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Effect of INM on growth and physiological parameters of maize in maize-groundnut cropping system

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Abstract
A field experiment entitled "Dynamics of soil carbon under integrated nutrient management practices in maize - groundnut cropping sequence" was carried out under field conditions during both *kharif* and *rabi* seasons of 2019-2020 and 2020-2021 at Field No. 50B of Wetland Farm, S.V. Agricultural College, Tirupati campus (under the judicatory of Acharya N.G. Ranga Agricultural University) Growth parameters of maize *viz.*, plant height, dry matter accumulation and Chlorophyll content at tasselling was significantly higher in interaction with where 125% RDF + 10 FYM (M_1S_2) and was on par with the 125% RDF + Poultry manure @ 5 tons ha^{-1} (M_1S_3). Growth and physiological parameters *viz.*, plant height, dry matter accumulation significantly influenced at 30, 60, 90 DAS and harvest days after sowing during both the years and Chlorophyll content was recorded at tasselling stage in both the years there was a significant results were found in subplots in both years and highest was found in application of poultry manure 5 ton per ha.

Keywords: Groundnut, maize, *Kharif* and nutrient

Introduction
In India, agricultural production system has shown sustainable development in the recent years in order to gain food and nutritional security and also to overcome the environmental degradation/ pollution especially natural resources in the environment due to continuation over exploitation. The main objective of the production system is achieving the growth in crop productivity. The increase in productivity can be achieved by possible production technologies. We all very well know about adverse off-site impacts of nutrients may have leave agricultural fields by surface runoff or leaching finally reach ground water in excessive amounts. Nutrient loss from surface area directly and indirectly show the adverse effects to aquatic environment and humans health.

Maize-Groundnut cropping system is one of the most important system in Andhra Pradesh. One of the most important considerations to obtain sustainable yield is to maintain the optimum soil fertility in the soil. The succeeding crop response and yield mainly influenced by preceding crops and supplied inputs. Therefore, recently greater emphasis is being laid on the cropping system as whole rather than on the individual crops in a sequence.

Maize (*Zea mays* L.) is one of the most important cereal crop of the world, it occupies third position in production after rice and wheat. In India, maize possess third rank in area, and production. India produced 14.7 million tons of maize, with an average productivity of 1.72 and 1.26 t ha^{-1}. Maize has been used as a feed, fodder and food. Maize is an exhaustive crop and requires very high doses of nitrogen levels. To maintain sustainable crop production, balanced manuring and fertilizer application is more important to develop soil health. Usage of short foliage and high yielding varieties and hybrids is common in maize crop. The organic sources will improve the nutrient use efficiency of added chemical fertilizers by reducing nutrient losses by different means and enhancing nutrient availability to plant. Integration and incorporation of organic manure (FYM, poultry manure and urban compost) in the cropping system helps to improve soil structure, soil microbial activity and soil moisture conservation and which in turn helps to stabilize the production and productivity of the crops. Integrated nutrient management is also important for marginal farmers who cannot afford to supply crop nutrients through costly chemical fertilizers.

Material and Methods
The field experiment entitled "Dynamics of soil carbon under integrated nutrient management practices in maize - groundnut cropping sequence" was carried out under field conditions

during both *kharif* and *rabi* seasons of 2019-2020 and 2020-2021 at Field No. 50B of Wetland Farm,

S.V. Agricultural College, Tirupati campus (under the judicatory of Acharya N.G. Ranga Agricultural University) which is geographically situated at 13.5°N latitude and 79.5°E longitude with an altitude of 182.9 m above mean sea level in the Southern Agro Climatic Zone of Andhra Pradesh. According to Trolls classification, it come under the Semi-Arid Tropics (SAT).

