(1): 4-13.
5. Walkley A, Black CA. Estimation of organic carbon by chromic Acid and rapid titration method. Soil Science. 1934;37:29-38.
6. Wallianga I, Wan Vark W, Houba VJG, Vander Lee JJ. Plant analysis procedures Published by Department of Soil Science and Plant Nutrition, Wageningen Agricultural University, The Netherland; c1989.
7. Yadav HL. Changes in soil fertility as a result of different cropping system. Indian Journal of Agronomy. 1985;30(1):84-1085.
8. Shafer J, Agrawal R, Mehta M. SPRINT: A scalable parallel classifier for data mining. In Vldb. 1996 Sep 3;96:544-555.
9. Sharma M, Gupta YK. Effect of chronic treatment of melatonin on learning, memory and oxidative deficiencies induced by intracerebroventricular streptozotocin in rats. Pharmacology Biochemistry and Behavior. 2001 Oct 1;70(2-3):325-31.
10. Jackson WA, Flesher D, Hageman RH. Nitrate uptake by dark-grown corn seedlings: some characteristics of apparent induction. Plant Physiology. 1973 Jan;51(1):120-7.
11. Bhardwaj KK, Datt N. Effects of legume green-manuring on nitrogen mineralization and some microbiological properties in an acid rice soil. Biology and fertility of soils. 1995 Jan;19(1):19-21.
12. Katyal NK. Judges as advicegivers. Stanford Law Review. 1998 Jul 1:1709-824.