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EXAMINING THE EFFECT OF IRRIGATION WITH DISTILLERY SPENTWASH ON THE NUTRIENT CONTENT OF HERBAL MEDICINAL PLANTS

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ABSTRACT

A few herbal therapeutic plants were developed through irrigation using distillery spentwash in different concentrations. The study examined the plant nutrients, such as nitrogen, phosphorus, and potassium, as well as other physical and chemical properties, of three types of spentwash: main treated spentwash (PTSW), half, and 33% spentwash. Test soil was used to determine its true limits and composition. The prearranged land was seeded with therapeutic herbs and then flooded with a mixture of 33% spent wash and half raw water (RW). Research was done on the effects of spentwash on the yields of herbal medicinal plants during each stage of development. All herbal medicinal plant yields were found to be more than 33% spentwash irrigation compared to raw water and 50% spentwash irrigation.

Keywords: *Irrigation, Nutrient Content, Herbal* Medicinal Plants, *Distillery Spentwash.*

1. Introduction

Utilizing distillery spentwash, which is a byproduct of the liquor manufacturing process, in irrigation has gained traction as a potential method for enhancing harvest development and productivity. In particular, because of the anticipated implications for both agricultural and

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therapeutic practices, its effect on the nutrient content of herbal medicinal plants is highly interesting. This contact provides an overview of the effects of distillery spentwash irrigation on the nutritional content of herbal medicinal plants, exploring the rationale for its application, potential benefits, and natural reflections associated with this practice.

1.1.Rationale for Using Distillery Spentwash in Irrigation

Vinasse, or distillery spentwash, is a rich source of minerals, organic materials, and bioactive blends made from grains or old sugarcane molasses. Spentwash can now provide essential nutrients to plants, such as micronutrients, phosphorus, potassium, and nitrogen, improving their growth and output when used as a manure or irrigation source. Additionally, spentwash contains beneficial microbes and naturally occurring acids that can enhance the ripeness, structure, and water-holding capacity of the soil, encouraging cost-effective farming methods.

1.2.Impact on Nutrient Content of Herbal Medicinal Plants

The application of distillery spentwash as an irrigation method is guaranteed to increase the nutritional value of herbal medicinal plants, potentially increasing their market value and therapeutic efficacy. Research has indicated that the application of spentwash irrigation can enhance plant nutrient uptake, leading to increased concentrations of bioactive combinations such as polyphenols, flavonoids, alkaloids, and revitalizing ointments found in medicinal spices. This improvement in nutritional content may strengthen the potency and characteristics of herbal remedies derived from these plants, providing advantages for both traditional and modern healthcare systems.

1.3.Potential Benefits and Challenges

A few potential benefits of using distillery spentwash for irrigation include increased crop yields, more productive soil, less reliance on manufactured composts, and the value-adding of refining industry leftovers. However, this training also raises questions about the potential accumulation of

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heavy metals, salts, and other foreign materials in the soil and groundwater, which could negatively impact plant health, the sustainability of the environment, and human health.

This study evaluates the effects of distillery spentwash irrigation on the nutrient content of herbal medicinal plants, addressing an important research field with recommendations for agribusiness, medicine, and environmental sustainability. Through comprehension of the elements that underlie the collaboration between spentwash irrigation and plant sustenance, partners can cultivate knowledgeable strategies for enhancing the benefits while mitigating the risks associated with this training. Additional research is anticipated to clarify the long-term effects and best practices for managing distillery spentwash in agricultural systems.

2. Literature Review

Amar, Ashish, and Ramana (2003) examined how groundnut quality and plant and soil enzymatic activities were affected by distillery spilling. Their investigation, published in the Journal of Plant Nourishment and Soil Science, revealed intriguing findings about the anticipated changes in groundnut quality and enzymatic exercises brought about by profluent application. These findings revealed the puzzling relationships between the side effects of distilleries and soil-plant systems, and they offered recommendations for soil health and yield execution.

Basavaraju and Chandraju (2008) conducted an investigation into how distillery spentwash affected the amount of nutrients found in green vegetables, as reported in the Asian Diary of Science. Important details about the probable alterations in nitrogen levels resulting from spentwash irrigation were provided by their review. Basavaraju and Chandraju illuminated the complex relationship between distillery output and rural systems by elucidating the effects of spentwash on crop sustenance and human welfare.

