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SOIL CONSERVATION AND SOIL HEALTH ENHANCEMENT BY VERMICOMPOSTING.

S.L. Korekar

Yeshawantrao Chavan College,Tuljapur. Dist. Osmanabad.Maharashtra.

ABSTRACT:

Accumulation and putrefaction of various wastes may cause several adverse effects on environment and living organisms including human health. Planning of vermicompost (natural excrement) from different natural squanders will spare our condition all in all; at the same time natural squanders can likewise be overseen appropriately. With this foundation for sparing our condition from utilization of compound manures through legitimate administration of rural squanders, a test was completed in field at Hangarga,Devsinga Villages District ,Osmanabad in the year 2012 – 2013with two products (Rice-kharif/ rainy season and Lentil-rabi/winter season). It has been found that the use of vermicompost indicated better outcome in contrast with compound manures as far as soil physical and concoction properties and also profitability of soil.

Key words: Chemical fertilizer, Organic waste, Soil health, Vermincompost.

INTRODUCTION

The green revolution in mid 1960s, directed by research based new innovative improvement including new materials, strategies and methods for sorting out ranch inputs like water, compost, substance and so forth and the administration approach, changed horticulture significantly. Therefore, the yield displayed complex increment underway and profitability. Notwithstanding this superb advance amid the most recent couple of decades the terrible side of the story can't be disregarded. A lot of this achievement is ascribed to the serious utilization of compound manures, pesticides, water system water and so on. Chemicals are aggregated bit by bit inside the dirt and disintegrate its wellbeing. Our nation involves terribly a low position concerning yield levels in contrast with numerous different nations. Organizers, horticultural researchers and farming market analysts are seriously stressed over the moderate development rate of agrarian creation as of late.

At the beginning of new thousand years, confirmations are overpowering that a rural change is expected to address the worldwide difficulties of encouraging perpetually raising human populace, moderating nature and diminishing destitution. Then again land is contracting asset for harvest generation; to increase supportable nourishment and nutritious security, it is important to expand the yield of products per unit range per unit time through prudent utilization of agro-systems without hampering the biological adjust. Late reviews, notwithstanding, extreme utilization of manures is the requirement for

extra land outside general society and ecological soundness of the announced unfriendly effects. Over the top utilization of compound composts in farming area causes extensive number of natural issues. When it is connected deficient, rates of efficiency and quality are brought about noteworthy misfortunes (Savci, 2012). In this foundation, utilization of natural fertilizer, for example, vermicompost may enhance nature of farming items. Vermicomposting is the way toward delivering fertilizer through the activity of night crawler. It is an eco-biotechnological handle that changes vitality rich and complex natural substances into settled humus-like item vermicompost. Planning of vermicompost is a productive and effortlessly adoptable strategy of manure readiness. This treating the soil framework cannot just decay an immense measure of natural squanders additionally help to keep up higher supplement status in treated the soil materials (Bajsa et al., 2004; Lazcano and Domínguez, 2011; Hema and Rajkumar, 2012). Vermicomposting innovation utilizing worms (as adaptable regular bioreactors for viable reusing of natural squanders to the dirt) is an ecologically worthy methods for changing over waste into nutritious manures for harvest creation (Edward et al., 1985; Yadav et al., 2010). In addition, by preparing of junk, this innovation changes over the issue into an asset and gives great excrement which can be utilized to upgrade nature of the dirt (Azarmi et al., 2008).Yadav and Garg (2011) investigated the utilization of vermicomposting innovation in nourishment industry squander administration. In perspective of the over, an approach has been made in the proposed examination to incompletely or completely supplement the substance compost with the utilization of vermicompost for enhancing the efficiency of yields. The goals of the present review are: Preparation of vermicompost from accessible agrarian waste (natural) through vermiculture biotechnology. Ponders on yield of rice (kharif/blustery season) and lentil (rabi/winter season) under various healthful administration. Thinks about on physical and substance properties of soil after utilization of vermicompost or/and compound manure.

