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USE OF HUMAN HAIR AS A FERTILZER

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ABSTRACT

Human hair being a useless entity causes a negative impact on our environment, but still can be considered worthy of use. These problems need to be addressed and developed in the regions where their utilization is missing. Through this paper we review the use of human hair as a green fertilizer. Pot experiments were done to assess the use of uncomposted hair as a fertilizer for horticultural and high value crops. This paper has also given a comparison with commercial fertilizers. Further discussion on the effect of hydrolyzed human hair as a fertilizer on hot pepper and spinach is done. In the current scenario, the agricultural sector is completely dependent on commercial fertilizers and to reduce this burden we have tried to show a new alternative which also reduces the pollution to a great extent. This particular application of the human hair can be used as an idea for a business and such a thought is being implemented successfully in the west by entrepreneurs. It has also been observed that hair takes a considerable amount of time to degrade and to release nitrogen and other nutrients in the soil. Thus for the use of hair as a fertilizer on a large scale further research has to be carried out in order to increase the rate of its decomposition.

Keyword: - *Human hair, Fertilizer, Pot Experiments*

1.Introduction

Necessary nutrient sources for agricultural crop production are composted waste materials and byproducts, such as animal manure, municipal solid waste composts, and sewage sludge. Studies have shown that human hair, a readily available waste generated combined with additional compost, is an additional nutrient source for crops. Noncomposted human hair waste with municipal solid waste compost can be used as nutrient source for crops. Human hair contains cuticle, cortex, and medulla [5] The cortex is composed of proteins, granules of melanin, and matrix proteins which have an irregular structure. The cuticle is made up of keratin and cytoplasmic structures which originate from dead cells. Keratin is composed of 18 amino acids except for glutamine and aspartic acid [4] Melanin's structural stability may be higher than the keratin structure as it is composed of a benzene ring and its derivatives [5]. Hair composed of various structural chemicals such as cuticle, keratin, melanin, cytoplasmic compounds, fibril proteins, and medulla cells may have biophysicochemically stable complex structures. The reason why hair is so difficult to biologically or physicochemically degrade is because hair consists of

various structural chemicals such as cuticle, melanin, keratin, cytoplasm, proteins, and medulla cells.

1.1Constituents of Human Hair

Human hair contains cuticle, cortex, and medulla. The cortex is composed of proteins, granules of melanin, and matrix proteins which have an irregular structure. The cuticle is made up of keratin and cytoplasmic structures which originate from dead cells. Keratin is composed of 18 amino acids except for glutamine and aspartic acid. Melanin's structural stability may be higher than the keratin structure as it is composed of a benzene ring and its derivatives. Hair composed of various structural chemicals such as cuticle, keratin, melanin, cytoplasmic compounds, fibril proteins, and medulla cells may have biophysicochemically stable complex structures. The reason why hair is so difficult to biologically or physicochemically degrade is because hair consists of various structural chemicals such as cuticle, melanin, keratin, cytoplasm, proteins, and medulla cells.

2. Use of non-composted human hair for horticultural crops

We study two pot experiments that were conducted to evaluate the use of noncomposted hair byproduct as a nutrient source for container-grown crops. Lettuce and wormwood were grown in a commercial growth substrate with either of the following: 1) 5% by weight hair waste. 2) Controlled-release fertilizer(CRF) 3) Watered with a complete water-soluble fertilizer (WSF). After harvest, the substrate that previously grew wormwood was used to grow yellow poppy and feverfew was grown in the pots and substrate previously containing lettuce. Considering 50% nitrogen availability in human hair we calculate the amount of nitrogen present in 5% by weight of human hair and use the equivalent rate of commercial fertilizers containing same amount of nitrogen [7]. As compared to untreated control, yields in treatments containing hair or CRF or watered with WSF were higher.

2.1 Inference

The highest yields of lettuce and wormwood was observed with CRF followed by WSF and 5% hair treatments. But we noticed that the yield of yellow poppy was higher in the hair treatments than yields in inorganic fertilizer treatments or in the untreated control. From this study we can come to conclusion that noncomposted hair waste could be effectively used as a nutrient source for horticulture plants. As the time needed for degradation of the hair is quite high, hair waste should thus not be used as a single nutrient source for rapidly growing plants.

