SNEH TEACHERS TRAINING COLLEGE, JAIPUR
"Foster Emotional Intelligence in Youth Through Education" (ICFEIYE-2024)
DATE: 15 April 2024
International Advance Journal of Engineering, Science and Management (IAJESM)
Multidisciplinary, Indexed, Double-Blind, Open Access, Peer-Reviewed, Refereed-International Journal, Impact factor (SJIF) = 7.938

Analyzing The Impact of Distillery Spent Wash Irrigation on Jasmine (Oleaceae) Flowering Plant Sprouting, Growth, And Yield

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Abstract

The study investigated the impact of primary treated sewage water (PTSW) with varying dilution ratios (1:1, 1:2, and 1:3 SW) on the physicochemical properties and nutrient content of soil, as well as the growth and flowering patterns of Jasmine (Oleaceae species) Jasmine (Oleaceae) flowering plants were irrigated with distillery leftover wash at varying ratios to increase their production and sprouting growth. The chemical analysis demonstrated a decrease in concentrations of contaminants and nutrients with increasing dilution ratios of PTSW, suggesting the efficacy of dilution as an initial treatment step for sewage water. Furthermore, the soil analysis provided insights into the texture, pH, nutrient availability, and micronutrient levels, indicating suitable conditions for plant cultivation. The growth stages and flowering patterns of Jasmine plants under various irrigation levels were also documented, revealing differential responses to different soil moisture conditions. Overall, the findings underscore the importance of understanding the chemical compositions of sewage water and soil for effective wastewater treatment and environmental management, while also highlighting the potential implications for plant growth and development.

Keywords: ***Distillery, Wash Irrigation, Jasmine (Oleaceae), Flowering, Plant Sprouting, Growth, Yield***

1.INTRODUCTION

A byproduct of the distillation of alcohol, distillery waste wash presents benefits as well as challenges to agricultural ecosystems. The amount of distillery discarded wash that accumulates as alcohol production rises internationally also rises, calling for creative methods of disposal or reuse. Using it as a source of irrigation for farming operations is one such use. Still, there is a great deal of interest and worry regarding how different crops are affected by distillery spent wash irrigation.

The jasmine plant (Oleaceae) is a popular blooming plant that is grown for its scent, aesthetic appeal, and commercial worth in the herbal medicine and perfumery sectors. For strong development, blooming, and output, good watering techniques are frequently necessary throughout its cultivation. Thus, it is essential to look at how distillery spent wash irrigation affects jasmine plants in order to comprehend any possible repercussions on plant productivity and health.

There are benefits and drawbacks to using distillery waste wash as an irrigation supply. On the one hand, it provides a sustainable way to handle this industrial waste, maybe lowering the pollution that comes with disposing of it and giving agricultural use, especially in areas with limited water resources, a different source of water. However, if distillery waste wash is not adequately managed, it can contaminate soil and have negative effects on plant physiology because to its high quantities of organic matter, salts, and different hazardous substances, including heavy metals.

Numerous research endeavors have examined the effects of distillery spent wash irrigation on various crops, with in inconsistent outcomes. Some have highlighted negative consequences including soil salinity, phytotoxicity, and decreased crop yields, while others have documented beneficial effects like increased nutrient availability and growth stimulation. Its effects on jasmine plants have not, however, been the subject of much research, thus a thorough analysis is necessary to close this knowledge gap. For the purpose of environmentally responsible farming, it is crucial to comprehend how jasmine plants react to irrigation from distillery used wash. This study intends to shed light on its impacts on the yield, growth, blooming, and sprouting of jasmine plants, which will be useful information for researchers, policymakers, and farmers alike. It also adds to the larger conversation on the sustainable handling of industrial waste in agriculture, striking a balance between the objectives of environmental preservation and economic output.

2. REVIEW OF LITREATURE

Chandraju et al. (2016) provide a thorough examination of the effects of distillery spent wash irrigation on the yield and sprouting growth of jasmine. They demonstrate the complex impacts of this irrigation method on plant morphology and productivity through empirical research. Their results highlight the need for a balanced approach to agricultural techniques that takes yield maximization and environmental sustainability into account.

