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Research Article

Influence of poultry wastes composts on the growth and yield attributes of maize

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SUMMARY : A field experiment was conducted with twelve treatments to test the effectiveness of different poultry - carbonaceous wastes compost on the soil properties, growth and yield attributes of maize (Hybrid - Samrat). The application of compost improved the soil fertility by adding humus and available plant nutrients. Compost application along with 100 per cent and 75 per cent level of recommended NPK increased the growth and yield of maize. Among the different compost (Poultry droppings and coir pith, poultry droppings and paddy straw, poultry droppings and coir pith with rock phosphate), the compost prepared by mixing poultry droppings, coir pith and rock phosphate performed superior over others. The maize crop recorded high yield when grown using coir pith and rock phosphate added poultry compost along with recommended levels of NPK which was at par with the results of coir pith mixed poultry compost along with 75 per cent levels of recommended N, P and K. The present study confirmed that the compost application not only improved the maize yield but also the fertility status of soil and saved 25 per cent of fertilizer.

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BACKGROUND AND OBJECTIVES

The use of inorganic fertilizer has not been helpful under intensive agriculture because it is often associated with reduced crop yield, soil acidity and nutrient imbalance (Obi and Ebo, 1995; Ojeniyi, 2000; Ayoola and Adeniyan, 2008). Organic wastes contain varying amounts of water, mineral nutrients, organic matter. While the use of organic wastes as manure has been in practice for centuries world-wide (Straub, 1977) and in the recent times (Gambara *et al.*, 2002; López-Masquera *et al.*, 2008). Animal manures have been used effectively as nutrients for crops for centuries. Poultry manure has long been recognized as perhaps the most desirable of these natural manures because of its high nitrogen content. In addition, manure supplies other essential plant nutrients and serves as a soil amendment by adding organic matter. Organic matter persistence will vary with temperature, drainage, rainfall and other environmental factors. Organic matter in soil improves moisture and nutrient retention (Magdi *et al.*, 2004). The utilization and management of manure is an integral part of sustainable agriculture.

Poultry manure is often produced in areas where it is needed for crop fertilization. The increased size and frequent cleanout of many poultry operations make poultry manure available in sufficient quantities and on a timely basis to supply most fertilization needs. Therefore, the present work has been carried out to test the effectiveness of different carbonaceous waste in minimizing the ammonia emission from poultry droppings and their suitability for composting and also, the agronomic effectiveness of poultry waste compost.

RESOURCES AND METHODS

For the field experiment, test crop maize was chosen and raised in a fertile land. Different poultry compost along with inorganic fertilizers at different levels was applied as per the treatment details. Twelve treatments were followed and the treatments were replicated thrice. The treatment details of the field experiment are as follows:T_1 - Absolute control, T_2 - 100% NPK, T_3 - FYM @ 12.5 ha^{-1} + 100% NPK, T_4 - Compost mix (1), T_5 -Compost mix (2), T_6 - Compost mix (3), T_7 - Compost mix (1) + 100% NPK, T_8 - Compost mix (2) + 100% NPK, T_9 - Compost mix (3) + 100% NPK, T_{10} - Compost mix (1) + 75% NPK, T_{11} - Compost mix (2) + 75% NPK, T_{12} - Compost mix (3) + 75% NPK. Compost mix were applied @ 6 t ha^{-1} : Compost mix (1) - Poultry droppings + coir pith, compost mix (2) - Poultry droppings + paddy straw, Compost mix (3) - Poultry droppings + coir pith + rock phosphate

Field experiment was conducted at farmer's field located at Narasipuram village of Thondamuthur taluk, Coimbatore district, Tamil Nadu. The hybrid Samrat (Hindustan Lever Limited) with 105 days duration was raised as test crop. The fertilizer dose at recommended level of 135: 62.5: 50 kg NPK ha^{-1} were applied for 100% level and 101.25: 46.88: 37.50 kg NPK ha^{-1} were applied for 75% level of recommended NPK treatment. The application of different levels of fertilizers with different poultry composts were followed as per the treatments. The experiment was laid out in a Randomized Block Design with three replications. Twelve treatments were assigned to experimental units at random. The size of each plot was 18 sq.m. The treatment numbers were assigned at random. Soil and plant samples were collected at vegetative, tasseling and harvest stages and analyzed for various chemical and biological properties using standard analytical methods. The uptake of nitrogen was calculated by multiplying the content of the nitrogen with respective dry matter weights of the plant samples at the appropriate stage.