The soil of experimental site was sandy clay loam with pH of 7.68, Electrical conductivity 0.85 dSm^{-1}, low in organic carbon (0.42%), low in available nitrogen (128 kg ha^{1}) and high in phosphorus (52.8 kg ha^{-1}) and medium in potassium (318.82 kg ha^{-1}). The experiment was laid out in a split plot design for both the years 2019 and 2020 with three main plots (125%, 100%, 75% RDF) and four sub plots (control, FYM. Poultry manure and urban compost) total 12 treatments consisting of combinations of three replications. In *Kharif*, maize hybrid (Kavery-55K) was sown on 1st July during first year and 19th June during second year adopting a spacing of 60 × 20 cm. In general the climatic conditions were congenial during crop growth period and incidence of pest and disease attack was noticed to some extent. The observations on plant growth parameters *viz.*, plant height, dry matter accumulation at 30, 60, 90 days after sowing and at harvest in Maize were taken and chlorophyll content was recorded at tasselling stage.

Results and Discussion

Growth parameters

Plant height: During both years of study, there is a significant difference was observed with plant height due to different treatments at 30, 60, 90 and harvest days after sowing was recorded with 125% RDF + 10 FYM (M_1S_2) and was on par with 125% RDF + Poultry manure @ 5 tons ha^{-1} (M_1S_3) compared to all other treatments. The higher yield obtained through Integrated Nitrogen Management (INM) systems can also be attributed to increased plant height of maize crop. Similar results were reported by Kumpawat (2010) [2] and also Sharma (1983) [4] found that there was significant increase in plant height and number of leaves per plant with each successive increase in the level of fertilizers. Addition of 12t FYM ha^{-1} along with fertilizer levels up to 60 kg N, 30 kg P_2O_5 and 30 kg K_2O ha^{-1} significantly improved the growth character. Chandrashekara *et al.* (2000) observed that the application of poultry manure @ 10 t ha^{-1} along with 150: 75: 37.5 kg N, P and K ha^{-1} (100% recommended dose of fertilizer) recorded significantly higher grain (50.8 q ha^{-1}) and fodder yields (74.4 q ha^{-1}) than application of vermicompost, FYM @ 2.5 t ha^{-1} each and RDF alone. The percent increase in grain yield with application of poultry manure, vermicompost and FYM was 33, 16 and 14 percent, respectively over chemical fertilizer alone (Table 1).

Table 1: Plant height of maize at different growth stages as influenced by organic and inorganic nutrients (INM)

Treatments	30 DAS			60 DAS			90 DAS			At Harvest		
	2019	2020	Pooled	2019	2020	Pooled	2019	2020	Pooled	2019	2020	Pooled
Main plots												
M_1 = 125% RDF	82.8	77.3	80.0	163.3	153.2	158.2	180.8	170.6	175.7	197.9	190.5	194.2
M_2 = 100% RDF	79.6	65.6	72.6	166.3	144.1	155.2	190.1	163.7	176.9	207.2	177.4	192.3
M_3 = 75% RDF	70.9	63.6	67.3	154.5	133.4	143.9	190.3	157.1	173.7	207.4	169.2	188.3
SEm ±	0.4	0.61	0.41	0.50	1.35	0.78	0.64	0.69	0.65	0.64	0.44	0.43
CD (P = 0.05)	1.6	2.41	1.60	1.97	5.32	3.06	NS	2.72	2.57	2.51	1.75	1.69
Sub plots												
S_1 = Control	48.3	42.4	45.3	86.2	60.2	73.2	117.7	82.4	100.0	134.8	92.4	113.6
S_2 = FYM @ 10 tons ha^{-1}	88.3	80.3	84.3	191.1	173.8	182.5	211.2	197.6	204.4	228.3	214.2	221.2
S_3 = Poultry manure @ 5 tons ha^{-1}	88.0	76.3	82.1	178.2	174.7	176.4	208.5	190.6	199.5	225.6	208.2	216.9
S_4 = Urban compost @ 5 tons ha^{-1}	86.7	76.3	81.5	190.1	165.6	177.8	211.0	184.6	197.8	228.1	201.4	214.7
SEm ±	0.6	1.23	0.65	0.35	1.16	0.64	0.41	0.83	0.41	0.41	0.47	0.28
CD (P = 0.05)	1.7	3.66	1.93	1.03	3.45	1.90	1.22	2.47	1.22	1.22	1.40	0.84
Interaction												
Sub at same level main (S × M)												
SEm ±	1.75	3.69	1.94	1.04	3.49	1.92	1.23	2.50	1.23	1.23	1.41	0.85
CD (P = 0.05)	6.06	12.77	6.73	3.60	12.07	6.64	4.27	8.65	4.26	4.27	4.89	2.95
Main at same or different level sub (M × S)												
SEm ±	9.22	19.3	10.2	5.7	18.7	10.3	6.8	13.2	6.8	6.8	7.5	4.7
CD (P = 0.05)	29.40	59.7	32.2	19.8	63.6	35.3	24.0	42.9	24.1	24.0	24.7	16.5