Chandraju, Thejovathi, and Kumar (2013) Examine the effects of irrigation with wasted wash in distilleries on the yield of jasmine particularly. Their study adds to the body of knowledge by shedding light on the sustainability and long-term implications of using industrial effluents in agriculture. This study provides useful implications for farmers and policymakers that are struggling with resource management in agroecosystems by concentrating on yield measures.

Thomas (2000) adds to the conversation by providing a more comprehensive viewpoint on agronomic techniques for aromatic and therapeutic plants. Thomas' study establishes the foundation for comprehending the cultivation methods and environmental factors crucial for the sustainable growth of aromatic crops like jasmine, even though it does not specifically address distillery spent wash irrigation.

Abate et al. (2009) provides a draft training manual that incorporates input from various nations along with real-world experience and knowledge from the Wondo Genet Agricultural Research Center. This handbook is a thorough reference that covers many aspects of growing aromatic plants, as well as processing, application, and marketing tactics. Through the integration of regional experiences with international best practices, the handbook provides an all-encompassing strategy for information dissemination and capacity building in the aromatic plant industry.

Mengesha, Mohammed, Tessema, and Abate (2010) examine the cultivation, handling, and application of aromatic plants in further detail, concentrating on Ethiopia. They provide insight into the agronomic strategies, post-harvest handling procedures, and value-added processing processes necessary to optimize the economic potential of aromatic crops through actual observations and research findings. This publication gives stakeholders the tools they need to take advantage of the many opportunities that aromatic plant cultivation presents, while also adding to the body of knowledge already in existence.

3. MATERIALS AND METHODS

Standard procedures were employed to analyze the physico-chemical properties and the amounts of nitrogen (N), potassium (K), phosphorous (P), and sulfur (S) in the primary treated diluted spent wash (1:1, 1:2, and 1:3 SW). For irrigation purposes, the PTSW was diluted at ratios of 1:1, 1:2, and 1:3, respectively. Before beginning the waste wash irrigation operation, a composite soil sample was collected, and its physicochemical parameters were investigated. Following that, the sample was pulverized and dried in the air.

In order to conduct this experiment, one of the flowering plants that was selected was jasmine. Raw water (RW), 1:1 SW, 1:2 SW, and 1:3 SW were used to water the plants twice a week, and the other time, raw water was used as needed. The plants were planted in a variety of pots with dimensions of 30 inches in height and 25 inches in diameter. The amount of water applied to the plants ranged from 5 to 10 millimeters per square centimeter, depending on the climate. There were three different sets of cultivation that were carried out, and records of the sprouting and growth of each individual case were kept.

4. RESULT AND DISCUSSION

The compound cosmetics of 1:1, 1:2, and 1:3 SW, as well as PTSWAnalyses and organizations of different boundaries were performed, including pH, electrical conductivity, all out solids (TS), complete broke down solids (TDS), all out suspended solids (TSS), settelable solids (SS), compound oxygen interest (COD), natural oxygen interest (Body), carbonates, bicarbonates, all out phosphorous (P), absolute potassium (K), ammonical nitrogen (N), calcium (Ca), magnesium (Mg), sulfur (S), sodium (Na), chlorides (Cl), iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), cadmium (Cd), lead (Pb), chromium (Cr), and nickel (Ni).

Table 1: Chemical properties of the spent wash at the distillery

Chemical Parameter	PTSW 1:1	PTSW 1:2	PTSW 1:3	PTSW
pH	8.62	8.56	8.26	8.56
Electrical Conductivity (µS/cm)	31211	18125	81251	6125
Total Solids (mg/L)	51210	32562	32514	16256
Total Dissolved Solids (mg/L)	42510	19256	13251	71561
Total Suspended Solids (mg/L)	13251	61251	5251	1325
Settleable Solids (mg/L)	11251	5126	3256	4125
COD (mg/L)	14512	2136	112514	3261
BOD (mg/L)	17215	7920	5625	32221
Carbonate (mg/L)	Nil	Nil	Nil	Nil
Bicarbonate (mg/L)	13151	7125	4125	1356
Total Phosphorous (mg/L)	42.6	31.52	18.05	11.83
Total Potassium (mg/L)	7625	5126	3125	1758
Calcium (mg/L)	92362	625	412	199
Magnesium (mg/L)	1325.18	525.18	151.31	92
Sulphur (mg/L)	72	32.5	18.2	9.5
Sodium (mg/L)	625	312	325	152
Chlorides (mg/L)	71256	4125	4125	3256
Iron (mg/L)	8.2	5.3	4.2	3.2
Manganese (mg/L)	1425	525	312	174
Zinc (mg/L)	1.6	0.82	0.71	0.69
Copper (mg/L)	0.32	0.125	0.051	0.132
Cadmium (mg/L)	0.118	0.025	0.012	0.012
Lead (mg/L)	0.18	0.10	0.10	0.005
Chromium (mg/L)	0.10	1.125	0.016	0.009
Nickel (mg/L)	0.12	1.165	0.030	0.018
Ammonical Nitrogen (mg/L)	811.5	412.41	312.82	185
Carbohydrates (mg/L)	31.72	12.62	9.15	7.56