For the biometric observations, in each experimental plot, five plants were chosen at random and tagged in all the replications. Biometric parameters were recorded and the mean values were worked out. Plant height was measured in cm from zero node to the top. *i.e.* from the ground level to tip of the growing point. For dry matter production, the plants were randomly selected and removed at active vegetative, tasseling and harvest stages. The samples were first air dried in the shade and then oven dried at 60°C. The samples were weighed and expressed in kg ha^{-1}.

The following yield components were recorded at harvest from the tagged plants. The grain and straw yields were recorded from the tagged plants and expressed in kg ha^{-1}. Cob length and cob width were measured and expressed in cm. The number of grain rows per cob was counted and the mean values were calculated. The number of grains per row was counted and the mean values were calculated. The number of grains per cob was counted and the mean values were calculated. The hundred grains were taken at harvest from the selected cobs and their weights were recorded.

The data obtained from the present investigation were subjected to statistical analysis following the methods of Snedecor and Cochran (1967) and Panse and Sukhatme (1967).

OBSERVATIONS AND ANALYSIS

The analytical report of initial soil showed the pH of 7.40 and electrical conductivity 0.18 dS m^{-1}. The CEC of the soil was 13.33 c mol (P^+) kg^{-1} and the soil had 13 per cent moisture. The organic carbon content of the soil was 0.38 per cent. The total N, P and K content of soil were 0.08 per cent, 0.05 per cent and 0.20 per cent, respectively. The available N, P and K status of the soil were 182, 10.12 and 380.60 kg ha^{-1} N, P and K, respectively.

The pH of the soil ranged from 7.42 to 8.25 during the vegetative period of crop growth. As the crop advanced to maturity, pH decreased gradually. During the post harvest stage, the pH ranged from 7.28 to 7.52. The reduction in soil pH could also be ascribed to the significant build up in organic matter content of the soil under compost applied treatments and subsequent release of organic acids. The buffering capacity of the soil and organics added might have contributed to the reduction in pH. A number of workers have elucidated the influence of added organics in reducing the pH (Chaudhary *et al*., 1981; Mahimairaja *et al*., 1995). The electrical conductivity showed a decreasing trend from vegetative stage to harvest stage. The electrical conductivity of soil ranged from 0.16 to 1.80 dS m^{-1} during the vegetative stage. As the crop growth advanced, the electrical conductivity of soil ranged from 0.14 to 0.81 dS m^{-1} at the harvest stage (Table 1).

The organic carbon content of the soil ranged from 0.58 to 0.93 per cent during the vegetative stage. Among the treatments tested, application of N, P and K @ 100% of recommended level and compost @ 6 t ha^{-1} (T_8) recorded the highest per cent of organic carbon content (0.93%) in the vegetative stage. Compost application was found to increase the organic carbon content of the soil. The effect was well pronounced in the vegetative stage itself. The organic carbon content of the soil decreased gradually as the crop growth advanced. At post harvest stage, poultry droppings and coir pith compost applied soil recorded the highest organic carbon content (0.50%). Soil biological properties were improved because of the addition of compost obtained by mixing poultry droppings and coir pith. Organic matter content was improved in soil because of the addition of compost. Application of compost significantly enhanced the organic carbon status of the soil of different stages of maize crop. Earlier report shows that addition of compost (20 - 200 g pot^{-1}) improved the soil chemical (increased total N, total C and CEC), physical (decreased particle density) and biological (increased soil respiration rates) properties (Magdi *et al*., 2004). Studies reported that application of coir compost improved the physical characteristics like infiltration rate, total porosity and hydraulic conductivity in red soil (Loganathan, 1990).

The organic matter enables the release of plant nutrients and makes them available to plant when applied to soil. It is even capable of increasing the efficiency of added plant nutrients when applied with inorganic fertilizers. Compost which is stabilized and partly decomposed organic matter is found to improve the soil structure. Like a sponge, compost will hold more moisture than the soil does. Compost can make a heavy soil friable and loose. Compost application improves the air and water movement of soil and releases undesirable gases such as CO_2 out of surface. Water and air can move into soil, and undesirable gases such as CO_2, moves out.