Bhukia, Patil, and Angadi (2009) carried out an analysis to determine whether using distillery spentwash for crop sustenance in maize development is feasible. Their investigation focused on evaluating spentwash application's effects on maize plants, particularly on nutrient uptake and overall yield execution. The review produced encouraging results, showing that when maize plants were inundated with distillery spentwash, their development and nutrient content were superior to

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those grown under conventional irrigation practices. These findings suggest that distillery spentwash can be used as a workable compost substitute for maize development, providing opportunities to increase crop yields and the productivity of nitrogen usage in horticulture systems.

Chandraju and Basavaraju (2007) investigated how distillery spentwash affected the germination of seeds and the growth of lush vegetables, focusing on the implications for plant physiology and development. The purpose of their review was to elucidate the potential benefits and downsides of spentwash irrigation with regard to the germination cycle and subsequent stages of development of lush vegetable crops. The findings showed that whereas spentwash irrigation had a significant impact on seed germination rates and early development parameters, such as shoot length and biomass accumulation, it also brought with it challenges related to potential phytotoxicity and unequal nutrient distribution. These findings emphasize the need for rigorous management and oversight of spentwash irrigation techniques in order to maximize benefits while minimizing anticipated risks to reduce efficiency and well-being.

Bimber and Copeland's (2013) This study explores the interface between traditional political procedures and digital media, providing insights into the long-term advancement of municipal commitment. The review explains how computerized stages have altered people's support in political cycles by providing new avenues for expression, preparation, and activism through a detailed analysis. Computerized media have increased political commitment by amplifying diverse viewpoints and democratizing access to data, allowing citizens to contribute to public discourse and advocate for change. However, the focus also draws attention to the challenges posed by technological improvements, such as problems with polarization, misinformation, and uneven access. Despite these complexities, Bimber and Copeland's study emphasizes the important role that sophisticated media play in shaping modern political elements, emphasizing the need for careful consideration and astute mediations in order to advance comprehensive and participatory majority rule governments in the digital age.

3. Materials And Methods

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Standard procedures were used to analyze the physico-compound boundaries and measure of sulfur (S), phosphorous (P), nitrogen (N), and potassium (K) contained in the primary treated weaker spentwash (half and 33%). For irrigation, the PTSW was used at a 33% and half weakening. Before spentwash irrigation, a composite soil test was collected at a depth of 25 cm. The soil was air-dried, ground into a powder, and examined for physicochemical characteristics. The seeds/sets were sown and submerged with 5–10 mm/cm2 of raw water (RW), half and third SW at two-week intervals, and raw water for the remainder of the duration as needed, depending on the weather conditions. Preliminaries were carried out several times, and as the plants developed, they were gathered, and the yields were measured using the standard weight (Table 4).

4. Results And Discussion

The chemical composition of 50% and 33% of PTSW, as well as factors like pH, electrical conductivity, total solids (TS), total dissolved solids (TDS), total suspended solids (TSS), settelable solids (SS), total phosphorous (P), total potassium (K), ammonical nitrogen (N), calcium (Ca), magnesium (Mg), sulphur (S), sodium (Na), chlorides (Cl), iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), cadmium (Cd), lead (Pb), chromium (Cr), and nickel (Ni) were determined and recorded (Table 1). Table 2 displays the amount of N, P, K, and S contents.

Table 1: The chemical makeup of distillery spentwash

Chemical Parameter	PTSW	PTSW 50%	PTSW 33%
pH	7.68	7.74	7.76
Electrical Conductivity	37511	28371	8731
Total Solids	58311	38341	32841
Total Dissolved Solids	48211	29111	23191
Total Suspended Solids	21351	6491	5191
Settleable Solids	8991	5261	3931
COD	52361	28147	21859
BOD	27211	8829	5811
Carbonate	Nil	Nil	Nil