There are notable differences between the samples according to the chemical characteristics assessed in the various ratios of Primary Treated Sewage Water (PTSW). First, all of the samples had an alkaline pH, ranging from 8.26 to 8.62. The electrical conductivity, on the other hand, varies greatly; PTSW 1:3 records the greatest value (81,251 µS/cm), while PTSW 1:2 records the lowest (18,125 µS/cm). The overall solid content appears to be diluted as the dilution ratio increases, as evidenced by the trend of decreasing total solids content. The tendency is likewise observed in total dissolved solids. On the other hand, there are variances in total suspended solids and settleable solids throughout the samples, suggesting possible differences in sedimentation. Indices of organic pollution like BOD and COD show varying amounts of contamination in the samples, with PTSW 1:3 exhibiting noticeably higher values. Total phosphorus, total potassium, and bicarbonate levels are among the nutritional characteristics that drop as the dilution ratio increases. The concentrations of metals vary; certain elements, such as iron, manganese, and copper, decrease with dilution, while other elements, such as nickel and chromium, exhibit erratic patterns. Overall, these findings demonstrate the range of chemical compositions seen in PTSW samples and the significance of comprehending these differences in order to develop efficient wastewater treatment and environmental management plans.

The items in N, P, K, and S are shown in sum (Table 2).The measure of natural carbon, pH, electrical conductivity, accessible nitrogen (N), phosphorous (P), potassium (K), sulfur (S), replaceable calcium (Ca), magnesium (Mg), sodium (Na), DTPA iron (Fe), manganese (Mn), copper (Cu), and zinc (Zn) were among the qualities of the trial soils that were dissected and organized (Tables 3). Since the soil composition satisfies every need for plant growth, it has been determined that the soil is suitable for plant cultivation.

Table 2: Quantity of nutrients (N, P, K, and S) in the spent wash of the distillery

Chemical Parameter	PTSW 1:1	PTSW 1:2	PTSW 1:3	PTSW
Ammoniacal Nitrogen (mg/L)	825.9	463.41	395.82	176.8
Total Phosphorous (mg/L)	42.6	32.52	18.05	12.5
Total Potassium (mg/L)	8251	5121	3125	1925
Sulphur (mg/L)	81	43.3	18.9	9.2

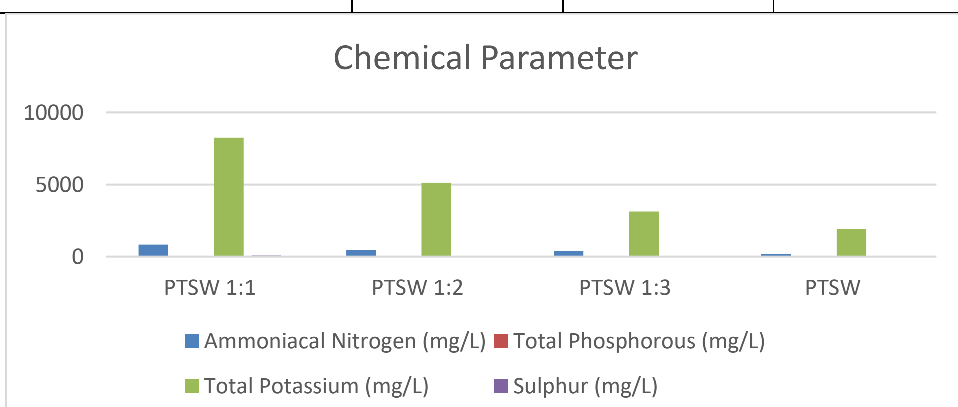

Figure 1: Quantity of nutrients (N, P, K, and S) in the spent wash of the distillery