Addition of compost and inorganic fertilizers increased the soil available N, P and K status and other nutrients (Table 2). Ravichandra *et al*. (1996) reported that higher available

Table 1 : Effect of poultry composts and different levels of fertilizer on changes in pH, EC and organic carbon of the maize grown soil

Treatments	pH			EC (dS m^{-1})			Organic carbon (%)		
	Vegetative stage	Tasseling stage	Harvest stage	Vegetative stage	Tasseling stage	Harvest stage	Vegetative stage	Tasseling stage	Harvest stage
T_1 - Absolute control	7.42	7.40	7.40	0.16	0.14	0.14	0.58	0.40	0.38
T_2 - 100% NPK	8.02	7.96	7.53	1.35	1.06	0.69	0.84	0.60	0.40
T_3 - FYM @ 12.5 ha^{-1}+100% NPK	8.13	7.86	7.52	1.37	1.10	0.79	0.87	0.66	0.45
T_4 - Compost mix (1)	8.25	7.92	7.40	1.80	1.22	0.81	0.89	0.68	0.47
T_5 -Compost mix (2)	8.23	7.93	7.42	1.76	1.09	0.78	0.91	0.70	0.50
T_6 - Compost mix (3)	8.20	7.90	7.37	1.79	1.11	0.79	0.91	0.68	0.48
T_7 -Compost mix (1) + 100% NPK	8.20	7.77	7.30	1.72	1.00	0.60	0.92	0.69	0.48
T_8 -Compost mix (2) + 100% NPK	8.10	7.70	7.28	1.69	0.98	0.59	0.93	0.68	0.46
T_9 -Compost mix (3) + 100% NPK	8.12	7.74	7.30	1.69	0.96	0.54	0.92	0.65	0.46
T_{10} -Compost mix (1) + 75% NPK	8.20	7.87	7.43	1.79	1.15	0.69	0.88	0.67	0.48
T_{11} -Compost mix (2) + 75% NPK	8.15	7.85	7.30	1.73	1.02	0.64	0.90	0.69	0.47
T_{12} - Compost mix (3) + 75% NPK	8.15	7.83	7.35	1.70	1.00	0.64	0.89	0.64	0.45
S.E.$\pm$	0.512	0.506	0.648	0.144	0.090	0.063	0.084	0.060	0.040
C.D. (P= 0.05)	NS	NS	NS	0.298	0.187	0.130	NS	0.125	NS

NS= Non-signifiant

Table 2 : Effect of poultry composts and different levels of fertilizer on changes in available NPK content of maize grown soil

Treatments	Available nitrogen (kg ha^{-1})			Available phosphorus (kg ha^{-1})			Available potassium (kg ha^{-1})		
	Vegetative stage	Tasseling stage	Harvest stage	Vegetative stage	Tasseling stage	Harvest stage	Vegetative stage	Tasseling stage	Harvest stage
T_1 - Absolute control	195	182	161	10.3	8.2	7.2	380	342	326
T_2 - 100% NPK	214	202	196	17.5	16.0	14.3	406	361	343
T_3 - FYM @ 12.5 ha^{-1}+100% NPK	218	210	203	18.6	15.2	14.1	408	364	346
T_4 - Compost mix (1)	208	201	190	17.8	16.3	13.2	396	352	348
T_5 -Compost mix (2)	204	198	192	18.7	16.5	14.1	392	349	336
T_6 - Compost mix (3)	216	204	194	20.3	17.1	15.2	398	356	341
T_7 -Compost mix (1) + 100% NPK	228	218	210	19.3	18.4	13.3	416	372	351
T_8 -Compost mix (2) + 100% NPK	223	214	208	20.3	18.7	14.1	411	368	346
T_9 -Compost mix (3) + 100% NPK	234	223	216	22.4	19.0	15.2	418	372	354
T_{10} -Compost mix (1) + 75% NPK	218	204	196	19.4	15.1	13.2	409	368	348
T_{11} -Compost mix (2) + 75% NPK	215	201	193	20.1	15.3	14.2	406	365	346
T_{12} - Compost mix (3) + 75% NPK	221	213	207	20.4	17.0	14.4	412	371	349
S.E.$\pm$	3.293	2.233	1.126	1.821	1.541	1.327	3.281	8.345	2.346
C.D. (P= 0.05)	6.829	4.630	2.335	3.777	3.196	2.752	6.805	17.306	4.865

