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EVALUATION OF EFFECT OF EXPIRED TABLET ON SOIL PHYSICAL PROPERTIES: A CASE STUDY OF RANOZEX TABLET

Divya J — Assistant Professor, Department of Environmental Science, JSS Academy of Higher Education and Research, Mysore-15.

Vasudha Ranjan* — Research Scholar, Department of Environmental Science, JSS Academy of Higher Education and Research, Mysore-15. *Corresponding Author

Shayeeba Fathima

ABSTRACT Pharmaceutical waste can result from many locations and from many activities in health care facilities. They generate medicines waste which are compounding from pharmacy. In the present study, an attempt has been made to know the effect of Ranozex expired tablet on soil physical quality. The expired tablets were applied at a concentration of 150 mg, 250 mg, 500 mg, 750 mg and 1g. The expired ranozex tablets was mixed with sandy loam clay soil and kept for observation for 7 to 27 days respectively. The experimental setup was maintained till 27 days, at every 7 days intervals, the soil was extracted and subjected to selected physical properties such as bulk density, particle density, water holding capacity and moisture content. From the results, it was found that, the bulk density and particle density were found to be reduced. The percentage of water holding capacity was found to be higher during the experimental period.

KEYWORDS : Expired drug, Ranozex tablet, Bulk density and Particle density

I. INTRODUCTION

Pharmaceuticals are used in the diagnosis and treatment purposes or to prevent sickness and for restoring, enhancing or correcting the consequences. Active substances of pharmaceuticals and their metabolites are typically released into the environment through agricultural application of wastewater and sewage biosolids containing pharma ceuticals, derived from wastewater discharged by households, hospitals, natural fertilizers and other medical facilities (Alwhaibi et al., 2022). There are several procedures that determine the fate of antibiotics in soil such as transport, leaching, plant uptake, photo degradation, biodegradation and adsorption.

The adsorption of these drugs into the soil depends on its physico-chemical characteristics, texture and organic matter and climatic conditions (Homayun et al., 2019, 2019). The fate and behavior of pharmaceuticals in the soil, including their mobility and availability to plants, depends on the soil physical, chemical and biological properties as well as on the properties of the substance itself (Dejaegher & Vander Heyden, 2010). Pharmaceuticals introduced into the soil are taken up and retained in various plant parts. In general, the highest accumulation coefficients have been found in vegetative plant parts, in the following decreasing order: roots> leaves> stems, while the lowest in generative parts, such as grains of cereals (Laurenson et al., 2014). Many studies have looked at uptake only but there was no much attempt being made to understand the temporal fate of the pharmaceuticals in soil matrices –(Hossain et al., 2011).

Based on the above concept, the present study has been undertaken with the following objectives.

- To study the physical characteristics of the selected soil.
- To study the Impact of physical parameters on soil quality.

II. MATERIALS AND METHODS

Description of the study area:

The soil samples were collected from a Garden Soil located nearby Sri Ranga Patna, Mysore Taluk, Mysore district. That land is consisting of varieties of flowering plants and trees.

Soil Sampling:

A random soil samples were collected from 0-15cm depth. The soil samples collected was mixed together to form representative composite soil sample. The collected soil samples were air dried and subjected for sieving and stored for further analysis.

Analysis of Soil Sample:

Physical characteristics were performed as per the standard procedure. The parameters conducted are moisture content, water holding capacity, bulk density and particle density.

Experimental Setup:

The soil sample were transferred to plastic pots, each pot is capable of holding 1kg of soil. This experimental study was done with different concentrations. For this, 10mg of expired Ranozex tablet was added to the soil in the concentration of 150 mg, 250 mg, 500 mg, 750 mg and 1g with three trails for 27 days. A control was maintained to know the variations in the soil physical parameters before and after the addition of the expired tablet. After the addition of the expired tablet at an interval of 7 days, the soil was extracted and the analyses of physical parameters were done. The image of experimental setup is shown below.

Figure 1: 150 mg – trial 1,2,3

Figure 2: 250 mg – trial 1,2,3

Figure 3: 500 mg – trial 1,2,3

Figure 4: 750 mg – trial 1,2,3

Figure 5: 1g – trial 1,2,3

III. RESULTS AND DISCUSSIONS

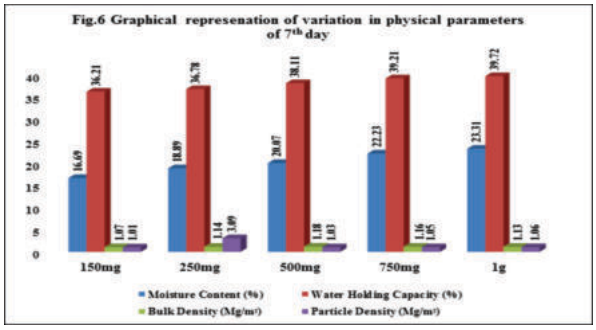
Table 1: Results of the Physical Parameters of the Soil Treated with Expired Ranozex Tablet

