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POULTRY WASTE MANAGEMENT THROUGH VERMICOMPOST OF BILASPUR DISTRICT (CHHATTISGARH STATE)

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ABSTRACT

Rapidly increasing population and high rate of industrialization has increased the problem of solid aste management. The problem has further increased in cities because of shortage of the dumping sites and strict environmental legislation, so scientists are seeking for management alternatives, which should be eco friendly, cost effective and fast. Now days we are facing major problem with Poultry waste because it is highly organic in nature, so vermin composting has become an appropriate alternative for the safe hygienic and cost effective disposal of it. Earthworms feed on the organics and convert material into casting, which is rich in plant nutrients.

KEYWORDS: *Collection Poultry Waste, Manure Management, Effects on Soil Properties, Composting.*

INTRODUCTION:

The action of the earthworms in the process of vermin composting of waste is physical and biochemical. The physical process includes substrate aeration, mixing as well as actual grinding while the biochemical process is influenced by the microbial decomposition of substrate in the intestine of the earthworms various studies have shown that vermin composting of organic waste accelerates organic matter stabilization which have a higher content of microbial matter and stabilized humid substances. We have selected two species for present study because their available literature and they can survive in the climatic conditions of the Jabalpur. By the use of above two species we can solve our above 3 problems and we can evaluate their efficacy in vermin composting of poultry waste. In the present era we are facing 3 major problems:

1. Pollution created by the solid waste.
2. Pollution created by the fertilizers.3. We have to change chemical based farming into organic sustainable for the quality betterment of grains as well as field area.

OBJECT OF THE STUDY

The primary objective of this study was to evaluate the effect of poultry litter applications at rates based on crop nitrogen needs on phosphorus and nitrogen transport in tilled and no-till settings during a three crop/two year rotation. A secondary objective was to use findings to develop management recommendations for minimizing both phosphorus and nitrogen losses associated with the use of poultry litter to supply cash grain nutrient requirements.

(i) Present an overview of the poultry industry in Chhattisgarh
(ii) Discuss the growth of the poultry industry in Chhattisgarh
(iii) Estimate the amount of waste generated from the poultry industry

(iv) List and comment on the existing disposal/utilization methods available for poultry waste in Chhattisgarh
(v) Document the existing problems with poultry waste in Chhattisgarh

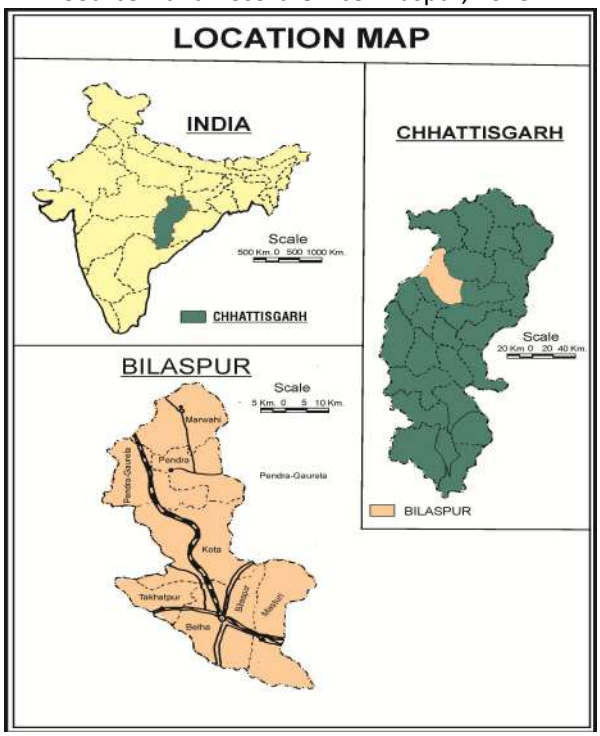
ADMINISTRATIVE DIVISION AND IMPORTANCE

There are 89 Tahsils, 10 Blocks, 15 urban centers (towns) and 1616 populated villages in the district according to 2001 census. The total geographical area of the district is 6377 Sq.km. According to 2001 census the population of Bilaspur district is 19,93,042 persons, out of which the rural population is 15,11,488 and urban population is 4,81,554. The density of population per Sq.km. is 241. The Railway Division of Bilaspur is one of the factors, which increased the importance of the districts. S.E.CL., N.T.P.C., Seepat and several other industries help to develop its importance.