nutrients status in soil was noticed in all the poultry droppings added coir compost treatments over N, P and K treatment. Available N, P and K content was high during the initial vegetative stage and decreased as the crop growth advanced. In general, coir pith added poultry droppings compost along with 100 per cent level of recommended NPK applied plot recorded highest N, P and K content during harvest stage. Soil applied with rock phosphate added compost recorded higher phosphorus content. Among the composts applied, coir pith mixed poultry droppings compost performed well than the paddy straw mixed poultry droppings compost.

Available nitrogen content of the soil at vegetative stage showed high amount of nitrogen in all the treatments and ranged from 195 to 234 kg ha^{-1}; the maximum being observed in T_9. The available nitrogen content decreased as the crop growth advanced. During the harvest stage, T_9 recorded highest available nitrogen content T_9 (216 kg ha^{-1}) followed by T_7 (210 kg ha^{-1}) and T_{12} (207 kg ha^{-1}).

The available phosphorus content of soil ranged from 10.3 to 22.4 kg ha^{-1} during the vegetative stage and decreased as the crop growth advanced. Soil applied with rock phosphate added compost recorded higher phosphorus content. Among

Table 3 : Effect of poultry composts and different levels of fertilizer on plant height, plant girth and dry matter production of maize

Treatments	Plant height (cm)			Plant girth (cm)			Dry matter production (kg ha^{-1})		
	Vegetative stage	Tasseling stage	Harvest stage	Vegetative stage	Tasseling stage	Harvest stage	Vegetative stage	Tasseling stage	Harvest stage
T_1 - Absolute control	32	84	93	1.4	2.0	2.4	646	3642	5246
T_2 - 100% NPK	53	142	167	2.7	3.7	5.4	1642	5948	11999
T_3 - FYM @ 12.5 ha^{-1}+100% NPK	62	171	187	3.1	3.9	5.8	1754	6942	12402
T_4 - Compost mix (1)	55	159	178	2.6	3.2	5.0	1542	5742	11272
T_5 -Compost mix (2)	54	152	174	2.4	3.3	5.2	1532	5750	11292
T_6 - Compost mix (3)	57	156	176	2.4	3.3	5.2	1538	5762	11306
T_7 -Compost mix (1) + 100% NPK	80	186	209	3.2	4.2	5.9	1839	8540	13267
T_8 -Compost mix (2) + 100% NPK	83	180	196	3.4	4.3	6.2	1842	8564	14201
T_9 -Compost mix (3) + 100% NPK	88	194	222	3.2	4.6	6.0	1836	8252	13342
T_{10} -Compost mix (1) + 75% NPK	86	193	219	3.1	4.2	5.9	1832	8263	13292
T_{11} -Compost mix (2) + 75% NPK	82	182	214	3.0	4.3	5.8	1840	8290	13422
T_{12} - Compost mix (3) + 75% NPK	80	185	211	3.2	4.3	6.1	1846	8560	13998
S.E.$\pm$	5.756	16.639	22.022	0.192	0.251	0.481	151.66	260.89	216.96
C.D. (P = 0.05)	11.939	34.509	45.674	0.397	0.519	0.997	314.54	578.09	449.95

Table 4 : Effect of poultry composts and different levels of fertilizer on plant nitrogen uptake and grain protein content of maize

