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Effect of Human Hair as Soil Amendment and Nutrient Source (Available Nitrogen).

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Abstract- Sixteen set of samples with four different cases were tested in frequency of 30 days up to 150 days. First case was of soil only, 6 kg each kept in four set of plastic containers. Second case was of mixes of soil and cow dung in proportions of soil 6kg and cow dung 10%, 15%, 20% and 25% by weight of soil each in four set of plastic containers. Third case was of mixes of soil, cow dung and hair in proportions of soil 6 kg, cow dung 10%, 15%, 20% and 25% by weight of soil and hair 1%, 2%, 3% and 4% by weight of soil each in four set of plastic containers. Fourth case was of mixes of soil and hair in proportions of soil 6kg and hair 1%, 2%, 3% and 4% by weight of soil each in four set of plastic containers. The test was carried out in controlled moisture condition by covering the plastic container by plastic sheet. Increment in percentage available nitrogen value has reached 67.7% for combination of soil 6kg and cow dung 10% by weight of soil up to 87.88% for combination of soil 6kg and cow dung 25% by weight of soil in 150 days. While increment in percentage available nitrogen value has reached 128% for combination of soil 6kg, cow dung 10% and hair 1% by weight of soil up to 242% for combination of soil 6kg, cow dung 25% and hair 4% by weight of soil in 150 days. Similarly, increment in percentage available nitrogen value has reached 42% for combination of soil 6kg and hair 1% by weight of soil up to 50% for combination of soil 6kg and hair 4% by weight of soil in 150 days. Hence, hair has found maximum effect in combination with soil and cow dung and can be effectively utilized as nutrient source for soil matrix.

Keywords: Nitrogen, Cow Dung, Human hair, Nutrient Source, Keratinolytic Fungi, P^H, Soil Amendment

I. INTRODUCTION:

Human hair is a material considered useless in most societies and therefore is found in the municipal waste streams in almost all cities and towns of the world. In rural areas or areas with low population density, the hair is thrown away in nature where it slowly decomposes, eventually returning the constituent elements, namely, carbon, nitrogen, sulfur, and so forth, to their respective natural cycles. Burning of human hair or the waste piles containing them—a practice observed in many parts of the world—produces foul odor and toxic gases such as ammonia, carbonyl sulfides, hydrogen sulfides, sulfur dioxide, phenols, nitriles, pyrroles, and pyridines. Open dumps of hair generate hair dust, which causes discomfort to people near them and, if inhaled in large amounts, can result in several respiratory problems. The best way to address such problems is to develop systems, which utilize the waste material as a resource. In addition to reducing waste, it contributes to the economy. As a potential material resource, human hair

has the advantage that it is completely biodegradable, renewable, and available in every locality.

This paper explores and assesses various uses of human hair from the perspective of expanding its utilization as a resource while addressing the associated solid waste and environmental problems. Historical and current uses of human hair have been reviewed including the mainstream and local/traditional uses as well as technologies that are being developed in various areas of scientific research. This includes the socioeconomic, environmental, and cultural aspects of the trade systems that have developed around some of the large-scale uses.

Available nitrogen is mineral nitrogen (ammonia and nitrate) and some form of organic which is available for plant. In this research available nitrogen is considered because decaying effect of hair transfers available nitrogen to soil mass. Finally, research is carried for analyzing effect of hair as source of nutrients in agriculture and soil amendments.

II. MATERIALS and METHODOLOGY:

A plastic container was filled with 6 kg of soil, using a randomized block design of sixteen samples in four cases each with four number of samples. The sample of human hair consists 0g, 60g, 120g, 180g, 240g and sample of cow dung consists 0, 600g, 900 g, 1200g, 1500g on weight basis of soil. Figure 3.1-3.4 shows the procedure of sample preparation. The experiment was carried out in controlled moisture condition by covering each container with plastic sheet.

Small portion of mixed sample was collected in the frequency of one month and tested for targeted parameters. The parameter studied were P^H, Temperature, Moisture and Available Nitrogen once a month.

III. EXPERIMENTAL SETUP

The model was setup in premises of Residence Gothatar, Kathmandu, Nepal as shown in figure
:

Fig1: Test Model Preparation

Fig2: Human Hair Measurement

IV. SAMPLE COLLECTION

Four samples each with 6 kg of natural soil was tested for pH in frequency of 30 days up to 150 days. Mixes of soil and cow dung in proportions of soil 6kg, cow dung 10 %, 15%, 20% and 25% by weight of soil was tested for pH in frequency of 30 days up to 150 days. Mixes of soil, cow dung and hair in proportions of soil 6kg, cow dung 10 %, 15%, 20% and 25% by weight of soil and hair 1%, 2%,3% and 4% by weight of soil was tested for pH in frequency of 30 days up to 150 days. Mixes of soil and hair in proportions of soil 6kg and hair 1%, 2%,3% and 4% by weight of soil was tested for pH in frequency of 30 days up to 150 days. Moisture was measured using gravimetric method. The experiment was carried out in controlled moisture conditions by covering the set models with plastic sheets.

