International Journal of Engineering & Scientific Research
Vol. 08 Issue 06, June 2020
ISSN: 2347-6532 Impact Factor: 6.660
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gate as well as in Cabell's Directories of Publishing Opportunities, U.S.A

IMPACT OF SUGAR MILL AND DISTILLERY EFFLUENTS ON GERMINATION, GROWTH (CHLOROPHYLL CONTENT) AND YIELD OF CROP PLANTS

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Abstract

This study examines how sugar mill effluent affects rice, wheat, and barley in different seasons. The study compared sugar mill wastewater concentrations. Over time, fertilization with sugar mill effluent changed the soil's EC, pH, OC, and other parameters (P-0.01). Sugar mill effluent disposal is a huge concern in India due to the high volume of wastewater. Many nations, including India, use agricultural wastewater. Effluents may contain dangerous chemicals, metals, metallic oxides, nitrogenous, and phosphate compounds that change plant agronomy. This paper covers sugar mill effluent physicochemical and biological features.

Keywords:sugar mill effluents, effluent, seed germination,Industrialization, hazardous

Introduction: Industrial pollution is wreaking havoc on the environment, affecting our water, air, and soil. Industrialization is devouring vast swaths of agriculture while also destroying the ecology and soil. When sugar effluent is used for irrigation, it affects soil fertility, plant growth, and seed germination. Paddy seed germination is reduced by SME. These effluents cause soil damage. Sugar industry chemicals are extremely dangerous to soil bacteria and fungus. Hazardous chemicals and metals used by SME endanger aquatic vegetation and wildlife [1]. It interferes with seed germination, growth, enzymatic activity, micronutrient absorption and distribution in plant tissues, transpiration rate, and water-plant interactions, among other things [7].

Pollution is a worldwide issue. Industrialization pollutes the environment. It is required for developing countries, yet it pollutes the environment. Waterways are contaminated by massive volumes of effluent from industries. It alters the physiochemical qualities of water and causes damage to plants and animals. Waterways are polluted by industrial waste and other human activities pollution. Water contamination can be caused by human actions that alter natural pollutant sources. Corrosion of groundwater has an influence on residential, agricultural, and industrial usage. Polluted water is responsible for one-third of fatalities

and 80% of diseases in developing countries (WHO 2004) [4]. Based on hazardous wastes produced, India's Ministry of Environment and Forests categorizes enterprises as Red (extremely polluting), Orange (polluting), or Green (moderately or non-polluting). Industries discharge waste water into nearby bodies of water, affecting water quality. Despite the fact that the sugar mill is one of India's most important agro-based industries and has a huge impact on rural economy, it produces massive volumes of effluents [4,8]. Organic waste contaminated the environment. The sugar industry discharges significant volumes of untreated effluent into bodies of water. Discharged wastewater is a major source of worry, with growing harmful consequences. Sugar mill effluent is also said to be contaminated [2]. It injured animals and changed water conditions.

The majority of Indians are farmers. Agriculture is India's primary industry. In 2011, India has 17,97,99,000 hectares and 60.47 percent agricultural land, according to the World Bank. Water is required for agriculture and all living things [13]. Irrigation consumes a lot of water, yet a lack of water has increased demand. Due to a lack of water, farmers used waste water for irrigation. Sugar mills discharged large volumes of wastewater into nearby rivers. Sugar mill effluent had higher levels of BOD, COD, dissolved solids, and suspended solids. Moreover, the sewage used to water surrounding farmers had high levels of chlorides, sulphates, nitrates, calcium, magnesium, and trace quantities of zinc, copper, and lead [5]. When wastewater is used for irrigation, it inhibits plant development and soil fertility. The soil was harmed by untreated effluent that contained organic compounds and heavy metals. This wastewater contains nutrients that are beneficial to agriculture. Effluent is high in plant nutrients and reduces fertilizer and water shortages [14].

Because it deposits heavy metals in plant tissue and damages consumers, effluent irrigation is not advised for food crops. However, attractive plants are watered with wastewater. India exports beautiful plants and flowers, particularly flowers, for a variety of uses [11]. African marigold is grown all across India, and the flowers are used in religious and social ceremonies. The blossoms of African marigolds are stunning. Plants in their whole are occasionally used as decorations. Marigold has a lot of carotenoid and xanthophyll pigments, as well as 80–90% lutein. It is commercially grown in India. Plant population dynamics and reproduction are controlled by germination [8]. It's an important indication of agricultural output. The effect of sugar mill effluent on Tagetes erecta seed germination and growth is investigated in this study.