3. Use of hydrolyzed human hair for hot pepper

In this study, we review waste human hairs that were collected and hydrolyzed with a mixture of 0.5 N KOH and 0.05 N Ca(OH)2 by heating treatment for 15 min at 130^0C [4]. The pH of the hydrolysate was maintained to 9 with the help of Ortho-phosphoric acid. The final solid content of the hair hydrolysate was brought up to 110 grams per litre based on the weight of hair. Hot pepper plant seeds were sown in compost soil and allowed to grow for 14 days. Later they were exposed to natural sunlight for a week. Tap water consisting of no hair hydrolysates was used at an interval of 5 days for 3 weeks during the growth of seeds and in the process of cultivating

saplings [2]. The hot pepper saplings containing 3 to 4 leaves were transported into the laboratory-level farm field which had been fertilized previously with diluted hair hydrolysate.

3.1 Inference

Bacterial growth was approximately thrice than that was seen in the non-fertilized farm field soil. The soil-intrinsic bacteria were increased as per the viable cell count, and more diversified. Increase in the rhizosphere bacterial community in the farm field soil, gives an indication that the hair hydrolyzate makes the farm field soil nutritional for bacterial growth. The growth of the hot pepper plant based on length and weight showed significant growth in the fertilized field as compared to that in the non-fertilized field. The fertilized field and non-fertilized field was different significantly from each other on the basis of appearance of the hot pepper plant with the former one being superior.

4. Use of hydrolyzed human hair for spinach

This study reviews the experiment in which liquid nitrogenous fertilizer was synthesized using waste human hair. The two solvents used for the hydrolysis of human hair were Potassium hydroxide and Tetramethylammonium hydroxide [3]. A vegetation pot experiment was carried out to compare the performance of liquid fertilizers and commercial NPK fertilizer on the growth and yield of spinach. The study design consisted of four treatments: no fertilization (1), KOH based liquid fertilizer from human hair (2), TMAH based liquid fertilizer from human hair (3) and commercial NPK (4). The seedlings were grown from seeds in a greenhouse using a particular type of experimental soil. After 14 days of seed germination, the seedlings were transplanted into the experimental pots. The pot experiments were conducted in 2-litre capacity pots. All the pots were filled with experimental soil. Before seedling transplantation, the pots were allowed to stand for 5 days. The pots were regularly watered to maintain their water content to ensure maximum growth of the crop. Any water that percolated through the pot and into the tray was collected and used to water the same pot in order to minimize the nutrient loss via leaching. The spinach plants were allowed to grow in these pots for 28 days and afterwards were harvested.

4.1 Inference

1. Plants grown using no fertilizer (1) had least number of leaves and KOH based fertilizer from human hair (2) possessed the highest number of leaves at the end of 28 days. The TMAH based fertilizer (3) was intermediate between the two.
2. For the plants grown without any additional nutrients (1) lowest average weight was observed. Performances of (2) and (3) were actually better than (1) and (4) which was due to abundant availability of nitrogen in the synthesized fertilizers (2) and (3). The best performance on the dry mass basis of the grown spinach was portrayed by KOH based synthesized fertilizer from human hair (2).
3. The average NO3 concentration in the edible part of the harvested spinach was found lowest in the crop without any fertilizer (1). There was a significant difference in nitrate concentrations in the plants grown on NPK (4) and TMAH based fertilizer (3) compared to KOH based fertilizer (2) as the nitrogen concentration in the form of nitrate was in the highest amount in (2).

5.CONCLUSIONS

Humans biochemically synthesize waste hair which is a natural organic compound. It is not priced for purchasing but for discarding. Human hair if buried regularly and allowed to accumulate in soil, the circulation of the material in the soil will be obstructed. Burning of human hair leads to release of its constituent particles into the air. Some compounds such as sulfur oxides and nitric oxides may give rise to air pollution [1]. In this paper we have tried to show how to extract the usefulness of hair rather than discarding it. If used in proper conditions and in a proper manner it can be used as a fertilizer. Hair to be used can be noncomposted or can even be hydrolyzed for its use to grow various crops. In the recent times entrepreneurs have acknowledged this advantage of human hair and have come up with business models in the west [6]

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