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Research Article

TEMPORAL VARIATION IN CHEMICAL PROPERTIES OF SOIL AMENDED WITH DIFFERENT TYPES OF ORGANICS UNDER PLANTED AND NON PLANTED CONDITIONS

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Abstract: The investigation was carried out to assess the behaviour of different organic manures under planted and non planted conditions. Four types of composts prepared from the same source and farmyard manure was used to conduct a laboratory incubation study without plant and a pot culture experiment with fodder maize of var. African tall. All the organic manures had acidic pH range and safe EC. The nonconventional thermo chemical fortified organic manure was found to be superior in terms of N and K content while vermicompost had the highest K content. The nutrient release pattern was found to be different for all soil treatments amended with organic manures including the control (C) thus reflecting the role of rhizodeposits in soil organic matter decomposition process.

Keywords: Soil organic matter, Organic manures, Rhizodeposition

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Introduction

The importance of Soil Organic Carbon (SOC) in regulating crop yields has been well established [18]. The accumulation of SOC can benefit crop productivity by improving soil structural properties, bulk density,aggregate stability, aeration and pore connectivity. SOC plays a role in increasing the size of the mineralisable N and P pool and ameliorating constraints like inappropriate pH and low cation exchange capacity. Availability of good quality organic manure often poses limitations for its large scale field application. Composting is a popular practice for producing manure from organic wastes, but the long duration required for processing is a hindrance for the wide scale adoption of this practice. A novel technology, the thermochemical composting serves as an option for quick and hygienic waste disposal [27]. Characterization of the nonconventional organic manure produced by thermo chemical treatment [19] and plant growth trials [16] have shown that it could well be used for crop production. But a comparison of the properties of this nonconventional manure with the conventional organic manures has not been attempted. Moreover, the behaviour of different organic manures in the rhizosphere will be different consequent to the root activity. Kuzyakov has reported about rhizosphere priming which is the change in soil organic matter (SOM) decomposition caused by plant root activity that is often associated with rhizodeposition. About 11% - 17% of net fixed C goes into the soil as rhizodeposition and estimates of howmuch C is allocated to rhizodeposition vary widely among plant species, with plant age, soil type, and nutrient availability. Rhizodeposition is an important energy source for the microbial production of extra-cellular enzymes that break down SOM and releases the nutrients. Higher availability of plant nutrients as a result of rhizosphere priming has been reported by many scientists [5, 6, 24]. The objective of this investigation was to study the variations in chemical properties of soil and the nutrient release pattern by different conventional and nonconventional organic manures under planted and non planted conditions.

Materials and Methods

The study was conducted at the Department of Soil Science and Agricultural Chemistry, College of Agriculture,Vellayani during 2016-2018.

Organic manure preparation

The organic manures used for the study were prepared in four different methods. Three conventional methods *ie.*aerobic composting, accelerated composting using microbial inoculum, vermi composting and one non conventional method *ie*. KAU rapid thermochemical decomposition. The aerobic compost (AC), microbial compost (MC), vermi compost (VC), and thermo chemical organic fertilizer (TOF) were prepared from identical wastes with a definite proportion so as to make effective comparison between the treatments. The TOF was fortified with N (1.5%), P (1%), Ca (1%), Mg (0.5%), Zn (50 ppm) and B (5 ppm) and included as a separate treatment TOF-F. The composition of wastes for composting was constituted by food waste (83%), fruit waste (5%), leaf litter (10%) and inert material (2%). Farm Yard Manure (FYM) which is the most commonly available organic manure was also included in the study for comparison. FYM was purchased from the Animal Husbandary Department of the college.

Laboratory Incubation Experiment

A laboratory soil incubation experiment in Completely Randomised Design with 7 treatments and 3 replications was conducted for 90 days with the different organic manures under study. The soil used for the experiment was kaolinitic, isohyperthermic, Typic Kandiustults of Vellayani series. 2 kg soil was mixed with 0.02 kg each of AC, MC, VC, TOF, TOF-F and FYM and then kept in plastic pots and incubated for 90 days at field capacity on the basis of gravimetric moisture content. For the control, no organic manure was added to the soil, but the soil samples were mixed well and incubated in the same way as the soils in other treatments. The weight loss of each pot was checked thrice in a week and distilled water was added as required to each pot to maintain constant soil moisture content.