V. Available Nitrogen:

The available nitrogen was observed for all the 16 samples in four cases in frequency of 30 days up to 150 days. In first cases (blank soil only), no increment in available nitrogen was observed. In second cases (mixes of soil and cow dung in different proportion), nominal increment in available nitrogen was observed. In third cases (mixes of soil, cow dung and hair in different proportion), large increment in available nitrogen was observed. In fourth cases (mixes of soil and hair in different proportion), slight increment in available nitrogen was observed. Large increment in available nitrogen in third cases indicate release of available nitrogen from hair and cow dung to soil and subsequent decay of hair. Decaying of hair was observed in visual inspection also. Initially, readily available nitrogen of hair transfers to soil mass combination increasing available nitrogen and with decaying of hair on soil mix leaves available nitrogen to natural soil again increasing available nitrogen with time. Slight increment in available nitrogen in soil and hair combination indicates poor decaying rate. Also, minimum decaying of hair was observed in visual inspection in these cases.

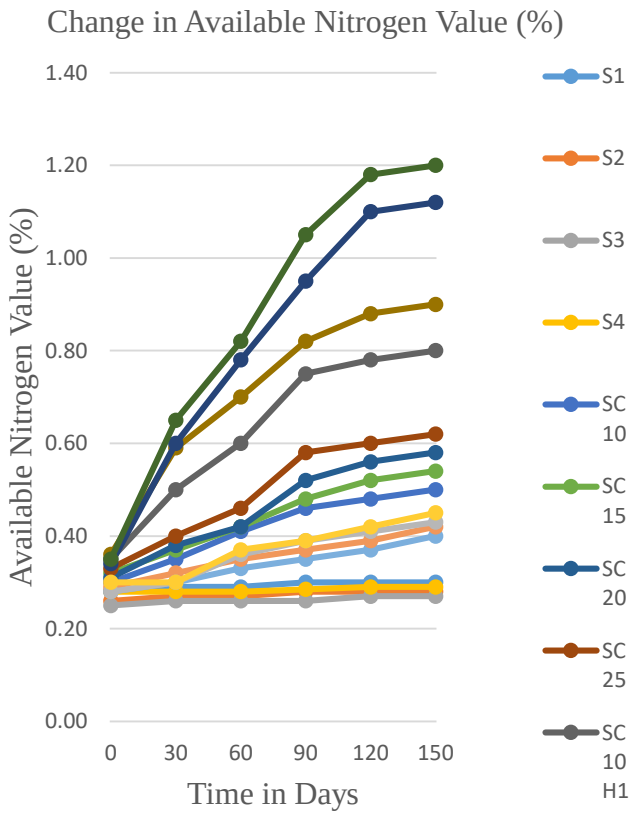

Fig3: Change in available nitrogen value over time

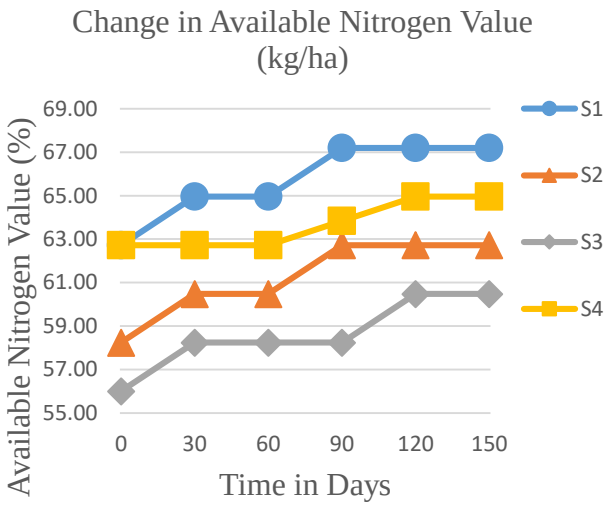

Fig4: Change in available nitrogen kg/ha in Soil Sample only

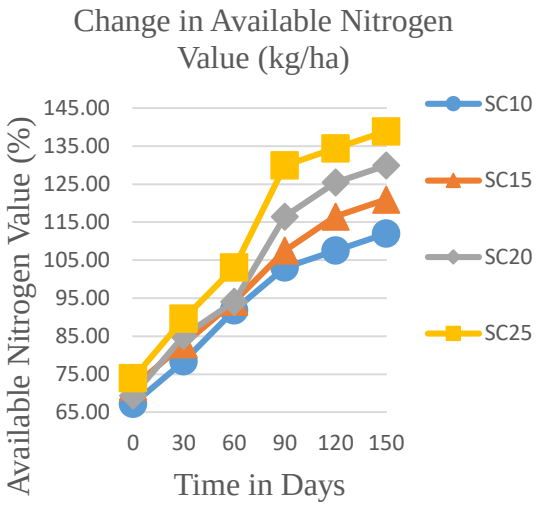

Fig5: Change in available nitrogen kg/ha in mixes of soil and cow dung sample

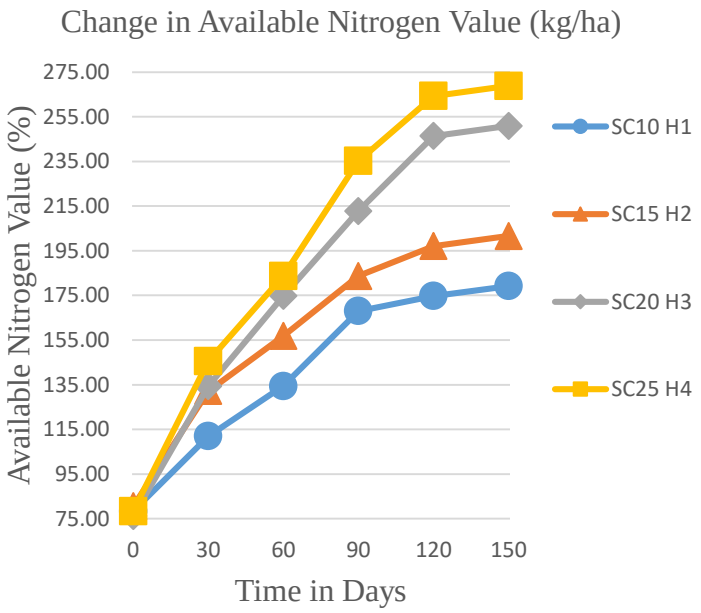

Fig6: Change in available nitrogen kg/ha in mixes of soil, cow dung and hair sample

