Eco. Env. & Cons. 30 (2) : 2024; pp. (533-537)
Copyright@ EM International
ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2024.v30i02.018

Nutrient analysis of the Flower waste degraded product (FDP) amended soils

P. Swapna* and V. V. Lakshmi

Sri Padmavati Women's University, Sri Padmavati Mahila Visvavidyalayam, Tirupati 517 101, A.P., India

(Received 11 September, 2023; Accepted 19 November, 2023)

ABSTRACT

The present-day agricultural practices rely on using excess of chemical fertilizers and pesticides which are detrimental to the ecosystem as well as farmers health. An alternative strategy was being explored to develop sources of organic manure that can be prepared in short time and can be used effectively for sustainable crop production. The organic manure improvised by microbial techniques is found to improve the soil fertility, organic matter input to the soil, prevent the soil erosion, preserve water quantity in soil, protect environment as well as soil health etc. As effective flower degradation was achieved in 2-3 days by the novel *Bacillus* isolates (*B. cereus, B. safeness* and *B. subtilis*), the organic manure preparation out of FDP (Flower Degraded Product) is also achieved in very short span of time. The macro and micronutrient analysis were found to be maximum in 30% and 40% FDP amended soils compared with the control amendments.

***Key words*:** *FDP, Amendments, Organic manure.*

Introduction

In developing countries like India, the main source of livelihood is based on agriculture. With the rapid growing population, urbanization and industrialization, the resources of land have become limited. So, the world-wide trend is to increase productivity of the crops to meet the ever-growing demand. The common organic fertilizers used traditionally like farmyard manure, vermi compost and organic manure from sources such as cattle dung, urine, sheep dung *etc.* Manure generated from agricultural and horticultural wastes composting or vermi composting are widely used in agriculture to improve the soil quality (Edwards and Aroncon, 2004; Lenin *et al.*, 2010). The organic grown fruits and vegetables are marketed at much high price than the one normally produced using chemical fertilizer treatment these days. A common person is not able to afford these products at such high prices. The production of common organic manure like farmyard manure, vermi compost *etc.* takes a longer time. So, FDP manure is a best alternative produced in short duration, having high levels of micro and macro nutrients and cost effective.

Materials and Methods

Preparation of FDP organic manure: FDP manure (Fig. 3) is prepared as per the protocols of Kumari and Lakshmi, (2011) and Swapna and Lakshmi, (2020). The macronutrients such as available nitrogen (AOAC, 2000), Available phosphorous (Watanabe and Olsen, 1965) and Potassium (Pearson, 1976) were estimated. The available micronutrients of all soil amendments were estimated by adopting the protocols of Lindsey and Norvell, (1978). The results were compared with

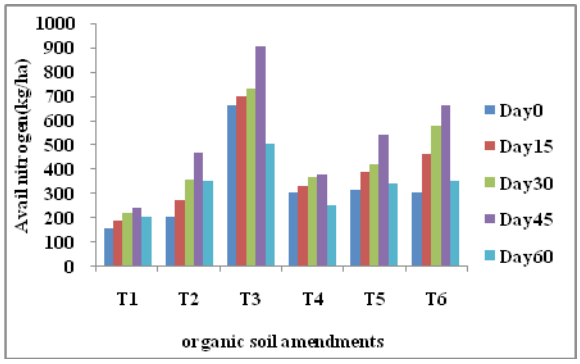
Vermicompost and Keratinase treated feather (KTF) which was produced in our laboratory. The soil amendments performed include. Statistical analysis such as One-way ANOVA and DMR analysis using SPSS package and the significant difference which the values taken at the portability level of P<0.01.

