RELEASE PATTERN OF ORGANIC CARBON AND AVAILABLE N AS AFFECTED BY SOIL INCORPORATION OF ORGANICS

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The average chemical N consumption in Assam (18.40 kg/ha) is one of the lowest in the country which indicates the fact that agriculture in Assam is, by and large organic. The traditional wisdom of farmers coupled with unavailability of fertilizer in time and their spiraling cost, compel farmers in this region to explore various sources of organic manures. It is an established fact that organic matter plays a vital role in maintaining soil health in respect of physical, chemical and biological properties of arable soil for sustainable crop intensification. It has been reported that FYM is the best material as soil organic matter builder, followed by dhaincha, straw being the least efficient (Debnath and Hajra, 1972). The present investigation aimed at evaluating the optimum days required for availability/mineralization of organic carbon and available N from various sources of organic manures after incorporation into the soil.

A field experiment was conducted at Horticultural Research Station, Assam Agricultural University, Kahikuchi, during winter season of 2001-2002 in a randomized block design with three replications. There was 10 different treatments of organic manures viz, Control (T0), FYM (T_1), Poultry manure(T_2), Mustard oil cake(T_3), Decomposed banana peduncle (T_4), Decomposed waste tender coconut (T_5), Mushroom spent compost (T_6), Compost of waste vegetable (T_7), Vermicompost (T_8) and Neem cake (T_9). The soil of the experiment site was sandy loam in texture, acidic in reaction (p^H5.5), low in organic carbon (0.36%) and available N (175.87 kg/ha). Initial average soil temperature and available soil moisture content in the month of January was 14.80C and 19.28%, respectively. The bacterial populations was counted as 20.93 X 105/gm of soil.

Each replications contained 10 numbers of pot according to treatment with a size of 1 cubic feet. One kg of each treatment materials was incorporated properly with 3 kg of soil and then each mixture was kept randomly in individual pit for about 35 days. Water was sprinkled to keep moist the mixture once a week. Samples were collected from each pit at 7, 15, 21, 28 and 35 days of soil incorporation of organic manures. Organic carbon and available N content in soil were determined by Walkley and Black's methof (Jackson, 1973) and alkaline permanganate method (Subbiah and Asija, 1956), respectively. Available soil moisture content and soil pH (at 1: 2.5 soil water suspension) was estimated by soil moisture meter and pH meter, respectively. Bacterial populations was estimated following a 10 fold serial dilution technique.

Availability of organic carbon (Table 1) and available N (Table 2) increased upto 28 days after soil incorporation of manures, irrespective of sources. Availability of both organic carbon and available N, however, was observed to be declined beyond 28 days of incorporation i.e., at 35 days. The availability of both organic and available N was found to be the highest at 7 days of incorporation due to rapid mineralization by vermiculture. Application of decomposed banana peduncles made maximum availability of organic carbon and available N by 15 days due probably to mineralization by cellulolytic microorganism. Availability of organic carbon and available N from FYM and neem cake was found to be the maximum at 21 days after incorporation, respectively, while the same was maximum at 28 days with application of mushroom spent compost.

While the organic carbon at 7 days after incorporation significantly carried amount all the sources, the available N content did not vary with sources. Such trend in case of available N was largely governed by the bacterial populations at 7 days after incorporation (Table 3), which in turn, might probably be due to available soil moisture content (Table 4). At 15 days after incorporation the organic carbon did not vary between mushroom spent compost and vermicompost.

At 21 days after incorporation, the highest organic carbon content was found in decomposed banana peduncles and decomposed waste tender coconut, both significantly varied with all other sources. The control showed the least organic carbon. Same type of availability was also noticed in respect of availability N contents, bacterial population and available soil moisture. At 28 days after incorporation, the maximum organic carbon content was found with mushroom spent compost, vermicomposed, decomposed banana peduncle and FYM without any difference. The control treatment was found to be inferior to all the sources. In case of available N, however, no sources could prove to be superior over others, the control being significantly inferior. Similar trend was also observed in case of bacterial populations and available soil moisture.

Though there was a gradual decline of both organic carbon and available N at 35 days after incorporation, decomposed banana peduncle, decomposed waste tender coconut, mushroom spent compost and vermicompost showed higher and similar organic carbon and were superior to others, the control showing the least value. The treatment of decomposed banana peduncle hold more amount of available soil moisture at 35 days. Bahar et al. (1997) reported that organic carbon content of soil gradually decreased from maximum tillering to harvest of rice crop, while 100% substitution of N through organic manure resulted in the highest organic carbon content of soil as the entire N was met through application of organic manure. The highest available N content of soil released from organic mamure at different days of incorporation of manures in to the soil might be due to increase in micro-bial populations leading to greater mineralization (Sriramachandrasekharan et al., 1985). The pH of the soil also had been influenced to a limited extent by addition of various sources of organics (Table 5). In general the pH increased upto 35 days after incorporation, which was largely due to increase in available soil moisture content. The changes in pH could not exhibit a definite trend probably due to interaction of many factors such as irrigation content, type of compost etc.