When Primary Treated Sewage Water (PTSW) samples are analyzed chemically at various dilution ratios, significant differences are seen in a number of important parameters. First, when dilution ratios increase, there is a trend toward a decrease in the concentration of ammoniacal nitrogen, a crucial sign of organic contamination. This implies that as the sewage water is diluted, its amount of organic nitrogen compound contamination decreases, suggesting a possible reduction in the biological oxygen demand and, thus, the pollution load. These results highlight the efficacy of dilution as a first treatment step in lowering the organic matter in sewage water.

Likewise, with increasing dilution ratios, there is a diminishing pattern in the Total Phosphorous levels. A necessary nutrient, phosphorus can cause eutrophication and deterioration of water quality when it is consumed in excess. When treated sewage effluent is diluted, the concentration of phosphorous decreases, which may indicate a reduction in the risk of nutrient-related environmental problems in water bodies downstream. Additionally, at increasing dilution ratios, the total potassium content exhibits a similar trend of decreasing concentration. Although potassium is a necessary nutrient for plant growth, aquatic ecosystems may suffer if there is an abundance of it in water bodies. Potassium concentration decreases with dilution, indicating a possible reduction in the nutrient load released into receiving waters. This could lessen the chance of nutrient enrichment and its related ecological effects. Finally, there is a noticeable drop in sulfur levels as dilution ratios increase. Particularly in untreated sewage, sulfur compounds can lead to unwanted odors and water pollution. Dilution-based treatment methods may enhance water quality and reduce odors, as seen by the decrease in sulfur concentration with dilution. Overall, the chemical analysis shows that dilution is a useful initial treatment technique for lowering the concentrations of different contaminants and nutrients in sewage water, which helps to mitigate any negative environmental effects related to wastewater discharge. To guarantee the general quality and safety of treated sewage effluent before its release into the environment, additional treatment and observation could be required.

Table 3: Features of the test soil

Parameter	Value
Coarse sand	10.12
Fine sand	42.15
Silt	30.71
Clay	22.82
pH (1:2 solution)	9.15
Electrical conductivity	612
Organic carbon	2.75
Available Nitrogen	512
Available Phosphorous	325
Available Potassium	119
Exchangeable Calcium	195
Exchangeable Magnesium	312
Exchangeable Sodium	186
Available Sulphur	422
DTPA Iron	312
DTPA Manganese	325
DTPA Copper	152
DTPA Zinc	62

The properties and content of the soil sample under investigation are shown by the soil analysis results. Regarding soil texture, the distribution of various particle sizes is clear; coarse sand makes up 10.12% of the sample, fine sand counts for 42.15%, silt for 30.71%, and clay for 22.82%. These ratios point to a mostly sandy soil texture with a moderate quantity of clay and silt. When the soil's pH is measured in a 1:2 solution, it comes out at 9.15, which is alkaline. The availability of nutrients for plant growth and other soil processes may be impacted by this alkaline pH level.

Furthermore, the soil's electrical conductivity is measured at 612, which offers information about the salinity of the soil as well as its capacity to conduct electricity, possibly hinting at the existence of dissolved salts. The soil's observed 2.75% organic carbon concentration suggests the presence of organic matter, which is essential to soil fertility and general health. The amount of available nitrogen (512 units), phosphorus (325 units), and potassium (119 units) per unit of measurement are the available nutrients that are necessary for plant growth. These nitrogen levels offer important information for soil management and agricultural applications.

Measurements are also made for exchangeable cations, such as sodium, magnesium, and calcium. It is discovered that exchangeable sodium is 186 units, exchangeable magnesium is 312 units, and exchangeable calcium is 195 units. These cations affect the general fertility of the soil, as well as its structure and nutrient availability. Additionally, the concentrations of micronutrients like DTPA iron, manganese, copper, and zinc are included in the soil analysis. DTPA measurements are 312 units for iron, 325 units for manganese, 152 units for copper, and 62 units for zinc. These micronutrients are crucial for a number of plant biochemical processes and have a big impact on the growth and development of plants. The soil texture, pH, nutrient content, and micronutrient levels found in these soil analysis results are all important details that can guide crop selection, agricultural practices, and soil management techniques for the best possible plant development and productivity.