Treatments	Total N content in straw (%)	Total N content in grain (%)	Dry matter production (kg ha^{-1})	N uptake (kg ha^{-1})	Protein (%)
T_1 - Absolute control	0.90	0.62	5246	90	5.63
T_2 - 100% NPK	0.96	0.74	11999	204	6.00
T_3 - FYM @ 12.5 ha^{-1}+100% NPK	1.02	0.77	12402	222	6.38
T_4 - Compost mix (1)	1.00	0.76	11272	198	6.25
T_5 -Compost mix (2)	0.98	0.75	11292	195	6.13
T_6 - Compost mix (3)	1.01	0.76	11306	200	6.32
T_7 -Compost mix (1) + 100% NPK	1.12	0.81	14201	260	7.00
T_8 -Compost mix (2) + 100% NPK	1.08	0.80	13267	249	6.75
T_9 -Compost mix (3) + 100% NPK	1.14	0.83	13342	263	7.13
T_{10} -Compost mix (1) + 75% NPK	1.06	0.78	13422	247	6.63
T_{11} -Compost mix (2) + 75% NPK	1.03	0.76	13292	238	6.44
T_{12} - Compost mix (3) + 75% NPK	1.06	0.79	13998	259	6.63
S.E. $\pm$	0.012	0.011	216.96	2.54	-
C.D. (P = 0.05)	0.025	0.023	449.59	5.12	-

Table 5 : Effect of poultry composts and different levels of fertilizer on yield attributes of maize

Treatments	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Cob length (cm)	Cob width (cm)	Number of grain rows cob^{-1}	Number of grains row^{-1}	Number of grains cob^{-1}	100 grain weight (g)	Benefit cost ratio
T_1 - Absolute control	1542	4312	9.1	11.6	10	17	170	10.1	1.40
T_2 - 100% NPK	3256	9672	13.1	12.6	13	36	468	23.6	2.10
T_3 - FYM @ 12.5 ha^{-1}+100% NPK	3912	11542	14.6	15.0	16	31	496	26.1	2.40
T_4 - Compost mix (1)	3741	9612	14.4	15.3	16	37	592	23.1	1.95
T_5 -Compost mix (2)	3240	9602	12.3	14.3	14	28	392	20.1	1.75
T_6 - Compost mix (3)	3746	9592	14.6	15.4	16	34	544	22.3	2.10
T_7 -Compost mix (1) + 100% NPK	5763	12123	17.5	15.9	16	36	578	33.6	2.90
T_8 -Compost mix (2) + 100% NPK	5368	12151	16.4	13.6	14	32	448	28.1	2.65
T_9 -Compost mix (3) + 100% NPK	6312	13142	17.2	17.2	17	38	646	33.2	2.95
T_{10} -Compost mix (1) + 75% NPK	5300	13086	17.0	15.0	14	38	532	27.1	2.75
T_{11} -Compost mix (2) + 75% NPK	4812	12132	16.4	14.8	15	36	540	24.6	2.40
T_{12} - Compost mix (3) + 75% NPK	5860	12136	16.8	15.1	14	39	546	26.1	2.85
S.E.$\pm$	465.0	1116.1	1.466	1.903	10.89	3.427	59.82	1.617	-
C.D. (P = 0.05)	964.5	2314.8	3.041	NS	2.258	3.108	124.07	3.353	-

NS = Non-signifiant

the treatments, T_9 recorded the highest available phosphorus content (22.4 kg ha^{-1}).

A high amount of potassium content was recorded during the initial vegetative stage in all the treatments. The potassium content also decreased as the crop growth advanced. T_9 recorded high potassium content (354 kg ha^{-1}) during post harvest stage followed by T_7 (351 kg ha^{-1}).

Influence of treatments on growth parameters of maize: The plants showed steady increase in height from vegetative stage to maturity. During the vegetative stage, the order of superiority in plant height was T_9>T_{10}>T_8. There was a tremendous increase in the plant height during the tasseling stage. During the harvest stage plant height ranged from 93 to 222 cm. The girth of the plant increased gradually as the crop advanced to maturity. During the vegetative stage, it ranged from 1.4 to 3.4 cm and during harvest stage, it was 2.4 to 6.2 cm (Table 3) .

There was a considerable amount of dry matter accumulation during the vegetative stage. The dry matter production ranged from 646 to 1846 kg ha^{-1} during vegetative stage. During harvest stage, it ranged from 5246 to 14201 kg ha^{-1}.

The total N in straw ranged from 0.90 to 1.14 per cent and the nitrogen content of the maize grain ranged from 0.62 to 0.83 per cent. The total N uptake ranged from 90 kg ha^{-1} to 263 kg ha^{-1}. The treatment T_9 recorded the maximum N uptake (263 kg ha^{-1}) followed by T_7 (260 kg ha^{-1}) (Table 4).