1. T1: Soil sample (1500g) (Soil control).
2. T2: Soil sample (1200 g) +300 g Vermicompost (20%VC) (vermi compost control).
3. T3: Soil sample (1200 g) +300 g Keratinase treated feather (20%KTF) (KTF control).
4. T4: Soil sample (1200 g) +300 g FDP (20% FDP)
5. T5: Soil sample (1050 g) +450 g FDP (30% FDP)
6. T6: Soil sample (900 g) +600 g FDP (40% FDP)

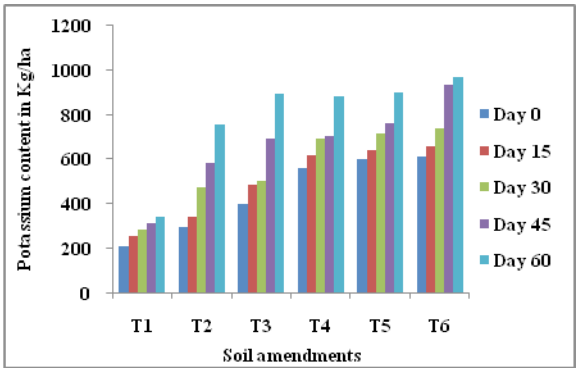
Results

Macronutrient analysis

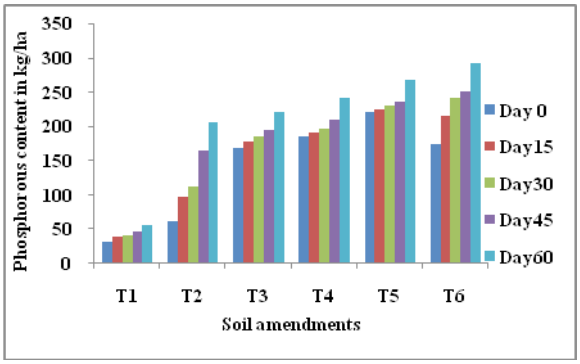
The available nitrogen content in all amendments showed an increasing trend from 0th day to 45th. A maximum nitrogen content of 903kg/ha was observed by 45 days in T3 (KTF amendment) followed by FDP amendments (T4, T5 and T6) which was in range of 377- 664kg/ha. Soil control and 20%VC amendments had nitrogen content of 240 and 464kg/ha respectively. KTF as well as FDP amendments T5 and T6 were found to have better available nitrogen content compared with the Soil control and 20%VC (Fig.1a). One-way ANOVA analysis revealed that the significance among the amendments was 0.001 (Table 1). The DMR analysis placed the plans under different amendments into two subsets. The T1, T4, T2, T5 and T6 were placed in first subset and the T6 and T3 was categorized in second subset having highest value. The phosphorous content in all amendments increased from 0th day to 60thday as shown in Fig.1b. The highest phosphorous content was recorded in 40% FDP (292 kg/ha) followed by 30% FDP and 20%FDP with 267kg/ha and 241 Kg/ha respectively. The phosphorous content in the 20%VC (T2) and 20%KTF (T3) was in the range of 205-221kg/ha (Fig. 1b). One-way ANOVA analysis revealed that there was significant variation among the amendments. The DMR analysis categorized the T1 control in first subset and T2, T3, T4 were placed in second subset and T5 and T6 were positioned in



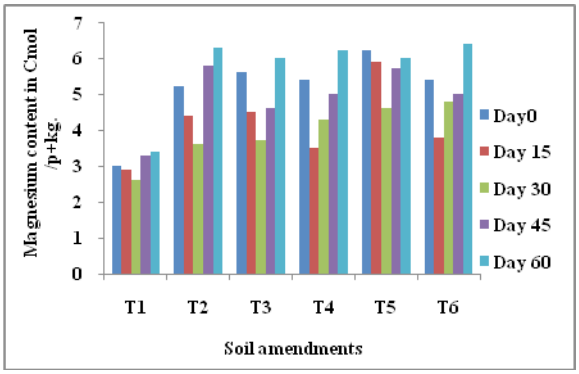
(a)



(c)



(c)



(d)