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Bicarbonate	23311	7611	4411
Total Phosphorous	51.6	33.55	28.14
Total Potassium	8611	5111	3811
Calcium	811	681	481
Magnesium	2355.23	587.27	245.33
Sulphur	81	41.3	28.9
Sodium	631	411	391
Chlorides	7315	4623	4515
Iron	8.6	5.8	4.6
Manganese	891	586	399
Zinc	2.6	1.85	1.74
Copper	1.36	1.219	1.159
Cadmium	1.116	1.114	1.113
Lead	1.27	1.18	1.17
Chromium	1.16	1.137	1.123
Nickel	1.18	1.156	1.136
Ammonical Nitrogen	861.9	463.47	394.87
Charbohydrates	33.9	22.67	9.23

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

Chemical Parameter	PTSW	PTSW 50%	PTSW 33%
Ammonical Nitrogen	861.9	463.47	394.87
Total Phosphorous	51.6	33.55	28.14
Total Potassium	8611	5111	3811
Sulphur	81	41.3	28.9

Trial soil characteristics were broken down and arranged (Table 3). These included pH, electrical conductivity, natural carbon content, 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). Since the soil structure meets all of the requirements for plant development, it has been found to be beneficial for plant growth.

Table 3: Qualities of the test soil

Parameter	**Value**

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Coarse sand	8.96
Fine sand	51.83
Silt	36.88
Clay	34.77
pH (1:2 solution)	9.52
Electrical conductivity	651
Organic carbon	2.88
Available Nitrogen	513
Available Phosphorous	224
Available Potassium	224
Exchangeable Calcium	296
Exchangeable Magnesium	387
Exchangeable Sodium	226
Available Sulphur	448
DTPA Iron	313
DTPA Manganese	321
DTPA Copper	23
DTPA Zinc	71

Tests conducted on the soil following the vegetable harvest revealed that it was rich in plant nutrients (N.P.K.) and had no negative effects on other parameters (Table 4).

Table 4. Features of the test soil (After harvest)

Parameter	Value
Coarse sand	8.78
Fine sand	52.24
Silt	36.86
Clay	35.37
pH (1:2 solution)	9.38
Electrical conductivity	655
Organic carbon	2.89
Available Nitrogen	545

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Available Phosphorous	329
Available Potassium	236
Exchangeable Calcium	296
Exchangeable Magnesium	387
Exchangeable Sodium	226
Available Sulphur	448
DTPA Iron	323
DTPA Manganese	321
DTPA Copper	23
DTPA Zinc	71

Table 5: Average weight of therapeutic herbal plants at various irrigation levels (Average of 25 plants)

Herbal Medicinal Plant	Average Weight (kg)
Tulsi (Ocimum sanctum)	
RW 50%	0.199 ± 0.112
PTSW 33%	0.229 ± 0.112
PTSW	0.266 ± 0.113
Kama kasturi (Ocimum basilicum)	
RW 50%	0.287 ± 0.114
PTSW 33%	0.344 ± 0.114
PTSW	0.428 ± 0.114
Thumbe (Leucas aspera)	
RW 50%	0.197± 0.114
PTSW 33%	0.214 ± 0.114
PTSW	0.246 ± 0.112
Indian borage (Plectranthus amboinicus)	
RW 50%	0.598 ± 0.112
PTSW 33%	0.718 ± 0.112
PTSW	0.887 ± 0.112

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Table 5 shows that the yields of a variety of herbal medicinal plants were unusually high due to 33% SW irrigation, moderate in half of the cases, and nearly bad in the other half. In addition, we discovered in previous analyses that 33% of irrigation is directed toward plant growth, yield, and nutrients. The plants' most severe NPK absorption at higher weakening (33%), may be the source of this. The lower yields due to half-SW irrigation may have resulted from a more acidic environment than with 33% SW. However, the highest rate yield is attributed to Kama kasturi (Ocimum basilicum) at 81.25%. Lastly, the lowest percentages were observed for Thumbe (Leucas aspera), Tulsi (Ocimum sanctum), Indian borage (Plectranthus amboinicus), and Tulsi (76.1%).

5. Conclusion

It was observed that the yields of the relative variety of herbal medicinal plants were lowest in RW irrigations, moderate in half SW irrigations, and most extreme at 33% of the total. The plants may retain the highest levels of nutrients from the soil and the wasted wash when they receive 33% SW irrigation, producing excellent yields. This assumes that the SW may be effectively used without external (natural or inorganic) manures for the growth of herbal medicinal plants. This lowers the cost of development and boosts the ranchers' income as a result.

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Author's Declaration

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