MATERIALS AND METHODS

Study area

Field examinations were directed at the rancher's field at town Bhabanipur, Block Haringhata, District Nadia, West Bengal, India. The test soil is topsoil in surface containing 33.7% sand, 40% sediment and 26.3% dirt. The review was embraced in the year 2012– 2013.

Preparation, collection and analysis of used vermicomposts

Vermicompost was set up by Heap technique (Basak et al., 2011). This fertilizer was gathered from AnimeshMondal, a dynamic rancher and proprietor of the vermicomposting plant of Village and Post Madanpur, Dist. Nadia, West Bengal, India. The synthetic parameters viz. natural C, add up to N, P and K of utilized vermicompost were resolved. The Organic carbon was dictated by Walkley and Black's quick titration technique (Jackson, 1973). Add up to nitrogen was assessed by Modified large scale Kjeldahl strategy (Jackson, 1973). Add up to phosphorus was dictated by Olsen's strategy (Jackson, 1973) and Total potash was controlled by the Flame photometer technique (Jackson, 1973).

About crops

Two products to be specific rice and lentil (Rice – kharif/stormy season and Lentil – rabi/winter season) were chosen and sown. Their assortments were IET-4094 (Khitish) and B-77 separately. The trial was laid out in Randomized Block Design with 4 medicines (T_0-without compost or excrement, T_1-100% natural through vermicompost, T_2-100% substance through compost and T_3-half natural through blended natural fertilizer + half concoction through manure) recreated 3 times. Yield and yield parts were recorded and examined in the two progressive editing years.

Soil analysis

After accumulation (twice-before product foundation and in the wake of collecting of harvests), the dirt examples were set up for examinations in the research facility. For arrangement of soil tests distinctive methodology were included, for example, Drying, Grinding, Mixing, Partitioning, Sieving and so forth. Distinctive physical and concoction properties were examined by the utilizing diverse techniques. Mass thickness was dictated by the technique for Blake and Hartge (1986). Add up to porosity was assessed from the mass thickness and molecule thickness. Mechanical investigation of soil tests was resolved after the Boyoucous hydrometer technique (Gee and Bauder, 1986).

The water holding limit (WHC) of the dirt was measured with the assistance of Keen-Rackzowski box as portrayed by Baruah and Barthakur (1997). Immersed water powered conductivity was ascertained by Dracy's condition. Natural carbon was controlled by Walkley and Black's fast titration strategy (Jackson, 1973). Accessible nitrogen was assessed by Kjeldahl technique (Jackson, 1973). Accessible phosphorus was controlled by Olsen's strategy (Jackson, 1973) and Available potassium was evaluated by the Flame photometer technique (Jackson, 1973).

RESULTS AND DISCUSSION

From Table 1 plainly the connected vermicompost was made out of 11.7% natural carbon, 1.26% aggregate nitrogen, 2.01% aggregate phosphorus and 0.77% aggregate potash. Comparative outcomes were seen by Purohit (2006) and Karmakar et al. (2009). They opined that relying on the way of substrate, on a normal the vermicompost contained 10.12-11.98% natural carbon, 1.09-2.75% aggregate nitrogen, 2-2.45% aggregate phosphorus and 0.78-1.39% aggregate potash

Table 1. Chemical composition of applied vermicompost

Composts	Organic C (%)	Total N (%)	Total P2O5 (%)	Total K2O (%)
Vermicompost	11.7	1.26	2.01	0.77

Table 2 demonstrates that distinctive yield parts (number of panicles m - 2 and percent filled grain) and yield (grain yield and straw yield) of rice harvest developed in the year 2012 and 2013, contrasted essentially with various healthful administration medicines. In the event of both years the greatest number of panicles m - 2 was recorded with the product getting 100% natural through vermicompost (T_1) and it was factually at standard with the medications T_2 and T_3.