Fig. 1(a) Available nitrogen (b) Phosphorous content (c) Potassium content (d) Magnesium content in different amendment

third subset. The potassium content in the soil amendments increases from 0th day to 60thday as shown in Fig.1c. The highest available potassium content among all soil amendments was recorded in T6 (971 kg/ha) followed by T5 (898 kg/ha), T3 (896 kg/ha) and 882kg/ha in T4. The maximum available potassium content of control amendments T1 was in the range of 205- 340kg/ha and T2 was found in the range of 293-756kg/ha respectively. The FDP amendments showed significantly higher available potassium at 60th day comparable with the T3 controls. The One-way ANOVA analysis showed significance among the soil amendments. The DMR analysis categorized the amendments into three subsets. T1, T2 were categorized in first subset, whereas T3 and T4 was placed in second subset. Third subset was positioned with T3, T5 and T6. The magnesium content in all amendments decreased from 0th day to 30th day and gradually increased to 60th day marginally as shown in Fig.1d. The magnesium content of FDP amendments (T4, T5 and T6) were found to be high which was within the range of 6.0-6.4Cmol/p+ kg. In the soil case of the control amendments the magnesium content was found to be lower in the range of 2.6-3.4Cmol/p+ kg. The highest available magnesium content was recorded in T6 followed by T2 T5 and T4. One-way ANOVA results showed the significance at 0.001 among the soil amendments. The DMR analysis categorized all soil amendments into three subsets. The amendment T1 was placed in first subset and second subset was placed with T3 and T4. The third subset was positioned with T2, T5 and T6

Micronutrients analysis of the soil amendments

The copper content of the soil amendments decreased from 0th day to 15th day and increased marginally to 60th day as shown in Fig.2a. The maximum copper content was in FDP amendments (T4, T5 and T6) was in the range of 2.2-2.46ppm by day 60 and similarly in the case of vermi compost and KTF control amendments the maximum copper content was 2.4 and 2.35 ppm respectively. The highest copper content was found in 40% FDP among all the amendments. The One-way ANOVA results represent the significance among the amendments and the DMR analysis positioned all the amendments into two subsets where T5 and T6 in subset having highest value

The iron content of the soil amendments was increased from 0th day to 60th day as shown in the Fig. 2b. Maximum iron content was recorded in T6 with16.07 ppm followed by T5 with 14.08 ppm and T3 with 10.26 ppm. The least iron content was found T1 with 4. 30ppm.The one-way ANOVA results revealed that there was significance at 0.01 levels among the soil amendments and control. The DMR test has categorized the amendments in two subsets where T1, T2, T4 was placed in first subset and T3, T5 and T6 placed in second subset having highest values. The manganese content of all soil amendments was increased from 0th day to 45th day and decreases marginally by 60th day as shown in the Fig. 2c. The highest manganese content was observed in T3 with 17.65 ppm followed by FDP amendments (T5 and T6) with maximum of 12.99 and 13.48 ppm respectively. Lowest manganese content was recorded in T1. The One-way ANOVA results revealed that there was significance among the soil amendments. The DMR test categorized the amendments into two subsets. T1 was placed in first subset and all other amendments were positioned in subset 2. Table 1. One-way anova analysis of macroand micronutrients among various amendments. The Zinc content had shown increasing trend from 0th day to 60th day among all amendments as shown in the Fig.2d. Highest Zinc content was observed in T2 with 10.7 ppm followed by T3 with 7.26 ppm and it was followed by T6 with 3.91 ppm. The maximum zinc content was found in T2 was 10.7 ppm). The one-way ANOVA among the soil amendments was shown the significance of 0.01 levels (Table 1) and in the DMR test; the amendments are placed in two subsets. The amendments T5, T6, T4 and T1 were categorized in first subset and T3 was placed in second subset. The third subset was positioned with T2 having highest value.