When compared to 1:1, SW, and raw water, the sprouting and growth of jasmine plant leaves showed excellent absorption of all the parameters in both 1:2 and 1:3 spent wash. The uptake of nutrients like fat, calcium, zinc, copper, and vitamins C and T were almost similar in 1:1, 1:2, and 1:3 spent wash irrigations, but much higher in 1:1, 1:2 spent wash irrigations than in 1:3 and raw water irrigations were the nutrients and parameters like protein, fiber, carbohydrate, energy, magnesium, and phosphorous (Table 4-5).

Table 4: Jasmine plant growth at various irrigation levels (cm)

Plant	Date	Growth Stage (1:1 SW)	Date	Growth Stage (1:2 SW)	Date	Growth Stage (1:3 SW)
Jasmine (Oleaceae)	16th	23nd	30th	16th	23nd	30th
Day	24, 27, 30	11, 12, 13	24, 26, 28	23, 27, 31	24, 27, 30	11, 12, 13

The data presented delineates the growth stages of Jasmine (Oleaceae) across a range of dates, classified according to three distinct soil moisture levels: 1:1, 1:2, and 1:3 SW. The plant showed development stages on the 16th, 23rd, and 30th of the month, depending on the soil moisture level. The subsequent dates and corresponding growth stages specifically reveal that on the 16th of the month, the jasmine showed growth stages under 1:1 SW, 1:2 SW, and 1:3 SW circumstances. For example, on the sixteenth, development stages were seen on the twenty-four, twenty-seven, and thirty days under 1:1 SW circumstances. In a similar manner, the plant showed growth phases on days 23 and 30 for each of the three soil moisture conditions, along with the dates and related growth stages. This information can be used to better understand the development patterns of jasmine plants and the ideal climatic conditions by providing insights into how the plant reacts to varying soil moisture levels over time.

Table 5: The average quantity of jasmine (Oleacea) flowers at each irrigation interval. (Average number from the five plants is used.)

Plant	RW	1:1 SW	1:2 SW	1:3 SW
Jasmine (Oleaceae species)				
The quantity of flowers	18	--	--	--
Flowers' Size	6cm	--	--	--
The quantity of flowers	--	30	--	--
Flowers' Size	--	6cm	--	--
The quantity of flowers	--	--	50	--
Flowers' Size	--	--	6cm	--
The quantity of flowers	--	--	--	52
Flowers' Size	--	--	--	6cm

The information given relates to the quantity and size of jasmine (Oleaceae species) blossoms under various circumstances, indicated by RW (probably regular watering) and three distinct soil moisture levels: 1:1 SW, 1:2 SW, and 1:3 SW. Upon inspection, it was found that there were eighteen 6cm-sized flowers growing under regular watering (RW) circumstances. Regarding the particular soil moisture circumstances, there were thirty six-centimeter flowers on 1:1 SW, fifty six-centimeter flowers on 1:2 SW, and fifty-two six-centimeter flowers on 1:3 SW. It's interesting to note that beyond routine irrigation, there were no documented bloom counts or sizes for the 1:1 SW and 1:2 SW circumstances, suggesting that the plants may have responded differently to differing soil moisture levels. According to this research, varied watering circumstances result in diverse flowering patterns and sizes for jasmine (Oleaceae species), which offers important information for horticulture management and maintenance techniques.

5. CONCLUSION

The viability of irrigating jasmine plants with primary processed diluted wasted wash (PTSW) from distillery wastewater was examined in this study. It has been discovered that the jasmine (Oleaceae) plant's growth and uptake of nutrients were significantly impacted by 1:1, 1:2, and 1:3 SW irrigation as opposed to raw water. However, the 1:3 distillery wasted wash exhibits more nutrient uptake than the 1:2 SW Jasmine plant. This may be because plants absorb nutrients at a higher rate when spent wash is more diluted. Soil was tested after harvest and the results showed no negative impact on features. These results point to wasted wash irrigation as a viable means of assisting jasmine cultivation and providing a sustainable replacement for current agricultural methods. Although more investigation is required to refine irrigation methods and evaluate long-term effects on plant health and soil quality, generally, this study offers insightful information about the sustainable use of water in agriculture.

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