Pot Culture Experiment

A pot culture experiment, as in the case of laboratory incubation, was conducted for 90 days using fodder maize variety.

African tall to study the rhizosphere priming effects on soil application of different organic manures. The design was CRD with 7 treatments and 8 replications.5 kg of soil was mixed with 0.05 kg each of AC, MC, VC, TOF, TOF-F and FYM and pots were filled the soil and fodder maize seeds of variety African tall were sown and plants were well maintained for 90 days. A no manure control pot was also maintained where maize seeds were sown in soil not mixed with organic manures. The soil samples of three replicates of all treatments were analysed at each sampling intervals (0, 15, 30, 60 and 90 days of incubation). All parameters like pH, EC, N, P and K content were determined at all sampling intervals.

Organic manure analysis

The prepared organic manures and FYM were air dried and analysed for their physical and chemical parameters. The pH and electrical conductivity (EC) were measured in deionized water (1: 2.5 w/v and 1:5 w/v respectively)[8], N content by Microkjeldahl distillation after digestion with H_2SO_4 [15], P content by nitric-perchloric (9:4) acid digestion and spectrophotometry using vanado-molybdic yellow colour method (Double Beam UV-VIS spectrophotometer 2201, Systronics) [11] and K content by nitric-perchloric (9:4) acid digestion and flame photometry (Digital Flame Photometer 130, Systronics, India) [8].

Soil sample analysis

The soil samples from the incubation study and pot culture experiment were shade dried and analysed at all the sampling intervals (0, 15, 30, 60 and 90 days). Soil pH and EC were measured in deionized water (1: 2.5 w/v and 1:5 w/v respectively)[8], N content by alkaline potassium permanganate method [28], P content Bray No.1 extraction and spectrophotometry (Double Beam UV-VIS spectrophotometer 2201, Systronics) [15] and K content [15].

Results and Discussions

Chemical properties of organic manures

The pH of all the organic manures was in the acidic range and the highest pH was recorded by TOF-F. All organic manures had a safe EC, the highest being recorded by TOF-F. The nonconventional organic manure when fortified (TOF-F) had the highest N content which was on par with MC and both these manures were significantly different from all others. . The P content was significantly different between the manures. Vermicompost (VC) registered the highest value and differed significantly from all other manures. The K content of organic manures varied in the order TOF-F > TOF > VC > MC > AC > FYM. The treatment TOF-F with the highest K content was statistically superior to all other manures [Table-1]. Among the different manures used in the experiment, the highest N content was recorded by MC. The N content in MC was 2.2, 2.4 and 1.34 times higher than that in AC,FYM and TOF respectively. Although MC had significantly higher N content than other treatments, it was on par with TOF-F. This might be due to the effect of the microbial inoculum used in this treatment for preparation of compost which might have enhanced the nitrogen fixation process. The highest content in TOF-F is due to the effect of fortification. The longer duration of conventional composting in AC might have resulted in the loss of some of the mineralised N through leaching and volatilization accounting for the lower values. The C/N ratio was the lowest in VC and highest in FYM. The C content in VC was the lowest, but N content was higher than AC or FYM, imparting a lower C/N ratio. [3] reported that in vermicomposting system, organic carbon content is reduced and nutrients like N,P,K and Ca increased as a result of active feeding by earthworms and microorganisms.. Earthworms harbour different microbial symbionts like bacteria, protozoa and fungi in their guts which are responsible for the organic matter degradation[23]. Decrease in organic carbon during the vermicomposting process indicates complete degradation, maturity, mineralization and waste decomposition [13]. FYM had the lowest content of N making its C/N ratio the highest. The major component in FYM as reported by [26] is cattle dung and cattle shed wastes, which provide the major portion of drymatter and N,P and K. They estimated that about 39 % of N, 20 % of P and 32 % of K are lost during preparation of FYM by conventional methods and the major loss is through leaching. Although the TOC content in FYM was lesser than MC, the N content was higher in MC imparting it a lower C/N ratio.