Table 1. One-way ANOVA analysis of Macro and Micro elements

Macro and micro nutrients	f-Value	P-Value
Avaialable nitrogen	3.873*	0.021
Phosphorous content	3.643*	0.031
Potassium content	3.325*	0.047
Magnesium content	3.247*	0.051
Copper content	3.172*	0.067
Iron content	3.839*	0.020
Manganese content	4.175*	0.006
Zinc content	4.037*	0.008

*Significance at 0.01 levels

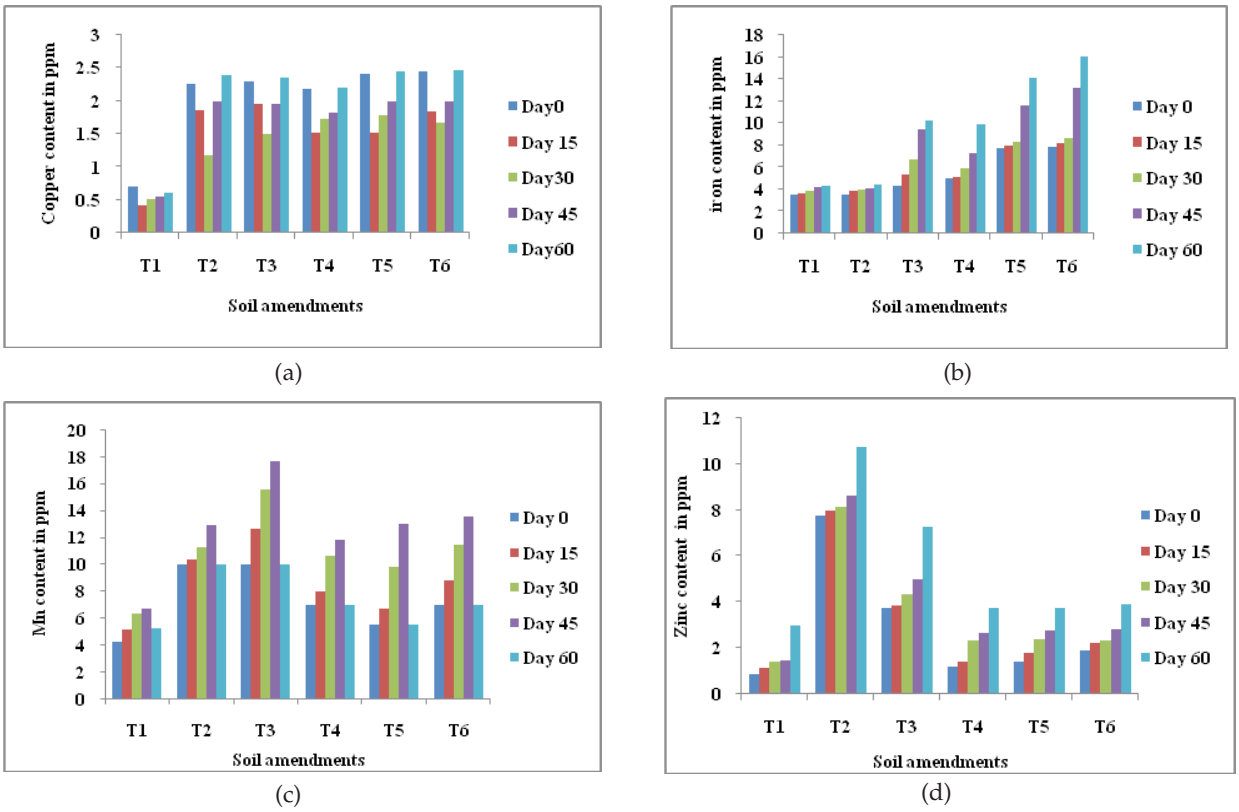


Fig. 2 (a) Copper content (b) Iron content (c) Manganese content (d) Zinc content in different amendments

Fig. 3. FDP manure

Discussion

Among the macronutrients in the soil nitrogen is continuously depleted due to utilization by plant for its growth and due to soil microbial activity. Nitrogen can become a major limited element, leading to the loss of fertility for long term cultivated crops. It requires continuous addition of nitrogen fertilizer to the soil, and this can be cost intensive as well as have negative impact on the environment. Addition of organic manure on the other hand results in sustained release of nitrogen and other nutrients, builds up soil health and does not cause serious environmental issues and hence is a preferred choice (Drinkwater *et al.*, 1996).