Dry matter accumulation

Adequate NPK might have helped in harvesting of solar energy as reflected by Dry matter accumulation During both the years of study significant difference observed due to different treatments at 30, 60, 90 DAS and at harvest significantly higher dry matter accumulation was recorded with 125% RDF + 10 FYM (M_1S_2) and was on par with 125% RDF + Poultry manure @ 5 tons ha^{-1} (M_1S_3) compared to all other treatments and lowest found in control plot similar results found in Prasad (1981) [3] reported that combined application of NPK and organic manure is beneficial in increasing the dry matter yield of maize significantly. Application of 4 or 8 t ha^{-1} of enriched FYM along with 112.5 or 150 kg N ha^{-1} significantly improved Leaf area index (LAI), Leaf area duration, dry matter accumulation in cob as well as total dry matter production in maize (Tolessa debele *et al.*, 2001) [6] (Table 2).

Table 2: Dry matter production (kg ha-1) of maize at different growth stages as influenced by organic and inorganic nutrients

Treatments	30 DAS			60 DAS			90 DAS			At harvest		
	2019	2020	Pooled	2019	2020	Pooled	2019	2020	Pooled	2019	2020	Pooled
Main plots												
M_1 = 125% RDF	366	382	374	2645	2720	2690	7332	7482	7407	10084	10397	10258
M_2 = 100% RDF	353	369	361	2376	2434	2422	6745	6845	6820	8798	9019	8947
M_3 = 75% RDF	317	333	325	1889	2006	1935	6441	6591	6516	8965	9186	9139
SEm ±	1.04	1.04	1.04	7.89	10.44	7.89	5.20	8.75	5.20	9.16	6.73	4
CD (P = 0.05)	4.07	4.07	4.07	31.00	40.98	31.00	20.41	34.36	20.41	35.97	26.44	16
Sub plots												
S_1 = Control	145	160	153	888	958	934	1753	1903	1828	2275	2527	2440
S_2 = FYM @ 10 tons ha^{-1}	435	451	443	2791	2916	2837	8687	8837	8762	11751	1207	11905
S_3 = Poultry manure @ 5 tons ha^{-1}	414	430	422	2814	2839	2860	8783	8866	8858	11900	1214	12110
S_4 = Urban compost @ 5 tons ha^{-1}	388	404	396	2719	2833	2765	8134	8284	8209	11203	1140	11335
SEm ±	1.48	1.48	1.48	10.74	10.22	10.74	19.47	14.12	19.47	6.76	10.14	5.56
CD (P = 0.05)	4.41	4.41	4.41	31.90	30.36	31.90	57.85	41.96	57.85	20.0	30.14	16.51
Interaction												
Sub at same level main (S x M)												
SEm ±	4.45	4.45	4.45	32.21	30.65	32.21	58.42	42.37	58.42	20.2	30.43	16.67
CD (P = 0.05)	15.40	15.40	15.40	111.46	106.06	111.46	202.15	146.6	202.15	70.2	105.30	57.67
Main at same or different level sub (M x S)												
SEm ±	23.4	23.4	23.4	169.6	163.3	169.6	304.1	222.2	304.1	110	159.8	87.8
CD (P = 0.05)	74.5	74.5	74.5	543.2	544.9	543.2	915.2	699.6	915.2	381	506.5	281.8