The concentration of P in VC and FYM were higher than all the other conventional and nonconventional manures. It is reported that phosphorus occurs in animal manure in a combination of inorganic and organic forms. In general, 45 to 70 percent of manure P is inorganic [12]. Even the organic P is easily decomposable by soil microorganisms to the inorganic form. The lowest P content was observed in AC. The P content in MC was more than 2,3 and 4 times that of AC, TOF and TOF-F respectively as a result of action of P solubilising capacity of the microbes used for composting. The values for K content in TOF and VC were on par but significantly superior to the other manure types. The high content of K in TOF is due to the addition of dilute KOH which is used for processing of waste. The values in AC and MC were on par, but was significantly higher than that of FYM. The low content of K in FYM is attributed to leaching losses. [26] reported that about 32 % of K is lost from FYM by leaching. Significant difference could not be obtained for Ca content of the manures, but MC had significantly higher values for Mg content whereas S content was the highest in VC when the treatment TOF-F is excluded. In the case of micronutrient content, the manures MC and VC were superior to others. In these two processes, microbial activity is very high leading to mineralization of organic matter releasing the plant nutrients. [3] reported that the gut of earthworms is inhabited by a variety of microorganisms by which organic matter degradation occurs efficiently.

Effect of different organic manures on soil pH and EC

The pH had an increasing trend upto 60 D but on 90 D a slight drop in pH was noted under non planted situation [Fig-1]. At all levels of sampling an acidic pH was observed for every treatments. The treatment C recorded the highest pH of 5.55 at 0D which was on par with all treatments except MC. The soil EC at different periods of incubation remained significant and safe. At 0 D, TOF-F and VC recorded the highest EC (0.38 dS m^{-1}) followed by MC (0.37 dS m^{-1}) which was on par with them. The treatment TOF-F had the highest values for EC at 15 D (0.52 dS m^{-1}), at 30 D (0.54 dS m^{-1}) and at 60 D (0.58 dS m^{-1}) and found to be statistically different from all other treatments. At 90 D, VC had the highest EC - 0.54 dS m^{-1} and found to have significant difference from all other treatments[Table-8].Under planted conditions also pH had an increasing trend upto 60 D and at 90 D a slight drop in pH was observed and control C recorded the highest values for soil pH at all levels of sampling [Fig-2].The soil EC at different periods in pot culture experiment remained significant and safe at all levels of sampling. The treatment TOF-F recorded the highest EC at all levels of sampling. At 0D, TOF-F (0.38 dS m^{-1}) was on par with MC and VC, at 15 D, TOF-F (0.39 dS m^{-1}) was on par with MC, at 30 D, TOF-F (0.40 dS m^{-1}) was on par with all treatments except VC and C, at 60 D (0.45 dS m^{-1}) and at 90 D (0.39 dS m^{-1}), TOF-F remained different from all other treatments [Table-9]. The pattern of kinetics exhibited by pH and EC was exactly opposite to each other under both planted or non planted situations. Soil pH decreased in the treatments upto 60D whereas EC increased. Under nonplanted conditions, the decline in pH in TOF was sharper, reaching the lowest level at 30 D and then increased to the highest level, whereas with fortification it behaved exactly similar to the other conventional manures. But under planted condition, this difference could not be obtained. The decrease in pH may be due to the release of organic acids from the organic manures [17]. A decline in soil pH with application of organic manures is also been reported by [The decline 19] of pH was sharp in the case of non planted treatments but more gentle in planted pots. Similarly, the increase in EC was sharper under non planted than planted situation. The increase in EC might have been due to the release of nutrient elements from organic manures as a result of mineralization. [10]. reported that cationic and anionic nutrients are produced due to mineralization of organic manures thereby increasing the electrical conductivity of soil. Significant increase in EC with application of different types of organic manures had been reported [22]. The trend observed in the present study corresponded well with there lease pattern of N, K, Mg and S, in different treatments. At 60 D the pH started increasing and EC decreasing. The increase in pH may be due to the effect of basic cations produced by mineralization of C and production of OH- ions by ligand exchange [4]. Composts release alkaline substances and cations such as Ca^{2+}, Mg^{2+}, K^+ which increase pH and counteract soil acidification. The trend obtained in EC in the present study supports this fact.