The available nitrogen content was highest in 20%KTF amendment (903kg/ha) followed by 40% FDP (664kg/ha) 30% FDP (539kg/ha) and vermi compost (464kg/ha) by 45th day. The availability of phosphorous content also increased marginally from 0th day to 60th day. A maximum of phosphorous concentration of 292kg/ha was observed in 40% FDP followed by 30% FDP (267kg/ha) by 60th day of experimental period. The phosphorous content in the 20%VC (T2) and 20%KTF (T3) were in the range of 205-221kg/ha. Potassium is another major element required for the plant growth. The potassium content was maximum in 40% FDP (971kg/ha) followed by (267kg/ha) by 60th day of experimental period. The KTF as well as 20 and 30% FDP amendments showed maximum of 896-898kg/ha. Magnesium is an important macronutrient plays role during photosynthesis. The initial magnesium content

on 0th day in 30% FDP was 4.8Cmol/p+kg and it was raised to 5.8Cmol/p+kg by 45th day and stood at 7.8 Cmol/p+kg at the end of the experiment. Similar trend in Mg levels was seen in all other organic amendments also. Thus, the study indicates that FDP can be a good organic manure as the quantity of all the available macronutrients were higher when compared to KTF and Vermi compost at 30% and 40% concentration. Similar trend was also observed on analysis of available micronutrients in the soil amended with FDP. The copper content of soil amendments increased with time. Copper content of 3.64 ppm was observed by 60th day in the case of 40% FDP followed by 30% FDP followed by vermi compost and KTF amendments. Similarly iron content also showed the progression as the time increased. Maximum iron content of 16.07 ppm was observed in 40% FDP amendment and followed by 30% FDP (14.08 ppm). KTF amendment stood next with iron content of 10.26 ppm. The manganese content was found to be high in vermicompost amendment with 17.65 ppm by 45th day. The manganese content in vermicompost and 30% FDP was almost comparable. The zinc content was also high in vermi compost amendment 10.7 ppm followed by KTF amendment with 7.26 ppm. In FDP amendments Zn content was marginally lower maximum being 3.91 ppm.

Conflict of Interest - None

References

AOAC, 2000. *Official Methods of Analysis of the AOAC* (18th ed). Washington, DC.

Drinkwater, B.W., Dwyer-Joyce, R.S. and Cawley, P. 1996. A study of the interaction between ultrasound and a partially contacting solid–solid interface. *Proceedings of the Royal Society of London. Series A*. 452(1955): 2613–2628.

Edwards, C.A. and Arcancon, 2004. The use of Earthworms in the breakdown of Organic wastes to produce vermi composts and Animal feed protein. *Earthworm Ecology*. 345–355.

Kumari, Ch. M. 2011. *Production of microbial keratinases and its application in bioremediation of feathers* [PhD Thesis] submitted to Sri Padmavathi Mahila Visva Vidyalayam. Tirupati, India.

Lenin, M., Kumar, S.G. and Thangadurai, R. 2010. Growth and nutrient content variation of groundnut Arachis hypogea L. under vermicompost application. *Journal of Experimental Sciences.* 1(8): 210–215.

Pearson, E.F., Winnewisser, B.P. and Trueblood, M.B. 1976. Millimeter Wave Spectrum of Excited Vibrational States of Potassium Hydroxide, KOH and KOD. *Zeitschrift für Naturforschung A.* 31(10): 1259-1267.

Swapna, P. and Lakshmi, V.V. 2020. Effective Recycling of Flower Waste as Organic Manure. In: *Bioresource Utilization and Bioprocess* (pp. 253-265). Springer, Singapore.

Watanable, F. S. and Olsen, S. A. 1965. Calorimetric determination of phosphorus in water extract. *Soil Sciences.* 93: 183–188.