Physiological parameters

Chlorophyll content

During both the years, the cholorophyll content recorded at tasselling stage was found to significantly higher values found in subplot and highest was found in 125% RDF + 10 FYM (M1S2) and was on par with 125% RDF + Poultry manure @ 5 tons ha^{-1} (M1S3) compared to all other treatments. And lowest found in control plot this is mainly due to adequate and timely availability of nutrients for growth of plant and good utilization of solar radiation. Significantly more 1000-grain weight (282.7 g) in maize was recorded from plots fertilized @ 75 percent N ha^{-1} as urea + 25 percent N ha^{-1} as poultry manure, while statistically minimum 1000-grain weight (247.3 g) was recorded in control where no fertilizer (organic and inorganic) was applied. The highest dry matter production and chlorophyll content with application of recommended dose of fertilizer along with FYM @ 10 t ha^{-1} as compared to individual application of FYM @ 10 t ha^{-1}, 100 and 150 percent recommended dose of fertilizers (89, 122 and 149 g plant^{-1}) to maize in a clay loam soil. (Tetarwal *et al.*, 2011) (Table 3) [5].

Table 3: Chlorophyll readings at tasselling stage of maizeas influenced by organic and inorganic nutrients

Treatments	Chlorophyll content		
	2019	2020	Pooled
Main plots			
M_1 = 125% RDF	36	37	37
M_2 = 100% RDF	35	35	35
M_3 = 75% RDF	32	34	33
SEm ±	0.12	0.14	0.13
CD (P = 0.05)	NS	NS	NS
Sub plots			
S_1 = Control	20	20	20
S_2 = FYM @ 10 tons ha^{-1}	38	40	39
S_3 = Poultry manure @ 5 tons ha^{-1}	40	42	41
S_4 = Urban compost @ 5 tons ha^{-1}	38	40	39
SEm ±	0.20	0.28	0.26
CD (P = 0.05)	0.61	0.84	0.78
Interaction			
Sub at same level main (S ×M)			
SEm ±	0.61	0.85	0.79
CD (P = 0.05)	NS	NS	NS
Main at same or different level sub (M × S)			
SEm ±	3.3	4.5	4.2
CD (P = 0.05)	NS	NS	NS

Conclusion

Application of 125% RDF + 5 ton poultry manure (M_1S_3) produced taller plants at all stages. The growth parameter *viz.*, dry matter accumulation, and Chlorophyll content recorded significantly higher with 125% RDF + 5 ton poultry manure (M_1S_3) on par with 125% RDF + 10 ton FYM (M_1S_2) and lowest found in (M1S1), while growth parameters and growth analysis.

References

1. Chandrasekhar GK, Harlapur SI, Muralikrishna S, Girish G. Response of maize (*Zea mays* L.) to organic manures

with inorganic fertilizers. Karnataka Journal of Agricultural Sciences 2000;13(1):144-146.
2. Kumpawat BS. Integrated nutrient management in pearl millet (*Pennisetum glaucum*) and its residual effect on succeeding mustard (*Brassica juncea*) crop. Ind. J Agric. Sci 2010;80(1):76-79.
3. Prasad B, Sinha NP. Balance sheet of soil phosphorus and potassium as influenced by intensive cropping and fertilizer uses. Plant and Soil 1981;60(2):187-193.
4. Sharma JP. Economy in fertilizer use through organic manures in growing maize. Indian Journal of Agronomy 1983;28(2):154-155.
5. Tetarwal JP, Baldev Ram, Meena DS. Effect of integrated nutrient management on productivity, profitability, nutrient uptake and soil fertility in rainfed maize (*Zea mays*). Indian Journal of Agronomy 2011;56(4):373-376.
6. Tolessa debele, Sharanappa Sudhir K, Sujith GM. Direct and Interactive effects of enriched farm yard manure and nitrogen levels on the productivity and nutrient uptake of maize. Karnataka Journal of Agricultural Sciences 2001;14(4):894-899.