The base number of panicles m - 2 was recorded in the harvest without manure (T_0). In the year 2012 the most extreme percent filled grain was seen under the treatment T_1 and it was factually at standard with the medicines T_2 and T_3. In the year 2013 the rate of grain filling was tiny bit more than the year 2012 and the greatest rate of grain filling was acquired under the treatment T_1 and it was factually at standard with medicines T_2 and T_3. The most minimal rate of filled grain was recorded under the treatment T_0 in both the years. In the year 2012 the greatest grain yield was recorded under the treatment T_1 and it was factually at standard with the grain yields recorded under the medicines T_2 and T_3. The most reduced grain yield was seen in the product without compost or excrement (T_0). The size of increment in yield was fairly more in the year 2013. The greatest grain yield was gotten from the plots accepting the treatment T_1 and it was factually at standard with those recorded under the medicines T_2 and T_3. The base grain yield was seen in the product without manure (T_0).

In the year 2012 the most extreme straw yield was gotten from the harvest prepared with 100% natural through vermicompost (T_1) and this straw yield was measurably at standard with the medications T_2 and T_3. In the year 2013, the most extreme straw yield was seen under the treatment T_1 and it was factually at standard with the medications T_2 and T_3,

Table 2. Effect of different nutrient management on number of panicles m-2, percentage of filled grain, grain yield and straw yield of rice grown under rice-lentil sequence

Treatment	First Year				Second Year			
	Number of panicles. m^{-2}	% filled grain	Grain yield ($kg.ha^{-1}$)	Straw yield ($kg.ha^{-1}$)	Number of panicles. m^{-2}	% filled grain	Grain yield ($kg.ha^{-1}$)	Straw yield ($kg.ha^{-1}$)
T_0	248.8	65.28	2387	3604	253.1	67.29	2463	3571
T_1	317.9	76.25	3414	4439	329.3	78.00	3667	4632
T_2	313.4	73.81	3367	4398	323.8	75.87	3562	4548
T_3	314.5	75.51	3380	4419	324.9	76.78	3581	4561
SEm (±)	3.86	1.471	29.9	32.5	3.06	1.234	37.9	33.6
CD(P= 0.05)	10.95	4.263	83.9	92.1	8.61	3.452	108.7	94.4

T_0-Without compost or excrement, T_1-100% natural through vermicompost, T_2-100% concoction through manure and T_3-half natural + half compound

Table 3 shows that distinctive parameters, for example, number of cases per plant, seed yield and stover yield of lentil developed amid first year and second were fundamentally affected by different dietary administration medications. In the principal year of test the most noteworthy number of units per plant was recorded under the harvest getting 100% natural through vermicompost (T_1) and the most elevated number of cases per plant was nearly trailed by the medicines T_2 and T_3. Minimal number of cases per plant was seen where the yield was treated with the treatment T0. Also in the second year of examination the greatest number of units per plant was found where the yield got 100% natural through vermicompost (T_1) and this esteem was nearly trailed by the medicines T_2 and T_3. The base number of units per plant was seen where the product was treated with the treatment T_0. This table likewise demonstrates that the seed

Table 3. Effect of different nutrient management on number of pods per plant, seed yield and stover yield of lentil grown under rice-lentil sequence

Treatment	First Year			Second Year		
	Number of pods.$plant^{-1}$	Seed yield ($kg.ha^{-1}$)	Stover yield ($kg.ha^{-1}$)	Number of pods. $plant^{-1}$	Seed yield ($kg.ha^{-1}$)	Stover yield ($kg.ha^{-1}$)
T_0	37.2	452	1108	43.4	515	1248
T_1	62.6	783	1552	70.8	868	1741
T_2	60.5	734	1362	68.3	805	1630
T_3	62.0	767	1512	69.5	824	1648
SEm (±)	3.06	38.6	85.3	3.4	42.5	113.2
CD (P = 0.05)	8.89	109.3	240.7	9.84	118.2	321.5

T0- Without fertilizer or manure, T_1- 100% organic through vermicompost, T_2-100% chemical through fertilizer and T_3-50% organic + 50% chemical

