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Biocomposting of *Anagallis arvensis* and Impact of Prepared Vermicompost on the Growth of *Tagetes erecta*, Plant

Om Prakash

Department of Zoology, H.R.P.Degree College, Barkhera, Pilibhit (U.P.), India

Abstract: ***In western Uttar Pradesh state of India, several crops viz., Brassica campestris,Brassica nigra, Saccharum officinarum, Mentha piperita, Cicer arietinum (Chana), Lens esculenta (Masoor), etc. are grown in agricultural lands.In these crops, various kinds of weeds are also grown simultaneously, thereby reducing the crop yields, because most of the fertilizers using for growing crops, are absorbed by these weeds also. Anagallis arvensis is a common weed of these crops which appears and grown greatly during the winter season. Hence, in the present studies, an attempt was made, especially for the bioconversion of this weed into vermicompost and impact of prepared vermicompost on the growth of an ornamental plant, Tagetes erecta (marigold). Present study revealed that prepared vermicompost in different combinations have showed better results if it is used at 1:1 and 1:2, ratios of vermicompost + soil, and successively, lower in 1:3, 3:1, and control (only soil) media. The results were discussed in the light of physico-chemical parameters (PCPs) of different experimental media, shoot length and total number of flowers of Tagetes erecta and data available.***

Keywords: *Anagallis arvensis*, cattle dung, *Eisenia fetida*, vermicompost, and *Tagetes erecta* (marigold)

1. Introduction

A number of weeds in agricultural fields are grown simultaneously, along with different types of crops, such as *Ageratum conyzoids*, *Argemone mexicana*, *Lathyrus aphaca*, *Chenopodium album*, *Physalis minima*, *Physalis peruviana etc.* Their presence in the cropping system decreases the crop yields in various ways. *Anagallis arvensis* is a common weed of various crops like *Brassica compestris*, *Saccharum officinarum*, *Mentha piperata*, *Cicer arietinum*, and *Lens esculenta*, *etc.* in the western part of Uttar Pradesh state of India.Most of the contents of the fertilizers used in agricultural fields are absorbed by this weed in the cropping system and resulted the crop yield. Keeping this in mind, in the present studies, an attempt was made especially for the transformation of this weed into useful vermicompost and impact of prepared vermicompost on the growth of *Tagetes erecta*.

2. Materials and Methods

The fresh weed *Anagallis arvensis* was collected from growing cropping fields of *Brassica camprestis*, from nearby areas of Village-Kajarbojhi, Barkhera, Pilibhit (U.P.), India, during the winter months, and cut into small pieces of 2 cm size with the help of fodder machine for the experimentation. This weed waste was mixed with cattle dung in the four combinations of 1:1, 1:2, 1:3 and 3:1.Six kg of each combination was kept in rectangular experimental beds (size 100 x 100 x 20 cm), in replica of five. After pre-decomposition period of 20 days of time, 30 g immature worms of the genus, *Eisenia fetida (Savigny)*were inoculated into each experimental beds. Moisture of each bed was maintained by sprinkling 500 ml water alternatively. Keeling of different experimenltal waste media was done once in every successive week. The experiment was conducted till the bioconversion of weed, *Anagallis arvensis* with the cattle dung through worms into vermicompost (biocompost).The initial and final physico-chemical parameters (PCPs) of different combinations were analysed after the completion of the experiment as per the techniques described by Saxena (1994) [1]. For the impact of growth of the plant *i.e. T. erecta* , three experimental plots (size 3 x 3 m) , were maintain and prepared vermicompost from all the four combinations *i.e.* 1:1, 1:2, 1:3, & 3 :1, was mixed in the experimental plots, on a depth of 10 cm upper surface of the soil . A very quickly, 150 plants of 10 cm sized, were collected from nursery and planted into each experimental plots including the control experimental plots (plots without vermicompost used), and wait for 40 days of time, then different plant parameters were taken and started for the growth of the plant, *T. erecta*.

3. Results and Discussion

The vermicompost was prepared within the 55, 65, 80 and 45 days of time, respectively, in dung +weed combinations of 1:1, 1:2, 1:3, and 3:1, experimental media. Prepared vermicompost was quickly collected in plastic bags and stored in the dark room for further experimentation. After the process of bioconversion of waste into vermicompost, decrement in BD, % moisture content (%MC), % organic matter (%OM), % water holding capacity (%WHC), and pH was recorded in different experimental media than that of initial PCPs of cattle dung. Decrement in BD was 1.13 times in 1:1, 1.42 times in 1:2, 1.48 times in 1:3, and 1.08 times in 3:1 media; decrement in %MC was noticed 1.50 times, 1.80 times, 2.24 times and 1.14 times, respectively, in 1:1, 1:2, 1:3, and 3:1, experimental media. In case of % OM, it was 1.21, 1.12, 1.08, and 1.04 times, respectively, in 1:1, 1:2, 1:3, and 3:1, media. In case of % WHC, it was 1.17 times, 1.24 times, 1.38 times, and 1.03 times, respectively, lower in 1:1, 1:2, 1:3, and 3:1, media. In addition, decrement in pH was also recorded it was 1.10, 1.09, 1.08, and 1.06 times, respectively, lower in all the experimental media, than that of initial PCPs level of cattle dung (Table-1). Although, Prakash (2011) [2], has reported that worm-castings plays a significant role in the decreasing pH, BD, %MC, and by

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increasing the level of % WHC, % N and % OM of the habitat *i.e.* soil, in general. However, Singh and Prakash (2009) [3], have reported decrement in the level of pH, % MC, % OM, % WHC in different experimental media; while working on the biocontrol of a toxic weed *Argemone Mexicana* through vermicomposting.