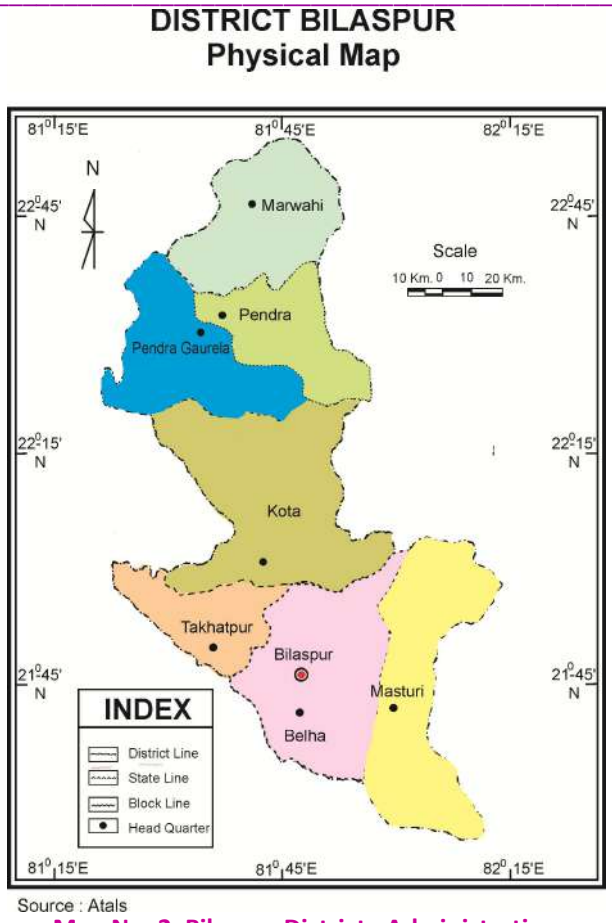
TABLE No. 1
Bilaspur District: Administrative Division

Tahasils	Blocks
1. Masturi	1. Masturi
2. Bilaspur	2. Bilha
3. Takhatpur	3. Takhatpur
4. Kota	4. Patharia
5. Pendra Road	5. Kota
6. Bilha	6 Pendra Road
7. Marwari	7. Goerella
8.	8. Marwari

Source: Land Record Office Bilaspur, 2018



Map No. 1 Bilaspur District: Location Map
Source: Atlas World ,Oxford 2018,



Map No. 2 Bilaspur District: Administrative

Source: Atlas World ,Oxford 2018,

MATERIALS AND METHODS COLLECTION OF THE WASTE MATERIAL

Poultry waste is the collected from the poultry farm. As we aware through the literature on the Earthworm that for the survival and better result of composting, the pH, moisture and the organic content of the feed given to them (earthworms) are very important and the pH must be neutral or alkaline but in case of poultry waste it was found that it was highly acidic pH), where as organic content and moisture were suitable . Therefore during the inoculation of the earthworms on pure poultry waste, no response was given by the any earthworms variety and their mortality rate was very high and this was mainly because of high acidic pH. To neutralize the acidic pH of poultry waste CaCO3 was used Ramachandra TV, Saira V. (2004) .