At the end of the experiment, the pH was lower than initial in all treatments except control (C). Soil EC under laboratory conditions increased to a higher level than initial value at 90 D, but was well below the prescribed critical limits for plant growth.

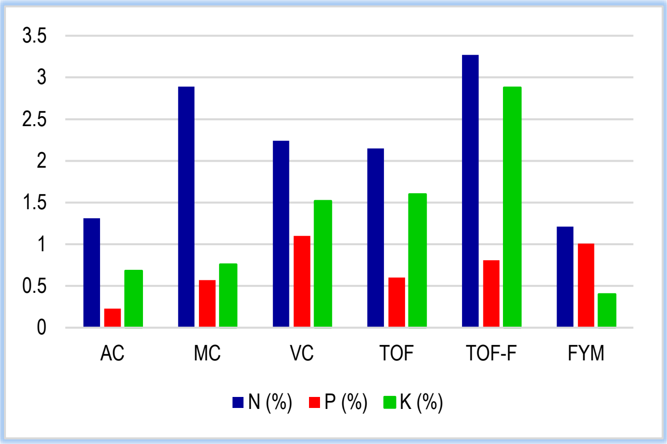

Fig-1 Effect of application of different manures on kinetics of soil pH in non planted soil

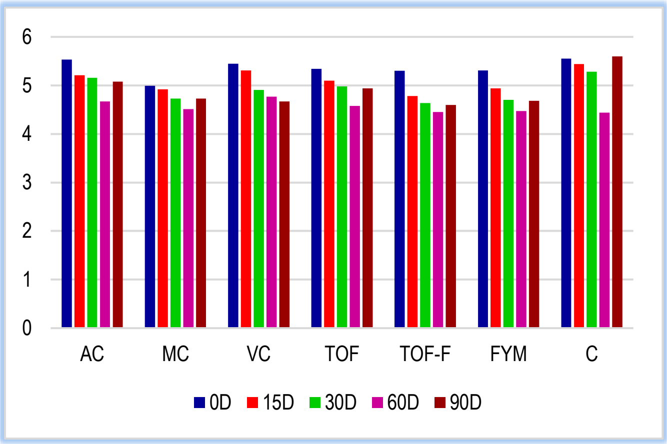

Fig-2 Effect of application of different manures on kinetics of soil pH in planted soil

Effect of different organic manures on soil nutrient availability

Soil available N

A general decrease in available N content was observed in all the treatments with time in non planted conditions[Table-2]. The soil available N content differed significantly from the 0th day on addition of the treatments. On 0 D TOF-F registered the highest N content which was on par with AC and MC. At 15 D, the highest N content was shown by VC (313.60 kg ha^{-1}) which was on par with all other treatments except TOF, FYM and Control. On 30th day TOF recorded the highest N content (301.06 kg ha^{-1}) and it was on par with TOF-F, MC and AC. On 60th day TOF-F recorded the highest value which was on par with MC, AC and VC. At the end of the experiment on 90th day TOF-F maintained the highest value, but was on par with MC, VC and TOF and significantly different with rest of the treatments. The control treatment (C) recorded a decrease in N content from 0 D and was inferior to all other treatments. The available nitrogen content of soil in pot ranged from 363.78 kg ha^{-1} (TOF-F at 0 D) to 75.26 kg ha^{-1} (C at 60th& 90th D) [Table-5] At 0th day, TOF-F (363.78 kg ha^{-1}) had the highest N content followed by AC (326.14 kg ha^{-1}) and was found to be on par with VC and MC but significantly different from others. On 15th and 60th day AC showed highest N content, 288.51 kg ha^{-1} and 225.79 kg ha^{-1} followed by MC and TOF-F. On 30th day, MC and TOF-F had the highest values for N (326.14 kg ha^{-1}) and they were on par with VC. The treatment MC (188.16 kg ha^{-1}) recorded the highest N at 90 D and was found to be significantly different to only FYM and control. A decline in soil N content was observed on 15 D in planted and non planted situations (except VC under laboratory conditions) followed by an increase upto 30 D which again continued to decrease even at the end of the study period on 90 D. The sharp decline in planted treatments is the result of plant uptake. Depletion of N content in soil as a result of uptake by plants induces a positive priming effect in the rhizosphere as suggested by [29]. They suggested that when the content of soil N is depleted by plant uptake, more quantities of exudates are released into the rhizosphere soil thus promoting soil C mineralization. It is well known that N mineralization is a biological process. Addition of organic manures supply easily available C and N compounds to soil microbes, as a result of which a sudden increase in their population occurs in soil. An increase in CO_2 evolution and N availability occurs within twenty-four hours after soil incubation. The CO_2 flux soon after addition of organic manures is indicative of flourishing decomposers, which is responsible for immobilisation of the released N. However after a time the supply of easily available C and N compounds will be exhausted resulting in a decline of microbial population, releasing the immobilised N into the soil [7]. The increase in N availability noticed on 30 D coincides with this phase. Similar results have been reported by many [1, 2, 21]. The treatments FYM and C recorded a continuous decline without any peak at any of the sampling intervals. The high C/N ratio of FYM may be the reason for the immobilization of N in this treatment. TOF-F maintained the highest N level [14]. reported that the nutrient content in composts made from the same source could vary depending upon the technology used for production of compost.