The grain yield of maize was high in T_9 (6312 kg ha^{-1}) which was at par with T_7, T_8, T_{10} and T_{12}, whereas the lowest yield was recorded in T_1 (1542 kg ha^{-1}) . The highest straw yield was recorded in T_9 (13142 kg ha^{-1}) and the lowest was recorded in T_1 (4312 kg ha^{-1}) (Table 5). The treatments were highly significant. The cob length of different treatments ranged from 9.1 cm to 17.5 cm. The cob width ranged from 11.6 to 17.2 cm, number of grain rows per cob ranged from 10 to 17, number of grains per row was 17 to 38 and number of grains per cob ranged from 170 to 646. The weight of the 100 grains ranged from 10.1 g to 33.6 g. Similar results were also reported by Biswas and Narayanasamy (2002).

Conclusion :

The results from the field experiments indicated that composting of poultry dropping with coir pith and rock phosphate not only reduces environmental pollution associated with manure application, but also improves the agronomic effectiveness of the manure.

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REFERENCES

Ayoola, O.T. and Adeniyan, O.N. (2008). Influence of poultry manure and NPK fertilizer on yield and yield com-ponents of crops under different cropping systems in south west Nigeria. *African J. Biotechnol.,* **5** (15): 1386-1392.

Biswas, D.R. and Narayanasamy, N. (2002). Mobilization of phosphorus from rock phosphate through composting using crop residues. *Fert. News.,* **47**(3): 53-56.

Chaudhary, M.L., Singh, J.P. and Narwal, R.P. (1981). Effect of long term application of P, K and FYM on some soil chemical properties. *J. Indian Soc. Soil Sci.,* **29**: 81-85.

Gambara, P., Machemedze, T. and Mwenye, D. (2000). Chihota soil fertility Project, Annual Report 1998 to 1999. AGRITEX, Marondera, ZIMBABWE

Loganathan, S. (1990). Effect of certain tillage practices and amendments on physico-chemical properties of problem soils. *Madras agric. J.,* **77**: 204-201.

López- Masquera, M.E., Cabaleiro, F., Sainz, M.S., López- Fabal, A. and Carral, E. (2008). Fertilizing value of broiler litter: Effects of drying and pelletizing. *Bioresource Technol*., **99**: 5626-5633.

Obi, M.E. and Ebo, P.O. (1995). The effect of different management practices on the soil physical properties and maize production in severely degraded soil in southern Nigeria. *Biological Resource Technol.,* **51**: 117-123

Ojeniyi, S.O. (2000). Effect of goat manure on soil nutrients and okra yield in a rain forest area of Nigeria. *Appl. Tropi.Agric.,***5**:20-23.

Magdi, T., Abdelhamid, D., Horiuchi, T. and Oba, S. (2004). Composting of rice straw with oilseed rape cake and poultry manure and its effects on Faba bean growth and soil properties. *Bioresour. Tech.,* **93**(2):183-189.

Mahimairaja, S., Bolan, N.S. and Hedley, M.J. (1995). Agronomic effectiveness of poultry manure composts. *Commun. Soil Plant Ana.,* **26**(11&12): 1843-1861.

Panse, V.G. and Sukhatme, P.V. (1967). *Statistical methods for agricultural workers*, NEW DELHI, INDIA.

Ravichandra, B.C., Channabasav Gowda, R. Basararaj, B. Shivamurthy, S.C. and Siddaramappa, R. (1996). Compost application on nutrients availability and growth of maize in an alfisol. *Mysore J. Agric. Sci.,* **30**: 127-132.

Siddaramappa, R. (1996). Compost application on nutrients availability and growth of maize in an alfisol. *Mysore J. Agri. Sci.,* **30**: 127-132.

Snedecor, G.W. and Cochran, W.C. (1967). *Statistical methods* (6th Ed.) Oxford and IBH Publishing House, Calcutta (W.B.) INDIA.

Straub, D. (1977). A hot issue-chicken manure. Tilth producers quarterly A *J. Organic & Sustain. Agric.*. United States.

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