Table-2, describes the impact of vermicompost on the growth of *Tagetes erecta* (marigold).It can be clearly seen in the table that after 40 days of time, shoot length measured 30.62, 34.48, 42.38, 23.17, and 19.98 cm , respectively, in 1:1, 1:2, 1:3, 3:1, and control (only soil) media. Increment in shoot length as well as total number of flowers was noticed after 80 and 120 days of time. After 120 days of time, a maximum increment in shoot length was recorded 2.61 times, 2.90 times, 2.85 times, 2.05 times and 2.50 times, respectively, more in 1:1, 1:2, 1:3, 3:1, and control media; while this increment in their flower number was 28.35, 22.14, 20.85, 16.63 and 12.86 times, respectively, more in 1:1, 1:2, 1:3, 3:1, and control media than that of 40 days of time.In addition, after 120 days of time interval , very less flowering (in case of 1:1, 1:2, and 1:3 experimental media) and even no flowering was seen and noticed in case of 3:1 and control media.There is a good evidence that vermicompost promotes the growth of plants [4]-[6], and it has been found to have a favourable influence on all yield parameters of crops like wheat, paddy, and sugarcane [7]- [10]. Vermicompost contains most nutrients in plant available forms such as phosphates, exchangeable calcium and soluble potassium [11]. Arancon *et al.*(2004) [12], have reported that positive effects of vermicompost on the growth and yield in strawberry, especially increase of leaf area, root length and fruits weight in the field conditions. Mishra *et al*,(2005) [13], reported that vermicompost had beneficial effects on growth and yield of rice, especially caused significant increase of many growth parameters, seeds germination and yield.Vermicompost have higher content of macro and micronutrients, plant growth hormones, beneficial microbes and contain important enzymes like amylase, protease, cellulase, kitinase and invertase which seem to promote the plant growth and enhance secondary metabolite synthesis [14].Use of chemical fertilizers has worldwide for cereal production [15].The continued use of chemical fertilizers causes health and environmental hazards [16].Rotation of legumes in cereal based cropping system reduces dependence on chemical fertilizer [17] and improves the soil conditions [18].

Table 1: Showing physico-chemical parameters (PCPs) of cattle dung and transformed vermicompost in different experimental media (waste *i.e.*. *A. arvensis* + cattle dung).

Initial PCPs of cd	PCPs	PCPs of transformed vermicompost			
		1:1	1:2	1:3	3:1
1.01± 0.05	BD (g/cm^3)	0.89± 0.06	0.71± 0.09	0.68± 0.03	0.93± 0.04
45.59 ±0.97	% MC	30.29 ±0.73	25.19 ±0.91	20.27 ±0.48	39.92 ±0.78
21.96 ±0.24	% OM	18.03 ±0.54	19.58 ±0.63	20.19 ±0.81	21.01 ±0.67
53.91 ±0.93	% WHC	45.96 ±1.09	4347 ±0.82	38.89 ±1.01	52.03 ±1.07
9.68±0.12	pH	8.79± 0.31	8.81± 0.09	8.89± 0.41	9.09± 0.19

Abbreviations: Cd= cattle dung, PCPs=physico-chemical parameters.

Table 2: Showing impact of transformed vermicompost on the growth of *Tagetes erecta*.

Diff. exp. med	Duration in days					
	40		80		120	
	SL	TNF	SL	TNF	SL	TNF
1:1	30.62± 0.51	02.12± 0.02	61.34± 0.10	31.23± 0.12	79.97± 0.97	60.12± 0.19
1:2	34.48± 0.12	03.92± 0.03	76.92± 0.85	49.92± 0.09	100.12 ±0.68	86.79± 0.31
1:3	42.38± 0.43	04.79± 0.03	98.92± 0.72	58.97± 0.17	120.98 ±0.37	99.91± 0.18
3:1	23.17± 0.09	01.45± 0.05	41.02± 0.64	11.37± 0.42	47.72± 0.59	24.12± 0.08
Ctl.	19.98± 0.18	01.67± 0.04	38.99± 0.28	10.79± 0.13	49.98± 0.34	21.49± 0.17

Abbreviations: Diff.=Different, exp.=experimental, med= media, Ctl.=Control.

4. Conclusions

Thus, it is clear that not only *A. arvensis*, some other kinds of weeds grown in the various cropping systems, in different parts of India and abroad, their presence greatly affected the crop yields. These weeds can be easily be transformed into biocompost (vermicompost), using different varieties of earthworms for sustainable environment, agriculture and crop yield.In addition, it can also be concluded that due to worm's activities, in the soil systems, pH, BD, & % MC, are decreased and the level of %WHC, %N, and %OM, is significantly increased on the one hand, and in the different experimental combinations of cattle dung and waste media the level of pH, BD, %MC, %OM, & %WHC, significantly, decreased, on the other. Finally, it may be say that during the process of bioconversion of different wastes into vermicompost PCPs of the prepared vermicompost are decreasing, in general.

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Author Profile

Dr. Om Prakash, earned his master's degree and Ph.D. in the subject of Animal Science (Applied Zoology), from Mahatma Jyotiba Phule Rohilkhand University, Campus,Breilly, India. He has a total 09 Years experience of research especially on biodiversity of earthworms and solid waste management, and contributed 12 research papers (04 Interrnational and 08 National levels) in various journals of National and International repute till now.

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