The sugar industry contributes to the development of India, yet its effluents harm marine and terrestrial environments. They alter the physiochemical characteristics of aquatic

bodies and aquatic flora and fauna that receive them. Sugar industry effluent poses a serious health risk to rural and semi-urban residents who rely on stream and river water for irrigation and domestic use. The discharge of these wastewaters into agricultural land has resulted in the mortality of fish in the stream and river, as well as damage to rice crops in the vicinity. The stench and colour of untreated sugar factory wastewater are unpleasant [12]. Farmers who irrigated with effluents had decreased growth, yield, and soil health. Numerous enterprises emit chloride, sulphate, phosphate, magnesium, and nitrate with their effluent, producing visual, olfactory, and gustatory problems. Plants, animals, and humans are all harmed by this water. Many employees are curious about the effects of industrial effluents on seed germination, plant development, and yield [6]. There have been no comprehensive studies on germination and plant growth using sugar industrial effluent. The effects of sugar factory effluent on seed germination, seedling development, amino acids, proteins, and chlorophyll content were investigated in this study.

Sources of Effluents

Classification of sugar mill wastewater produced during operating and crushing periods.

a) Mill House- The effluent is water used to clean the mill house floor and is changed by spills. This will prevent bacteria development on the juice-covered floor. This source's effluents include mill cooling water.

b) Boiling House Wastewater - Wastewater from boiling houses comes from leaking pumps, pipelines, and cleaning various units such as evaporators, juice heaters, clarifying, pans crystal, and centrifugation. Multiple pumps also added cooling water.

c) Wastewater from Boiler - Blow-down Boiler water includes soluble and insoluble particles such calcium, magnesium, sodium, fatty salts, etc. After water generation, these salts concentrate. Solids must be periodically discharged to avoid scaling the boiler.

d) Excess Condensate Water - Used for boiler feed water and cleaning. Sometimes it gets polluted with juice owing to carryover solids with condensing vapours, and it travels down the wastewater drain.

e) Condenser Cooling Water - Condenser cooling water is recirculated unless it becomes polluted with juice owing to malfunctioning entrainment separators, operating beyond the design rate of evaporation, etc. polluted water should drain invisibly. Condensation from boiling juice increases this amount of water.

f) Caustic soda and hydrochloric acid are used to clean heat exchangers and evaporators to remove deposits or scales on the tubing. Most sugar factories drain this essential chemical. Soda and acid wash create massive organic and inorganic pollution and wastewater treatment shock loads.

Effect of Effluent:

If sugar effluent is utilized for irrigation, it will influence soil fertility, plant growth, and seed germination. SME reduces paddy seed germination. These effluents harm soil. Highly hazardous chemicals from the sugar industry threaten soil bacteria and fungus. SME's hazardous chemicals and metals harm aquatic vegetation and animals. It impairs seed germination, growth, enzymatic activities, absorption and distribution of micro and macronutrients in plant tissues, transpiration rate, and water-plant relationships, among other activities.

Impact of Sugar Mill Effluent to the Environment:

Sugar and other carbohydrates are among the organic pollutants prevalent in wastewater. These effluents rapidly deplete the dissolved oxygen in receiving streams because of their high demand for oxygen right away. Hydrogen Sulphide, which precipitates iron as black sulphide, is released as a result of these processes, resulting to an unappealing look. Fish and other aquatic creatures are unable to survive in the water as a result of all of these factors. As the dissolved and suspended particles decay, they emit an unpleasant smell. In addition, the drainage is obstructed by suspended pollutants, which detach. Aeration is hampered by the build-up of excess oil and grease. Fertility of soil, plant development, and seed germination are all harmed when effluent from the sugar industry is utilized directly for agricultural techniques such as irrigation. According to this study, rice crop seed germination was slowed down due to sugar mill effluent. The soil fauna is also affected by sugar mill effluents. The very toxic compounds released by sugar mill wastewater will harm the bacteria and fungus that keep the soil fertile. VAM fungi have been shown to be affected by sugar mills, according to a study. Physicochemical features of sugar mill effluent containing hazardous compounds and heavy metals have been researched by

certain researchers and have been found to influence aquatic life. Toxic sugar industry wastewater is threatening economically vital fishes that provide nutrients to the freshwater ecology. Due to a lack of dissolved oxygen, this has occurred.

Conclusion

This study found that sugar factory effluent's BOD, chloride, alkalinity, hardness, calcium, magnesium, sulphate, and phosphate influenced plant development. When radish plants were watered with various effluent concentrations (except 20% and 40%), root and shoot length, number of leaves, leaf area, chlorophyll a, b, total chlorophyll and carotenoids, total sugar, amino acid and protein contents decreased compared to the control. 20 and 40% effluent concentrations boosted plant growth and biochemical content. Optimal inorganic nutrient levels and dilution reduce toxicity. Thus, diluted effluent may be employed as soil fertilizer for better radish growth, biochemistry, and yield. 20% effluent was better than 40%.

Acknowledgement

The author is thankful to Dr. R. N. Kewat, Associate Professor, Deputy of Biochemistry, ND University, Faizabad for providing necessary help & suggestions during the course of the study.

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