Table No.2 Status of Commercial farms

Commercial broiler farm	No. of Units	To(Animal Holding)	Average/Units
Minimum size -500	164	3182810	19407
Layer farm -500	906	4881464	5388

Source: Veterinary Statistic, Bilaspur(C.G)

RATIO OF POULTRY WASTE

The ratio of poultry waste was taken according to dry matter weight. According to dry weight analysis, 5 different combinations of fresh poultry waste were prepared. As we know that cow dung is a great source of the microbes. In these combinations, CaCO3 was mixed according to the weight of the dry poultry waste. According to dry weight analysis, 5 different combinations of fresh poultry were prepared.T1, T2, T3, T4 and T5 are different treatment combinations. T -2 (2:1) (i.e.) 2 parts of poultry waste and T -4 (1 :0) (i.e.) 1 parts of poultry waste Bhattacharyya JK, Shekdar AV, Gaikwad SA. (2004)

Poultry manure composition identifies the various components and their amount present in the manure. The manure is used rafter keeping it staked, about two metres high, for 3-4 weeks.. e heat thus generated, disinfects the manure and makes it fit for u in cattle ration Sengupta J.(2002). But its use in poultry feed is restricted because of the presence of uric acid in it, which is harmful for poultry

Table No. 3

Bilaspur District: Poultry manure composition

Sl.No	Component	Percentage composition
1	Moisture	12.02
2	Oil	1.00
3	Protein (nitrogen x 6.25)	20.72
4	Ash	29.57
5	Crude fibre	14.96
6	Acid insoluble ash	8.92
7	Salt	1.75
8	Calcium	5.49
9	Phosphorus	1.96
10	Manganese	0.073
11	Iron	0.255
12	Zinc	0.08
13	Copper	0.015
14	Cobalt	0.005
15	Vitamin A	1534 I.U./100g
16	Vitamin B12	0.94 mg/g
17	Calcium pantothenate	57.5 mg/g
18	Vitamin B6	97 mg/g

MATERIAL AND PREPARED VERMICOMPOST

1. pH
2. Electrical Conductivity
3. Organic Carbon
4. Organic Matter
5. Total Nitrogen
6. Available Nitrogen
7. Total phosphorus
8. Available Phosphorus
9. Total Potassium
10. Available Potassium
11. Ca
12. Mg

Table No.4

Chhattisgarh State: Commercial Poultry farms, 2010

Sl No.	Districts	No.of Farm	No.of Chicken
1	Raipur	103	612080
2	Durg	225	1556995
3	Rajnangaon	24	1170635
4	Dhantari	12	119500
5	Mahasamund	63	177650
6	Kabardha		
7	Bilaspur	90	496100
8	Korba	72	103625
9	Champa	58	186572
10	Raigarh	94	1603111
11	Jashpur	3	23900
12	Surguja	111	148526
13	Koriya	3	4200
14	Bastar	14	62420
15	Kanker	26	52350
16	Dantewara	8	6600
Total		906	4881464

Source: Veterinary Statistic, Bilaspur(C.G)

Table No. 5 Chhattisgarh State: Commercial Poultry of layer farms, 2010

Sl.No.	Districts	No. of Farm	No. of Chicken
1	Raipur	50	1683068
2	Durg	61	118900
3	Rajnangaon	19	1025674
4	Dhantari	1	8000
5	Mahasamund	5	53000
6	Kabardha		
7	Bilaspur	6	87778
8	Korba	1	1500
9	Champa	1	18000
10	Raigarh	1	1585
11	Jashpur		
12	Surguja		
13	Koriya	2	20000
14	Bastar	11	163350
15	Kanker	3	1555
16	Dantewara	3	400
Total		164	3182810

Source: Veterinary Statistic, Bilaspur(C.G)

MOISTURE AND TEMPERATURE

The semi decomposed material into vermicompost and these pots were now filled with sweet smelling spongy vermicompost. After completion of composting, earthworms were removed from the compost by drying it on a cemented floor, directly in sunlight. By this process earthworms gathered at the bottom of the compost and then bunch of earthworms were separated from the vermicompost.

Poultry Manure Management

The recent demand for low-cholesterol meat products has led to tremendous expansion in the poultry industry Agrawal A, Sahu KK, Pandey BD.(2004). In several states this rapid and concentrated growth of the industry has caused increasing concern about the disposal of poultry wastes with respect to nonpoint source pollution. Although poultry litter is one of the best organic fertilizer sources available, excessive applications of litter (as with any fertilizer source) can cause environmental problems. Nitrate leaching into the groundwater, nonpoint source P runoff into surface water bodies, and release of pathogenic microorganisms are three of the main problems encountered with improper management of this resource. The objective of this chapter is to give an overview of the current state of knowledge on the agricultural use of poultry litter and the options available to integrate litter into economically and environmentally sound management systems.

