Chemical Analysis of an agricultural land for different parameters before and after Diwali in the village of Bihar

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ABSTRACT

Scenario of celebrating Diwali has changed now a day. These days house is decorated by coloured electric bulbs and people of different age group gather near an open field and explode different kinds of fire cracker for several hours. The burning of gunpowder along with different compounds used for colour and light, no doubt causes pollution of the ambient airs, rather the residues comes to the ground and also causes alterations I the agricultural soil. To evaluate the impacts of these residues soil samples were analyzed for different parameters before and after the festival. Parameters observed in the present study were, pH, organic matter, electrical conductivity, nitrogen contents, exchangeable sodium, phosphorous, calcium, magnesium, chloride, phosphate, iron etc. During the work it was noted that the pH soil was reduced to 7.6 after the festival from 7.2. However, the electrical conductivity was increased from 0.285 µs cm2. There were slight variations in the organic carbon which became 2.70% after the festival than 2.56 that was before the festival. Sodium content increased to 29.74 mg/kg from 26.32 mg/kg. This was also noted in case of potassium, which become 18.48 mg/kg from 16.64 mg/kg. Likewise calcium from 34.52 mg/kg to 37.28 mg/kg magnesium from 11.38 to 13.6, iron from 126.24 mg/kg to 130.65 mg/kg respectively. Similarly, chloride from 280.0 mg/kg to 284.0 mg/kg, nitrate from 124.0 mg/kg and sulfate from 130.0 to 133.0 mg/kg respectively. It has been mentioned that above chemical are components of different kinds of five crackers and after burning their residues might have fallen down to the soil.

Keywords : Diwali and Chhath, Fire Crackers, Residues, Physico-chemical analysis, Agricultural Land, Components.

I. INTRODUCTION

Soil is a mixture of different organic matters, minerals, gases. Liquids and different microbes, which are essential for better health at the soil. Soil compositions are however, being disturbed due to different anthropogenic activities. For determination of the composition the chemical analysis of soil is essential (Jaishree *et al*; 2008; and Kanimozhi, 2011). In Bihar, the agricultural lands are used for the cultivation of wheat, rice, pulses and vegetables. For better yield of these crops health of soil should be better that can be assessed by physico-chemical analysis for selected parameters.

Different workers have studied different physico parameters of soil. Some of them may be mentioned here such as Johnston *et al*; (2008); Chik (2011); Singh and Mishra (2012); Sumithra *et al*; (2013); Manimegalai and Sukanya (2014); Soni (2016); Nisha *et al*; (2017); Ismail and Umamahesh (2018); Thakur *et al*; (2019). These workers analyzed the soil near industries or where sewage water etc. is being allowed to log. As mentioned, there are different chemicals in the fire crackers, so to analyze these the present study was carried out.

II. Materials & Methods

For chemical analysis, different chemicals and reagents were used. They were of A.R. grade purchased from the suppliers of Hi-Media products. Soil samples were collected in the agricultural land near which the explosion of different fire crackers was done during the festival. Samples were collected from the agricultural land before and after the festivals. Sample collection from the land was done from four different points randomly. They were collected in well cleaned plastic bags and brought in the laboratory. They were dried in shade and ground to fine powder. This was filtered through the muslin cloth to remove the debris. Then the powders were mixed together. Above mixture of soil was used for the study of pH, electrical conductivity, organic carbon, nitrogen contents, exchangeable sodium, potassium, calcium, magnesium, iron, chloride, phosphorous and sulfates. Above soil mixture solution was prepared and the pH was determined with the help of digital pH meter, Electric conductivity with conductivity meter. Amount of calcium, magnesium, sodium, iron and potassium were determined by following the standard methods as described by different authors. Similarly, the amount of chloride, organic carbon, nitrogen contents, phosphorous and sulphates were calculated from the above powdered soil. All the above parameters were analyzed separately from the soil samples taken before and after the festivals. All the experiments were repeated thrice and the means of the data for different parameters have been tabulated in table-1. Based on the above data the conclusion has been drawn.

Table-1

Showing range of different parameters of physico-chemical analysis of the soil before and after the festivals Diwali and Chhath in the village of Gopalganj district of Bihar.

S.N.	Parameters	Pre-Festival	Post Festival	% increase / decrease
01	pH	7.6	7.2	94.74
02	Electrical conductivity	0.285	0.354	124.21
03	Organic carbon	2.56	2.70	105.47
04	Na	26.32	29.74	112.99
05	K	16.64	18.48	111.0
06	Ca	34.52	37.28	108.00
07	Mg	11.38	13.46	118.28
08	Fe	126.24	130.65	103.49
09	Chloride	280.0	284.0	101.43
10	Nitrate	0.7	1.4	200.00
11	Phosphorous	121.0	124.0	102.48
12	Sulfate	130.0	133.0	102.31

III. Results and Discussion

pH values of the soil before and after the festivals where crackers were exploded have been presented in table-1. The values one the mean of the three measurements carried out at two different days. The values mentioned in the table, clearly indicated that there was reduction in the pH value from 7.6 to 7.2 after the festivals. pH of the natural soil is normally acidic. In the present study the became more acidic which may be due to deposition of chloride, sulfate released after burning of the crackers. Present findings are in agreement with the findings of Chaudhary (2013) and Nisha *et al*; (2017) who also noted changes in pH due to certain contaminations.

Electrical Conductivity:

The electrical conductivity of the agricultural soil before and after was also measured and means of data have been presented table.-1. From the table, it may be noted that electrical conductivity increased from 0.285 μs cm^2 to 0.354 μs cm^2. This also may be due to deposition of the residues of the crackers which were exploded near the field. The enhanced electrical conductivity of the agricultural land soil may be attributed to the deposition of ionic components of different kinds of fire crackers. Present findings are gin supported by the findings of Chaudhary (2013) who also reported enhancement of electrical conductivity from 0.47 to 0.59 μs cm^2 in the soil. Organic carbon was also analyzed but here very small increase the concentration was noted.

Amount of Sodium was analyzed. It was 26.32 mg/kg before the festival and became 29.24 mg/kg after the festival. Similarly, potassium contents were also analyzed. Here also the 16.64 mg/kg of potassium increased to 18.48 mg/kg after the festivals. Amount of magnesium which was 11.38 mg/kg became 13.46 mg/kg. Similarly, calcium increased from 34.5 mg/kg to 37.28 mg/kg respectively. We get that above findings corroborate with the findings of Chaudhary (2013) and Mishra *et al*; (2017) who also reported increase in the concentration of the aforesaid chemicals.

Concentration of chloride in the soil was also studied before and after the festivals. The concentration of chloride enhanced from 280.0 mg/kg to 284.0 mg/kg. Similarly, concentration of nitrate also increased from 0.7% to 1.4% and amount of phosphorous 121.0 mg/kg to 124.0 mg/kg and sulfate form 130 mg/ to 133 mg/kg respectively. From the table, it may conclude that except the pH, where a decrease in the pH content was noted, where as in rest of parameters increasing trends were noted. Similar reports have been published by Rakesh and Raju (2013); Nagh *et al*; (2014); Addis and Abebaw (2014); Manimegalai and Sukanya (2014); Mahajan and Billore (2014); Das *et al*; (2015); Dadawate (2020) and Arshi and Khan (2022).

Soil protection is also essential like water. However, human activities are destroying the natural composition of the agricultural soil. Explosion of crackers at different occasions in general and festivals in particular, are polluting an air water and soil respectively.

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