Table-1 Chemical characteristics of organic manures

Manures	pH	EC(dS m^{-1})	N(%)	P(%)	K (%)
AC	6.41	0.526	1.31	0.23	0.68
MC	6.84	0.606	2.89	0.57	0.76
VC	5.57	0.576	2.24	1.10	1.52
TOF	6.35	0.610	2.15	0.60	1.60
TOF-F	6.98	0.657	3.27	0.81	2.88
FYM	6.19	0.066	1.21	1.01	0.40
CD(0.05)	NS	0.002	0.143	0.011	0.061
SEm (±)	0.577	0.001	0.445	0.034	0.190

Table-2 Soil available N as influenced by different organic manures, kg ha^{-1}

Treatments	0D	15D	30D	60D	90D
AC	326.14	263.42	263.42	213.25	100.35
MC	301.06	250.88	275.97	225.79	200.70
VC	275.97	306.93	200.70	200.70	175.62
TOF	238.34	226.00	301.06	188.16	163.07
TOF-F	363.78	250.88	288.51	250.88	225.79
FYM	175.62	150.53	137.98	112.90	87.81
C	163.07	112.90	87.81	75.26	62.72
CD(0.05)	72.827	63.594	61.954	70.885	64.709
SEm(±)	23.780	20.765	20.229	23.146	21.129

Table-3 Effect of treatments on soil available P content at different periods of incubation, kg ha^{-1}

Treatments	0D	15D	30D	60D	90D
AC	130.48	133.02	97.14	76.84	150.21
MC	178.69	55.82	86.27	123.96	141.32
VC	156.58	109.46	176.90	171.63	139.91
TOF	136.65	112.97	52.193	56.18	130.12
TOF-F	138.09	83.37	105.84	145.71	134.40
FYM	165.28	76.84	144.62	179.42	209.50
C	59.08	97.14	102.21	112.36	137.73
CD(0.05)	18.236	18.039	16.975	18.940	18.630
SEm(±)	5.955	5.890	5.543	6.184	6.083

Table-4 Soil available K at different periods of incubation, kg ha^{-1}

Treatments	0D	15D	30D	60D	90D
AC	235.20	201.60	212.80	156.80	212.80
MC	347.20	436.80	380.80	392.00	302.40
VC	179.20	168.00	145.60	168.00	201.60
TOF	448.00	268.80	212.80	280.00	280.00
TOF-F	817.60	302.40	235.20	817.60	784.00
FYM	168.00	134.40	179.20	190.40	201.60
C	190.40	89.60	156.80	145.60	156.80
CD(0.05)	52.395	68.602	68.602	19.805	52.395
SEm(±)	17.108	22.400	22.400	6.467	17.108