The Table 4 represents to the pooled information of rice and lentil yield for back to back two years of studies and yield was changed fundamentally with the change in healthful administration medications. The most extreme rice yield was recorded under treatment T_1 where rice product was

prepared with 100% natural through vermicompost and it was measurably at standard with the grain yields recorded under medicines T_2 and separately. The most minimal one was seen in the event of T_0. yield of lentil varied altogether with various wholesome administration medicines in the year first year. The most astounding seed yield was seen from the treatment T_1 and it was factually at standard with the medicines T_2 and T_3. Additionally in the second year, the seed yield of lentil differed altogether with different nutritious administration medicines (Table 3). Be that as it may, the extent of increment in yield was a tiny bit more in this year. The greatest seed yield was seen in the plots getting 100% natural through vermicompost (T_1) and this esteem was factually at standard with the medicines T_2 and T_3. The most reduced seed yield was recorded under the treatment T_0 in both the years. The treatment T_1 demonstrated the most extreme stover yield and it was measurably at standard with the medicines T_2 and T_3. The base stover yield was acquired where the harvest was treated with the treatment T_0 in both years.

T_3. The most minimal grain yield was seen if there should be an occurrence of the treatment T_0. It was found that the use of 100% vermicompost (T_1), 100% compound (T_2) and half natural + half synthetic (T_3) expanded the rice yield by 31.51%, 30.00% and 30.32%, separately over control (the harvest without compost i.e. T_0). Likewise, it was seen that the use of 100% vermicompost (T_1) and half organic+ half substance (T_3) expanded rice yield by 1.69% and 2.15%, individually more than 100% synthetic through manure (T_2). If there should be an occurrence of lentil the most astounding seed yield was acquired in treatment T_1 and it was measurably at standard with the medicines T_2 and T_3. Most reduced seed yield was seen in product without manure (T_0). Utilization of 100% vermicompost (T_1), 100% compound (T_2) and half natural + half substance (T_3) expanded seed yield by 41.42%, 37.16% and 39.22%, separately over control. So also, it was showed that use of 100% vermicompost (T_1) and half natural + half compound (T_2) has expanded the seed yield by 3.63% and 6.78%, separately more than 100% synthetic through manure (T_2). This might be because of the way that natural compost, as vermicompost is a nutritive plant nourishment rich in NPK. These outcomes are as per those seen by Bwamiki et al. (1998) and Maynard (1993).

Table 4. Effect of nutritional management on seed yield of rice and lentil (2 years' pooled data)

Treatment	Yield (kg.ha^{-1})	
	Rice Grain yield (Kg ha^{-1})	Lentil Seed yield (Kg ha^{-1})
T_0	2425	483.5
T_1	3540.5	825.5
T_2	3464.5	769.5
T_3	3480.5	795.5
SEm (±)	33.7	40.49
CD (P = 0.05)	96.6	113.71

T0- Without fertilizer or manure, T_1- 100% organic through vermicompost, T_2-100% chemical through fertilizer and T_3-50% organic + 50% chemical

From Table 5 it is clear that different Physical properties of soil have changed slightly at the end

Table 5. Physical properties of soil samples collected from experimental site (after harvesting of crops)

Treatment	Bulk Density (g cm^{-3})	Porosity (%)	Capillary porosity (%)	Non-capillary porosity (%)	Maximum Water Holding Capacity (%)	Saturated Hydraulic Conductivity (cm.h^{-1})
T_0	1.65	36.8	24.5	12.3	36.01	1.05

T_1	1.42	46.0	21.58	24.42	45.02	0.04
T_2	1.64	36.9	24.09	12.81	37.44	0.5
T_3	1.52	40.04	26.95	13.09	43.02	0.32
Treatment	Bulk Density (g cm^{-3})	Porosity (%)	Capillary porosity (%)	Non-capillary porosity (%)	Maximum Water Holding Capacity (%)	Saturated Hydraulic Conductivity ($cm.h^{-1}$)

T_0- Without fertilizer or manure, T_1- 100% organic through vermicompost, T_2-100% chemical through fertilizer and T_3-50% organic + 50% chemical

Initial physical properties of soil samples collected from experimental site - Bulk Density (1.62g.cm^{-3}), Porosity (37.07 %), Capillary porosity (26.24%),

Table 6. Chemical properties of soil samples collected from experimental site (after harvesting of crops)

Treatment	Organic C (%)	Total N (%)	Available P (Kg ha^{-1})	Available K (Kg ha^{-1})
T_0	0.4	0.041	31.2	140.2
T_1	0.92	0.092	33.9	152.03
T_2	0.6	0.052	26.43	147.9
T_3	0.72	0.08	28.09	149.83

*T0- Without fertilizer or manure, T_1- 100% organic through vermicompost, T_2-100% chemical through fertilizer and T_3-50% organic + 50% chemical*of the investigation (following two years) because of different medications.