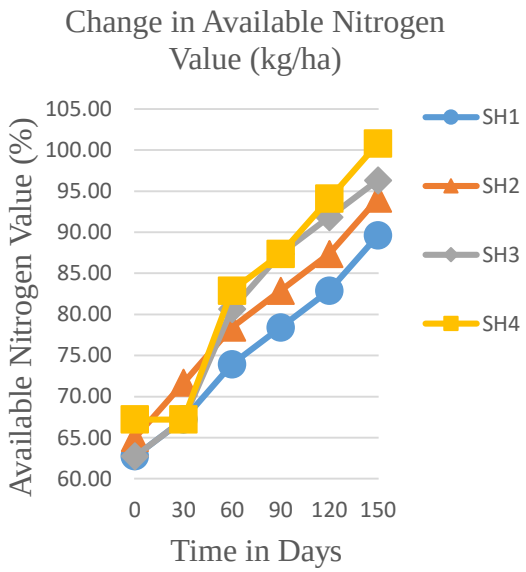

Fig7: Change in available nitrogen kg/ha in mixes of soil and hair sample

VI. CONCLUSION

Our research shows that available nitrogen in soil increases with decaying of hair and attained a medium nutrient value (268.8 kg/Ha) from low nutrient value (78.4 kg/Ha) in 150 days in combination of soil 6 kg, cow dung (25% by weight of soil) and hair (4% by weight of soil).

During observation period of 150 days, maximum increment in available nitrogen (from 0.25% to 1.2%) has found in mixes of soil, cow dung and hair. After 120 days, increment rate has become nearly constant indicating completion stage of decay of hair in this combination. During observation period of 150 days, medium increment in available nitrogen (from 0.33% to 0.62%) has found in mixes of soil and cow dung and, slight and constant increment in available nitrogen (from 0.30% to 0.45%) has found in mixes of soil and hair indicating poor decaying rate

Percentage increment in available nitrogen has reached up to 87.88% for combination of soil and cow dung in 150 days. While percentage increment in available nitrogen has reached up to 242% for combination of soil, cow dung and hair in 150 days attaining a constant changing rate at that stage indicating completion of decay. Similarly, percentage increment in available nitrogen has reached up to 50% for combination of soil and hair in 150 days. Hence, hair has found maximum effect in combination with soil and cow dung and can be effectively utilized as nutrient source for soil matrix.

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