Days	Soil Samples treated with different concentrations of Ranozex	Moisture Content (%)	Water Holding Capacity (%)	Bulk Density (Mg/m3)	Particle Density (Mg/m3)
7th Day	150 mg	16.69	36.21	1.07	1.01
	250 mg	18.89	36.78	1.14	3.09
	500 mg	20.07	38.11	1.18	1.03
	750 mg	22.23	39.21	1.16	1.05
	1g	23.31	39.72	1.13	1.06
14th Day	150 mg	26.12	40.13	1.233	1.02
	250 mg	26.71	40.56	1.367	1.04
	500 mg	27.71	41.17	1.236	1.04
	750 mg	29.67	40.08	1.261	1.06
	1g	30.10	42.13	1.297	1.07
21st Day	150 mg	12.27	48.09	1.351	1.04
	250 mg	17.74	48.021	1.355	1.06
	500 mg	21.83	44.062	1.345	1.05
	750 mg	25.33	48.129	1.353	1.07
	1g	26.14	45.093	1.285	1.08
27th Day	150 mg	49.07	76.85	1.37	1.034
	250 mg	49.19	65.62	1.34	1.039
	500 mg	49.53	98.15	1.36	1.256
	750 mg	51.04	87.89	1.32	1.148
	1g	52.14	75.75	1.36	1.283

Note: The above values presented on the table are the average of 3 trials. The experimental results of the analysis of physical parameters of the soil samples treated with Ranozex expired tablet are presented as follows. The soil was extracted from the treatments, was subjected to experimental analysis for every 7 days intervals. The discussions are presented as follows.

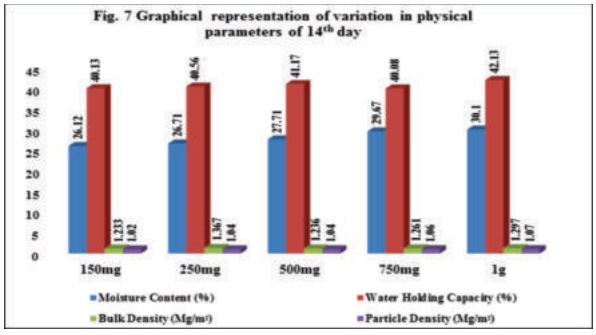
7th DAY:

In the present study, the percent of moisture content was found to be increase with the increase in concentration. Higher moisture content was observed in 1g and lowest in 150 mg. In water holding capacity, it gradually increases with increase in concentration was observed and the highest water holding capacity was found in 1g. In bulk density, except 1g, in all other treatments the value was found to be increase from 150 to 750 mg. In case of particle density, the higher value was observed on 250 mg treatment.



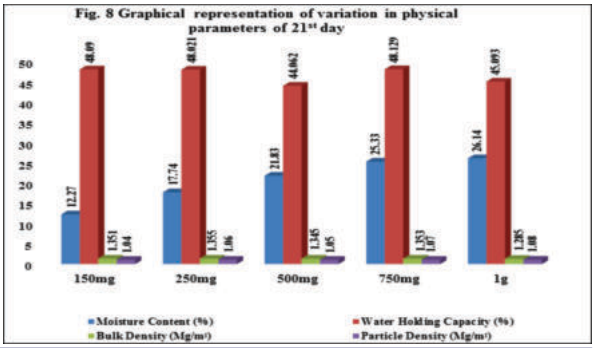
14th DAY:

From the experiment, the percent of moisture content was found to be gradual increase with increase in concentration. The higher moisture content was observed in 1g. In the water holding capacity, except 500 mg, in other treatments, a slight variation in the values were observed, but the higher water holding capacity was found in 1g. In bulk density, except 250 mg, in all other treatments a variation in the values were observed and highest value in bulk density was found in 1g. In case of particle density, values found to increase with the increase in concentration.



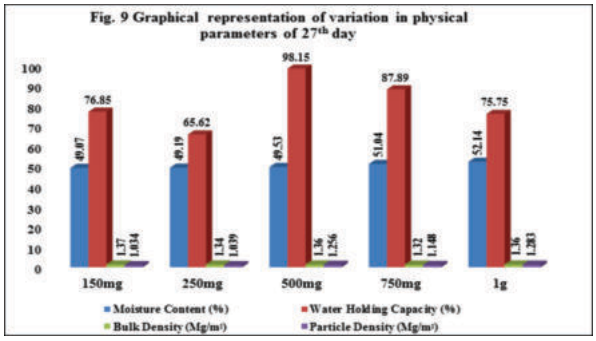
21st DAY:

In the present study, the percent of moisture content was found to be gradual increase with increase in concentration. The higher moisture content was observed in 1g. In the water holding capacity, except 750 mg and 1g the values were found to be varied. In bulk density, the lower density was found in 1g and in all other treatments the values were found to be varied. In particle density, the higher value was found in 1g and lower value was found in 150 mg.



27th DAY:

From the experiment, the percent of moisture content was slightly varied from 150 mg–750 mg. The higher moisture content was observed in 1g. In water holding capacity, except 500 mg, the values were found to be decrease with the increase in concentration. In bulk density, the values obtained were found to be slight varied in all the treatments. In case of particle density, the values were found to be increase with the increase in concentration, except in 750 mg treatment.



IV. SUMMARY AND CONCLUSION

From the overall study, it was found that, the moisture content value obtained from the experiment was found to be normal and the percent of moisture content was found to be increase with the increase in concentration as the number of days of observations. The normal range of bulk density is 1-1.65 Mg/m^3 therefore the experimental value obtained was found to be less than the normal range. The water holding capacity was found to be increase with the number of days of observation.

The highest percent of water holding capacity (98.15 %) was found to be in 27th day for the concentration of 500 mg of soil sample. The particle density value obtained from the experiment was found to be less than the normal range (2-2.65 Mg/m^3). When the bulk density and particle density is lower than the normal range, it may cause restrictions to the root growth and poor movement of air and water through the soil. From the study, it can be concluded that, the improper disposal and mixing of expired ranozex tablet has an impact on the soil physical quality.

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