In the event of mass thickness the least esteem was watched for the treatment T_1 and distinctive other lower qualities were found under the medications T_2 and T_3. The most noteworthy estimation of mass thickness was seen if there should arise an occurrence of the treatment T_0. As indicated by Miller et al. (2002) and Shirani et al. (2002) utilization of natural materials (excrement and additionally trim deposits) can expand soil natural matter fixation and decline mass thickness. The treatment T_1 demonstrated the most extreme porosity taken after by the medicines T_3 and T_2. The most reduced esteem was seen if there should arise an occurrence of the treatment T0. The most elevated rate of fine porosity was seen if there should be an occurrence of the treatment T_3 taken after by the medications T_0 and T_2. The most minimal esteem was appeared by the treatment T_1. The rate of non-narrow porosity was the greatest if there should be an occurrence of the treatment T_1 taken after by the medicines T_3 and T_2. The rate of non-slender porosity was the base if there should be an occurrence of the treatment T_0. Table 5 additionally delineates that the most extreme water holding limit was the most elevated if there should arise an occurrence of the treatment T_1 and it was trailed by the medications T_3 and T_2. The treatment T_0 displayed the most reduced rate of greatest water holding limit. The treatment T_1 demonstrated the base estimation of soaked water powered conductivity and diverse other lower qualities were found under the medications T_3 and T_2. The most astounding estimation of soaked pressure driven conductivity was seen if there should arise an occurrence of the treatment T_0. As per Anikwe (2000) soil natural fertilizers impact the level of conglomeration and can decrease mass thickness, increment add up to porosity and hydrualic conductivity of overwhelming dirt soils.

Introductory substance properties of soil tests gathered from test site-Organic C (0.48%), Total N (0.047%), Available P (32.84Kg ha^{-1}), Available K (142.5 Kg ha^{-1}). From Table 6 unmistakably the treatment T_1 demonstrated the most astounding rate of natural carbon and it was trailed by the medications T_3 and T_2. The most minimal esteem was appeared by the treatment T_0. The rate of aggregate nitrogen was the most elevated if there should be an occurrence of the treatment T_1 and it was trailed by the medications T_3 and T_2. The most minimal rate of aggregate nitrogen was seen if there should arise an occurrence of the treatment T_0. The treatment T_1 demonstrated the most elevated estimation of accessible phosphorus and it was trailed by the medications T_0, T_3 and T_2. The most noteworthy estimation of accessible potassium was tried if there should be an occurrence of the treatment T_1 taken after by the medications T_3 and T_2. The most minimal esteem was seen in the event of the treatment T_0. Magdoff (1992) and Sahai (2004) revealed that natural fertilizer filled in as a supply of various sorts of supplements which were fundamental for plant development. As per Sudhakar et al.

(2002) vermicompost contains miniaturized scale locales rich in accessible carbon and nitrogen. Worm cast infused soils are likewise rich in water dissolvable phosphorous (Gratt, 1970) and contains a few times more accessible potassium than encompassing soils (Sudhakar et al., 2002) which support better plant development.

CONCLUSIONS

It has been found that the utilization of vermicompost demonstrated better outcome in contrast with compound composts as far as soil physical and concoction properties and also profitability of soil. The planning of vermicompost from natural squanders will spare our condition all in all, in the meantime these squanders can likewise be overseen legitimately. From this review it can be reasoned that in contrast with synthetic manure, utilization of vermicompost is better from the perspective of every single ecological angle.

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