The present investigation clearly indicates the time of incorporation of various sources of organics for growing of corp. While vermicompost should be applied one week before sowing/planting, decomposed banana penduncle may be applied two weeks ahead. Neem cake and FYM should be applied three weeks ahead of sowing/planting. The investigation, however, needs further study during the kharif season, where due to higher temperature the availability is expected to be sooner.

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Table 1. Effect of various sources of organics on availability of organic carbon(%) at different days of incorporation

Treatments	Days of incorporation				
	7	15	21	28	35
Control	0.36	0.41	0.36	0.38	0.37
Farm yard Manure	1.08	2.79	3.64	3.69	3.35
Poultry manure	0.49	1.07	1.93	2.11	1.99
Mustard oil cake	0.97	2.34	2.49	3.49	3.49
Decomposed banana Peduncle	1.56	3.13	3.22	3.69	3.62
Decomposed Waste Tender coconut	1.23	2.61	3.28	3.64	3.62
Mushroom spent Compost	1.53	2.84	3.56	3.77	3.61
Compost of waste Vegetable	1.32	2.51	2.92	2.92	1.85
Vermicompost	1.86	2.87	3.46	3.73	3.60
Neem cake	1.43	2.78	3.03	3.00	2.95
C.D. (0.05)	0.08	0.07	0.06	0.09	0.08

Table 2. Mineralization of available N content(kg/ha) as affected by organic sources at different time of incorporation

Treatments	Days of incorporation				
	7	15	21	28	35
Control	175.87	176.43	177.14	177.88	174.52
Farm yard Manure	201.06	252.51	371.35	373.27	367.48
Poultry manure	191.36	211.65	341.25	362.42	310.68
Mustard oil cake	190.00	222.64	347.09	385.59	369.24
Decomposed banana Peduncle	223.12	274.28	359.59	387.04	375.57
Decomposed Waste Tenser coconut	194.22	238.27	351.59	383.91	368.02
Mushroom spent Compost	202.15	242.87	362.30	387.11	381.69
Compost of waste Vegetable	223.08	247.18	331.58	367.47	301.78
Vermicompost	262.31	268.30	362.84	372.27	370.13
Neem cake	246.12	258.52	380.61	380.77	377.53
C.D. (0.05)	42.34	58.21	52.20	82.59	31.01

Table 3.Bacterial population (X 105/gm of soils) as affected by days of soil incorporation of organics

Treatments	Days of incorporation				
	7	15	21	28	35
Control	20.93	22.86	21.33	23.22	21.78
Farm yard Manure	26.23	31.35	31.59	36.86	38.19
Poultry manure	27.24	33.71	34.06	37.34	34.45
Mustard oil cake	23.96	32.00	32.22	36.32	34.60
Decomposed banana Peduncle	27.40	34.79	35.98	39.18	39.17
Decomposed Waste Tender coconut	25.31	32.20	32.92	34.70	34.49
Mushroom spent Compost	25.14	32.57	35.18	40.13	35.30
Compost of waste Vegetable	26.94	32.12	32.31	36.50	34.09
Vermicompost	27.63	33.96	34.00	39.96	38.18
Neem cake	26.72	33.42	34.85	36.58	34.48
C.D. (0.05)	3.73	4.71	4.39	4.33	4.76

Table 4. Available soil moisture content(%) in soil at different days of incorporation of organics into soil

Treatments	Days of incorporation				
	7	15	21	28	35
Control	19.28	20.16	20.24	20.70	20.55
Farm yard Manure	20.50	27.36	31.64	36.42	36.55
Poultry manure	21.67	29.61	33.88	37.10	37.21
Mustard oil cake	22.06	28.16	31.30	36.05	36.35
Decomposed banana Peduncle	21.04	28.64	33.22	36.63	38.18
Decomposed Waste Tender coconut	21.28	29.45	32.01	36.92	37.72
Mushroom spent Compost	22.25	29.45	32.56	37.74	38.02
Compost of waste Vegetable	22.35	27.83	32.52	35.91	36.49
Vermicompost	20.08	27.18	34.46	36.94	37.64
Neem cake	21.13	29.08	30.20	36.77	37.42
C.D. (0.05)	1.91	3.38	3.61	3.73	3.35

Table 5. Soil pH at different time of incorporation of organics into the soil

Treatments	Days of incorporation				
	7	15	21	28	35
Control	5.55	5.55	5.56	5.56	5.56
Farm yard Manure	5.55	5.55	5.57	5.58	5.59
Poultry manure	5.56	5.55	5.56	5.58	5.58
Mustard oil cake	5.53	5.52	5.53	5.55	5.56
Decomposed banana Peduncle	5.54	5.55	5.55	5.57	5.60
Decomposed Waste Tender coconut	5.56	5.56	5.56	5.58	5.59
Mushroom spent Compost	5.56	5.54	5.55	5.59	5.61
Compost of waste Vegetable	5.53	5.51	5.54	5.55	5.57
Vermicompost	5.56	5.55	5.56	5.58	5.60
Neem cake	5.54	5.52	5.54	5.55	5.58