Table-5 Soil Available N at different sampling periods in pot culture experiment, kg ha^{-1}

Treatments	0D	15D	30D	60D	90D
AC	326.14	288.51	288.51	225.79	137.98
MC	301.06	263.42	326.14	213.25	188.16
VC	275.97	225.79	296.89	188.16	175.62
TOF	238.34	188.16	250.88	175.62	137.98
TOF-F	363.78	250.88	326.14	213.25	175.62
FYM	175.62	188.16	175.62	163.07	112.90
C	163.07	125.44	112.90	75.26	75.26
CD(0.05)	72.827	76.564	68.038	60.817	56.659
SEm(±)	23.780	25.000	22.216	19.858	18.500

Table-6 Soil available P as influenced by treatments in pot culture experiment, kg ha^{-1}

Treatments	0D	15D	30D	60D	90D
AC	130.48	51.83	141.85	47.48	146.80
MC	178.69	103.30	81.19	38.06	151.53
VC	156.58	133.87	164.92	151.87	158.78
TOF	136.65	79.38	131.94	63.43	138.46
TOF-F	138.09	117.44	118.52	60.17	144.98
FYM	165.28	70.32	116.35	137.01	133.08
C	59.08	40.60	44.22	57.99	119.61
CD(0.05)	18.236	19.451	16.861	19.096	18.630
SEm(±)	5.955	6.351	5.505	6.235	6.083

Table-7 Effect of treatments on soil available K at different periods in pot culture experiment, kg ha^{-1}

Treatments	0D	15D	30D	60D	90D
AC	235.20	197.87	242.67	123.20	168.00
MC	347.20	283.73	283.73	89.60	100.80
VC	179.20	175.47	123.20	89.60	123.20
TOF	448.00	197.87	242.67	134.40	280.00
TOF-F	817.60	321.07	265.07	145.60	291.20
FYM	168.00	153.07	141.86	89.60	100.80
C	190.40	130.67	112.01	100.80	190.40
CD(0.05)	52.395	53.104	103.08	19.804	52.395
SEm(±)	17.108	17.340	33.659	6.466	17.108

Table-8 Soil EC at different periods of incubation, dS m^{-1}

Treatments	0D	15D	30D	60D	90D
AC	0.31	0.45	0.49	0.41	0.34
MC	0.37	0.40	0.48	0.46	0.44
VC	0.38	0.41	0.44	0.51	0.54
TOF	0.30	0.42	0.43	0.43	0.40
TOF-F	0.38	0.52	0.54	0.58	0.50
FYM	0.24	0.42	0.44	0.46	0.48
C	0.20	0.39	0.39	0.40	0.31
CD(0.05)	0.053	0.018	0.035	0.018	0.035
SEm(±)	0.017	0.006	0.012	0.006	0.012

Table-9 Effects of treatments on soil pH at different periods in pot culture experiment, dS m^{-1}

Treatments	0D	15D	30D	60D	90D
AC	0.31	0.45	0.49	0.41	0.34
MC	0.37	0.40	0.48	0.46	0.44
VC	0.38	0.41	0.44	0.51	0.54
TOF	0.30	0.42	0.43	0.43	0.40
TOF-F	0.38	0.52	0.54	0.58	0.50
FYM	0.24	0.42	0.44	0.46	0.48
C	0.20	0.39	0.39	0.40	0.31
CD(0.05)	0.053	0.018	0.035	0.018	0.035
SEm(±)	0.017	0.006	0.012	0.006	0.012