Liquid poultry manures

Liquid poultry manures (those containing less than 150 g dry matter kg-1) are generated when manure is scraped or flushed into storage reservoirs, such as tanks, detention basins, aerobic or anaerobic lagoons, and oxidation ditches. Most of the liquid poultry manure is generated in laying-hen operations. Although these materials are generally amenable to hydraulic pumping, those containing between 40 and 150 g dry matter kg-1, referred to as slurries, can present problems to pumping equipment because of their viscosity and potential to plug orifices. Solid-liquid separation via sedimentation or filtration may be necessary when liquid poultry manures with higher amounts of solids are to be pumped Agrawal A, Sahu KK, Pandey BD.(2004). Although storage in reservoirs often serves to enhance

hydraulic properties of liquid poultry manures with regard to ease of pumping, this can result in considerable loss of plant nutrients, particularly N. Ammonia volatilization losses from storage reservoirs range from 25 to 80 percent of original N contained in liquids or slurries Nitrogen losses are minimized when the liquids or slurries are added to the bottom of storage reservoirs instead of to the surface.

Land Application of Manure

Except for small amounts used in animal feed, the major portion (greater than 90 percent) of poultry litter is applied to agricultural land (Carpenter 1992). This application usually occurs no more than a few miles from where the manure was produced. Thus, in states with a large or growing poultry production industry, increasing demands are being imposed on agricultural acreage to efficiently use the nutrients (primarily N 64 and P) contained in manure. In the major poultry producing states, the amounts of nutrients produced in manure exceed crop requirements. Data compiled by indicate that the amount of P produced annually in poultry manure exceeds that required by the three major crops in several poultry producing states. Poultry production is often concentrated in regions with small farms, which have very limited acreages forland application. While poultry production provides a fairly good income for these small farmers, problems created by manure use may have major environmental consequences.

Transportation

Generally, transportation of poultry litter is restricted to less than 10 to 20 km. Obviously, being able to transport the manure greater distances from the source of production increases the acreage for application. The cost of moving poultry litter is a major obstacle facing the more efficient use of this resource. The recent trend of several neighboring farmers to form cooperatives to compost and compact

manure more cost effectively should be encouraged by cost-sharing programs. By composting and compacting, the bulk density of the litter is increased, which reduces the cost of transportation Bhattacharyya JK, Shekdar AV, Gaikwad SA. (2004). However, for this to be cost effective, the nutrient content of the litter should be high. Since composting can result in N loss, growers may have to add compounds, such as aluminium sulfate, to the litter to reduce ammonia volatilization during this process.

Spreading equipment

The type of spreading equipment used depends on the method of storing and handling poultry manure. Traditionally, poultry litter is broadcast directly fromth e house, using a variety of spreaders Ramachandra TV, Saira V. (2004). Manure stored in deep pits is removed by scraping and is applied with a spreader. In a few cases, manure stored in shallow pits is removed by flushing and, after large solids have been removed by sedimentation and/or filtration, is applied with an irrigation system. Spreading equipment can vary among contractors. In many locations where the poultry industry has recently expanded, existing farm equipment is used to apply the manure. There has been less progress in improving spreading equipment for solid manure than for liquid manure. Equipment development should involve better control of the application rate and provide even distribution of manure.

