

Utilization of Chemical Waste Obtained from Chemistry Laboratories

PREETI RAI¹, HARSHA CHATRATH²

¹Research scholar JJT University Jhunjhunu, Rajasthan, India

²D.Y. Patil College, Pune, MH, India.

Corresponding Author email: rai.prit2010@gmail.com

Abstract

Chemistry laboratories of all educational institutes are putting or throwing chemical wastes in the drainage pipe line directly or indirectly which is a very rich source of energy and contain many nutrient rich ions. We are aware about the utilization of micronutrients and macronutrients by the plants for their growth and producing good crops by absorbing these ions from the soil. Soil of each geographical area differs due to different flora and fauna at different places. The chemicals which are thrown away in the sink which is connected to the drainage system contains ions such as Na^+ , K^+ , Fe^{2+} , Mn^{2+} , phosphates, carbonates, sulfates, nitrites, nitrates and many more. All these ions are helpful for plant growth in one way or the other. We can use it for plant growth and see the difference in rate of plant growth, planted in different pots under the similar conditions. Both the pots are moistened with normal tap water and ionized water separately at the same time. This may lead to some difference in the healthy growth of plants. Soil can also be enriched with these chemicals to enable the farmer to grow such plants which cannot be grown in that area under normal conditions. This will increase the income of the growers as well as the fertility of the soil.

Keywords: Chemical Wastes, Sink, Soil, Macronutrients, Fertility.

Introduction

Chemical waste is the waste made up of harmful chemicals which can cause environmental as well as water pollution and are also health hazardous. The chemical waste released from the laboratories can also be used for fruitful purpose. Chemical wastes have been classified into three categories viz. solid, liquid and gaseous chemical wastes which are hazardous according to their Ignitability, Corrosivity, Reactivity, and Toxicity. Solid waste contains some very important ions as well as heavy metals along with filter paper, waste paper and broken glass wares. Liquid wastes can be divided into aqueous waste, halogenated and non halogenated waste. These chemicals are creating a lot of pollution in the environment directly and indirectly. They are contaminating the water bodies and nearby areas. Some corrosive chemicals are also drained out in the sink which are corroding the sink as well as drainage pipe line. Stagnation is caused due to these chemicals in the drainage and nearby areas which is responsible for mosquito breeding and growth of harmful insects and causes different infections and diseases. Stagnant water infections may cause skin rashes and blisters in the body. These chemical wastes contain poisonous chemicals like Arsenic, Copper, Antimony, Zinc etc. which can cause health hazards and digestion problems. Some chemicals may cause coagulation and precipitation in the drainage pipe line by reacting with the chemicals which are already present there and will work as barrier for the free flow of drainage water. As we are aware about the utilization of micronutrients and macronutrients by the plants for their growth and producing good crops by absorbing these ions from the soil, so we can use these

chemical wastes to reduce the pollution and health hazards and increase soil fertility and plant growth which will be helpful for farmers.

The main aim of this study is to utilize chemical wastes of chemical laboratories of educational institutes, which is thrown away in the sink. These chemical wastes are highly polluting the drainage/sewage water bodies. These chemical wastes have been utilized to find out the difference in soil fertility and plants growth of the plants planted in different pots which have been watered with tap water and chemical waste mixed water as per methodology.

Materials and Instruments

pH meter, Thermometer, Earthen Pots, Chemical Waste, Trowel, Hoe, Soil, seeds of carrot, spinach, tomato.

Methodology

Chemical wastes were collected from the college chemistry laboratory. To see the effect on plant growth and soil fertility, six pots were planted out of which two were of tomatoes, two were of spinach and two were of carrot. Five seeds were sown in each pot by lightly pressing the seeds in the soil. Out of these six pots three were watered with tap water and three were watered with chemical waste water daily at the same time. After germination of seeds (5-7) days the growth parameters like plant height and number of leaves of the plants was observed and recorded. Observations were recorded every 7 days. Each set was repeated after 15 days to see the results and it was continued for 2 months.

Following observations were done while doing this research i.e. Rate of flowering, bearing of fruits, color of the leaves, size of the leaves, deformity caused in the shape and size of fruit and leaves, fruit ripening period, changes in the flowers color, withering of flowers and leaves, any infections caused.

Observations:



Figure 1: Sapling formation after 7 Days of seeding



Figure 2: Growth of plants after 37 Days



Figure 3: Growth of plants after 52 Days

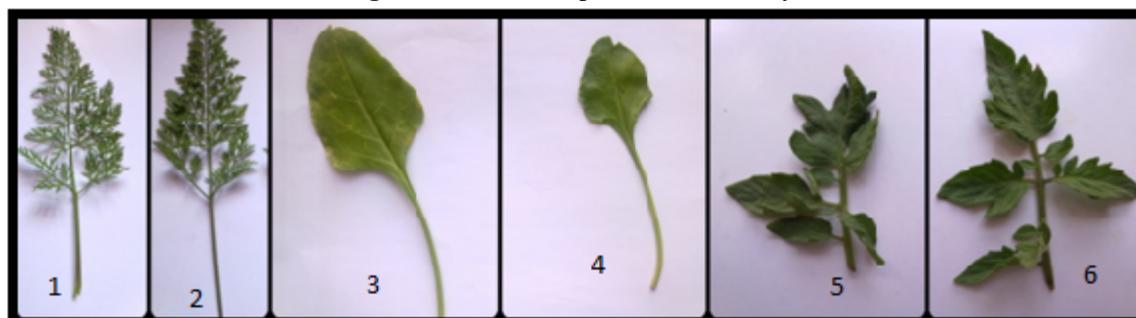


Figure 4: Leaves showing size differences (Carrot, Spinach, Tomato)