Soil available P

Under laboratory conditions, a high status of P was observed in all the treatments at all the sampling intervals. In the control pot, the P content increased from 59.08 kg ha^{-1} to 137.73 kg ha^{-1}.The highest P content in the experiment was reported by FYM on 90 D. FYM maintained a very high status of P on all the stages. However, on 15th day the highest value was recorded by AC (133.02 kg ha^{-1}), and on 30 D by VC (176.90 kg ha^{-1}) All the treatments including C recorded a high status of P even after the experiment. [Table-3]. The soil P content in the different treatments were high at all the stages under planted situation also. Even after the crop, the status remained high in all the treatments including C. The treatment MC recorded the highest P content at 0th day (178.69 kg ha^{-1}). On all other stages of sampling, the highest P content was observed in VC [Tabl-9]. The values were 15 D (133.87 kg ha^{-1}), 30 D (164.92 kg ha^{-1}), 60 D (151.87 kg ha^{-1}), and 90 D (158.78 kg ha^{-1}). On 15th day VC was on par with TOF-F and significantly different from others. At 30 D, VC was found to be statistically different from all treatments. On 60th day VC was on par with FYM but different with others and on 90th day VC was different with TOF, FYM and Control only [Table-6]. The soil used for the study had a high status of P. There was a decrease in soil available P initially upto 15 D followed by an increase in laboratory incubation experiment. But in planted treatments another sharp decline was observed on 30D after which the status increased to almost initial level. The initial decrease may be due to the immobilization as well as uptake by maize plants. Since P is essential in the seedling stage for root formation. However, it should be noted that VC and FYM recorded a high value for plant and soil P throughout the study period since they contained a high level of P. High content of available P in FYM as compared to other treatments is attributable to differences in P sorption by these sources. Phosphorus is bound to Fe and Al in bio solids composts and its release is lower than in FYM where P is bound as Calcium phosphates [25]. Increased P availability from farmyard manure is related to the decrease in orthophosphate sorption.

Soil available K

In the nonplanted conditions the available K content in soil decreased in all the treatments with time except FYM where an increase in status was observed at the end of the experiment. The treatment MC recorded the highest value for K both at 15 D (436.80 kg ha^{-1}) and 30 D (380.80 kg ha^{-1}) and was found to be significantly different from all the other treatments on these stages. Application of organic manures increased K availability in soil (Mahmood *et al*., 2017). The treatment TOF-F had the highest K content at 0 D (817.60 kg ha^{-1}), 60 D (817.60 kg ha^{-1}) and 90 D (784.00 kg ha^{-1}) of incubation study and remained significantly different from all other treatments [Table-4]. This is attributed to the method of preparation where dilute KOH is added for processing of waste [27]. A general decrease in soil K content compared to the initial level was observed in all the planted pots after the experiment. The level of Potassium content of soil ranged from 817.60 kg ha^{-1} (TOF-F at 0 D) to 89.60 kg ha^{-1} (FYM, MC and VC at 60 D) in planted pot experiment. The treatment TOF-F marked the highest K content at every individual days of sampling except at 30 D where MC had the highest value. The recorded highest K values at various sampling intervals were as follows- 817.60 kg ha^{-1} (0 D), 321.07 kg ha^{-1} (15 D), 283.73 kg ha^{-1} (30D), 145.60 kg ha^{-1} (60 D) and 291.20 kg ha^{-1} (90 D). On 0th day TOF-F was found to be significantly different from other treatments but at 15 D the value was on par with MC, at 60 D on par with TOF and AC and at 90 D on par with TOF. At 30 D, MC with the highest K content was on par with TOF-F, AC and TOF but significantly different from others [9]. reported that even at low rates of application municipal solid waste composts increased the soil K concentrations. But the availability at the end of the experiment was lower than the initial in all treatments due to plant uptake [Table-7].

Conclusion

Different organic manures behaved differently in the soils despite being prepared from the same source indicating that the process involved in their conversion had a profound influence on properties of organic manures. The nutrient release pattern under planted and non planted conditions differed due to the rhizospheric priming effect on mineralization of organic matter.

Application of research: It is the release of organic carbon as rhizodeposits that produces the most dramatic changes in the physical, biological and chemical nature of the soil. So basic understanding of rhizodeposition and its contribution to soil organic matter decomposition is needed for sustainable soil management.

Research Category: Soil health and organic farming

Abbreviations: AC- Aerobic compost, MC- Microbial compost, VC- Vermi compost, TOF- Thermochemical organic fertilizer, TOF-F- Themochemical organic fertilizer fortified, FYM- Farmyard manure, SOM- Soil organic matter. SOC- Soil organic carbon.

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