Available land base

In states where the poultry industry and/or confined animal operations are concentrated, the land base available for manure application is often limited. This limitation mainly arises from the cost of manure transportation. Consequently, poultry manure is usually applied in the immediate vicinity of the production site, with little regard to the geology, soils, or topography. This inflexibility may result in the application of litter to areas with elevated soil N and P contents from previous applications or with high runoff or leaching potentials. Consequently, in the future, recommended manure application rates should be flexible and account for differing geology, soil, and topography of potential application sites. Proliferation of the poultry industry has been economically driven. Numerous farmers with limited resources have turned to poultry production as a ready source of income with limited cash outlay. In many areas of the southern United States, intensive poultry production has developed on agricultural land unable to maintain high crop yields due to such factors as erratic weather, sloping topography, or soils that are rocky, shallow, coarse textured, or highly permeable. Local need for N and P in such regions would be lower than in areas of intensive crop production.

In most cases this has led to an increase in soil P levels after successive poultry manure applications because most crops require a higher N:P ratio than that supplied in poultry manure. For example, poultry litter has an average N:P ratio of 3 (table 14), while the N:P requirement of major grain and hay crops is Shekdar AV, Tanaka M. (2004). Soils receiving repeated applications of poultry litter for several years accumulate more P then N and have more P than the crop can use Basing litter application rates on soil P levels rather than on crop N requirements may mitigate the excessive build up of soil P and at the same time lower the risk for nitrate leaching to groundwater. However, such a strategy for determining proper litter rate would eliminate much of the land area with a history of continual litter applications, since many years are required to lower soil P levels once they reach excessive levels. In addition, farmers relying on poultry litter to supply most of their crop N requirements will have to purchase commercial fertilizer N instead of using their own manure N. Although basing rates on soil test P may resolve potential environmental issues, it places unacceptable economic burdens on farmers, that is, the cost associated with transporting the manure and buying additional fertilizer N are too high Sengupta J.(2002). Hydrology of the available land base will also be important in determining whether manure application rates should be based on N or P. If the potential for leaching of soluble chemicals from an application site exists, one could argue that N should be a priority management consideration. Conversely, if runoff and erosion potential far exceed leaching potential, then P would be the main element governing application rates.

Alternative Uses of Poultry Litter

Poultry litter, when mixed with feed grains, has been used as a successful feed for cattle. The poultry litter contained 195 mg Cu kg-1 because the chickens had been fed a diet containing high levels of copper sulphate. Currently, most poultry producers feed their broilers an excess of copper sulphate Bhattacharyya JK, Shekdar AV, Gaikwad SA. (2004). Although this excess results in faster weight gains, the gains are not due to a change in diet per se, but rather to a change in litter composition (Johnson et al. 1985). There are two possible explanations for this phenomenon: (1) the high copper levels in the litter reduced populations of path organic microorganisms or (2) no biologically mediated reactions, such as ammonia volatilization, are affected Shekdar AV, Tanaka M. (2004). It should be noted that not all broilers respond positively to this excess of copper in the diet.

Poultry Manure Application Effects on soil properties

In addition to providing nutrients for crop production, poultry litter applications build soil organic reserves. The organic matter benefits crop production via increases in soil water-holding capacity, water infiltration rates, action exchange capacity, structural stability, and soil tilth. found that high rates of poultry manure, when incorporated into the soil, resulted in decreases in bulk density and increases in water-holding capacity and water-stable aggregates. Asokan P.(2004)

CONCLUSION

The study revealed that chicken manure is a potential source of plant nutrients and chemical conditioner. For instance, the EC together with exchangeable bases increased with application rate in all soil types, thus indicating positive effects on soils. Similarly, significant increases of N (up to 50%) and P (up to 80%) were observed following addition of chicken manure. Technology transfer in production agriculture has become a fairly familiar process. For example, if a new herbicide is developed, it will undergo field testing by industry and universities, and if proven successful, information on the herbicide will be made available through a variety of mechanisms, including field days, extension brochures, industry field personnel, published journals, and other outlets. A tried-and proven infrastructure exists for getting the proper information to the potential user in an efficient and timely manner.

The most effective method for treating poultry waste on site is to establish an anaerobic digester system. It is by far the most popular process used to treat organic wastes in all other organic waste industries. It has the advantage of being an efficient process and produces biogas which can be used for heating or generating power. The bio solids remain after the digester process, which can be used a high quality fertiliser.

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