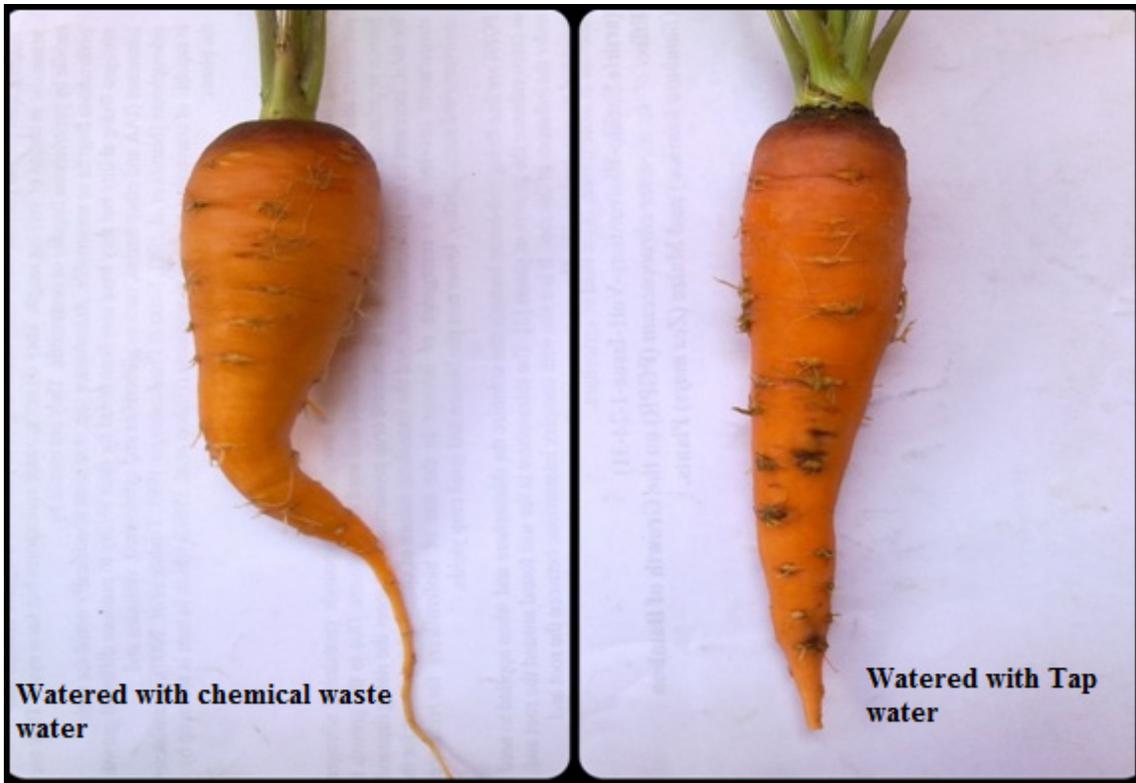


Figure 5: Effects on Carrots in Chemical waste water & Tap water Soil

Table 1: Comparative study of soil parameters before seedling formation

Soil with Tap water			Soil with chemical waste water		
	Color	pH		Color	pH
Carrot	Brown	7.42	Carrot	Black	8.9
Spinach	Brown	7.42	Spinach	Black	8.9
Tomato	Brown	7.42	Tomato	Black	8.9

Result and discussion

We have seen the change in growth of plants when compared with tap water and chemical waste water. Difference in the shape and size of leaves has been seen. In carrot and tomato leaves we can see the difference figure 4 (2, 6) which have been watered with chemical waste water is bigger in size than watered with tap water figure 4 (1, 4). In case of spinach leaf size has decreased which was watered with chemical waste water. Soil pH was also checked and it was seen that soil watered with chemical waste water was more basic compared with soil watered with tap water. After watering the soil with chemical waste water the soil has become highly mineralized and more amount of nutrients are available to the plants for their growth. Initially growth was seen showing good results but excess of nutrients are also harmful for the growth of plants as a result of which the growth of spinach leaves have retarded figure 4 (3, 4) and deformity in carrot shape figure 5. Further microbial analysis will also be done to check that apart from mineral ions from the chemical waste, which other factors are also affecting on plants growth and soil fertility. Availability of more amounts of nutrients than required decreases the uniform growth of plants.

Conclusion

Chemical waste contains many mineral rich ions such as Na^+ , K^+ , Fe^{2+} , Mn^{2+} , phosphates, carbonates, sulfates, nitrites, nitrates and many more. All these ions are helpful for plant growth and to enhance soil fertility. We have seen the changes in plant growth in carrot, spinach and tomato. pH of the soil has also been checked. Further work is still going on. Different aspects of microbial testing, biochemical and chemical analysis will be presented in the next paper. Utilization of these chemical wastes will reduce the pollution as well as save us from harmful diseases.

Acknowledgement

No work has been found on utilization of chemical waste of school and college laboratories for growth of plants and to check the fertility of the soil. Utilization of chemical wastes will help for the eco friendly environment and will help to keep check on the diseases caused by polluted water and harmful insects. This will encourage school and college students and staff to do useful work with laboratory waste rather than throwing it in the sink and dustbin. Small scale plantation will be done by using these chemical wastes in the school and college campus which is environment friendly and automatically increase the soil fertility and plant growth.

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