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Effect of different Dilutions of Effluent on Growth of *Acorus calamus*

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Abstract

A field work was undertaken to study the physico-chemical and biological parameters of treated distillery effluent and the effect of various concentrations such as (0, 5, 10, 20, 40, 60, 80 & 100%) on plant growth i.e. sprouting, No. of leaves, root length, Chlorophyll content in the *Acrous calmus* . The effluent could not be directly applied to the field because of its excessive TDS, BOD and COD values and large quantities of soluble and suspended organic matter. Effluents was filtered through muslin cloth and diluted 2.5 times and there after various dilutions were prepared by diluting it with tap water.

Key-Words: *Acorus calamus*, Effluent, Plant growth

Introduction

Acrous calamus belongs to the family Acoraceae. *Acorus calamus*, flower spike, leaves average of 1 c.m. The sympodial leaf of *Acorus calamus* is somewhat shorter than the vegetative leaves. The margin is curly-edged or undulate. The leaves are fragrant and were used as a strewing herb. Botanists distinguish between the Acorus species by the number of prominent leaf- veins. *Acorus calamus* has a single prominent mid-vein and then on both sides slightly raised secondary veins (with a diameter less than half the mid -vein) and many, fine tertiary veins. Roots are aromatic, spicy. *Acorus calamus* preferred habitat wetlands. It found in India, Europe, Southern Russia, Northern Asia Miner, Southern Siberia, China, Japan, Burma, Sri Lanka, Australia, Southern Canada and Northern USA.

It has been used since ancient times for its effects on the digestive system and the lungs. This herb eliminates phlegm, clears congestion and tranquilizes the mind, amnesia, heart palpations, insomnia, tinnitus, chronic bronchitis and bronchial asthma.

Water is the most essential natural resource and is responsible for existence of life on this planet. It is worthwhile to mention that the outcome of global industrialization has caused severe scarcity of water because of heavy consumptions followed by global industrialization which have brought along with it serious environmental hazards.

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The disposal of industrial effluents is one of the challenging problems being faced by the environmentalist. As reported by Swaminathan & Yaidheeswaran (1991) effluent from dye industry increased the germination and chlorophyll content of groundnut seedlings, at low concentration. Valdes *et.,al.* (1996) observed and increase in soil organic matter by 1% when it was mixed with sugar factory effluent. The studies conducted by Joshi *et., al.* (1994, 1998) Show that treated waste water contains various mineral nutrients, which are quite useful for the plant growth. Bishnoi & Gautam (1991) studied the effect of various concentrations of dairy effluents on seed germination and seedling growth of some kharif crops of noted that with increasing concentration, the percent germination decreased gradually. They concluded that the diluted effluent could be used as liquid fertilizer as it promotes seedling growth. The distillery effluent is mixture of organic and inorganic nutrients and has been reported to have a beneficial effect on seed germination (Subramanian, A, et. al. 1999). The effluent in the lower concentrations enhanced the growth of corn and rice Kumar and Bhargava (1998) cautioned on the deleterious effects of higher concentration of effluents by decreasing the growth of crops. This gave a new direction the studies i.e. effluents should be used after proper dilutions.

Presents studies undertaken for assessing the suitability of various dilutions of effluents from

distillery as potential liquid fertilizer. The distillery industry is closely linked with the fermentation industry.

A field experiment was designed to know the effect of different concentration (0-100%) of distillery effluent various growth parameters in *Acorus calamus.*

Material and Methods

Effluent sample was collected from the outlet point of a tank of ETP of distillery in previously cleared and dried poly jar, which were sealed immediately and labeled. Samples were analyzed for various physico-chemical and biological parameters as per standard methods of APHA-AWWA- WPCF (1998). For microbiological in studies effluent samples were collected aseptically in pre sterilized glass bottles. They were immediately inoculated on suitable culture medium. Encouraged with the results of the studies on physico-chemical and biological characteristics of the effluents(Table-1), laboratory experiments were conducted to evaluate the impact of different dilutions of effluents say 0, 5, 10, 20, 40, 60, 80 & 100% on growth of *Acorus calamus.*

The Soil was irrigated with different dilutions of diluted distillery effluent. Ten cutting of root of *Acorus calamus* were sown in soil. Sprouting of was observed and calculated after about 10days. Soil irrigated with equal volumes of different dilutions of effluents. Growth parameters were recorded after two month and four month. Following Parameters were studied

- Sprouting
- No. of leaves
- Root length
- Total growth of plants
- Chlorophyll content

Results and Discussion

Properties of the effluent

The physico- chemical and biological analysis of the distillery effluent is given in Table-1. Effluent of distillery was reddish brown in colour with unpleasant odour. Temperature of distillery effluent was 22.7°C. The average pH value of the distillery effluent was 7.70. The range of Dissolved oxygen in the distillery effluent is 0.7. The low D.O. is possibly due to high organic load. The average value of total solid in distillery effluent is 3630mgk. The value of B.O.D. in distillery was found to be 580.0. This indicates high organic load. The C.O.D value of the distillery effluent was 36000mg/microbiological parameters were bacterial count >300 CFU/ml fungi one and azotobacter nil CFU/ml.

A perusal of the result given in the Table-1 reveals that conductivity, salinity, TDS total solids, total suspended solids, D.O., B.O.D, C.O.D were above the permissible limits. Effluent is rich in potassium that is a major plant nutrient besides containing minor amounts of two other major nutrients, nitrogen and phosphorus. Smaller amounts of other minor plant nutrients such as calcium, magnesium, sulphate and chloride are present. However pH and nutrients were with in permissible limits suggesting thereby that this effluent can be a good liquid fertilizer.

Table 1: Physico- chemical and biological study of effluent

S/No.	Parameter		Units	Observation
1	**Physical Parameters**	TEMPERATURE	ºC	**22.70**
2		pH	-	**7.70**
3		CONDUCTIVITY	dS/m	**10.11**
4		SALINITY	ppt	**5.70**
5		TOTAL SOILDS	mg/L.	**3630.00**
6		TOTAL DISSOLVED SOILDS	mg/L.	**667.00**
7		TOTAL SUSPENDED SOILDS	mg/L	**2963.00**
8		CHLORIDES	mg/L	**1250.00**
9		SULPHATES	mg/L	**646.05**
10		TOTAL HARDNESS	mg/L	**2055.00**
11		TOTAL NITROGEN	%age	**0.05**
12		TOTAL PHOSPHORUS	ppm	**3.90**
13		DISSOLVED OXYGEN	mg/L	**0.70**
14		B.O.D.	mg/L	**580.00**

15	**Chemical Parameters**	C.O.D.	mg/L	**36000.00**
16		TOTAL ALKALINITY	mg/L	**3700.00**
17		SODIUM (Na)	ppm	**65.40**
18		POTASSIUM (K)	ppm	**260.40**
19		CALCIUM (Ca)	ppm	**546.60**
	Biological Parameters	**Standard Plate Count of**		
20		- BACTERIA	CFU/ml	**>300**
21		-FUNGI	CFU/ml	**1.00**
22		**AZOTOBACTOR**	**CFU/ml**	**Nil**

Effect of different dilutions of effluent on growth of *Acorus calamus*

Various parameters, which include the growth and health of plants, were evaluated after 2 month and 4 month sprouting. Thus after 2 month the maximum leaf No of 7 was observed in the field irrigated with 20% and 60% of effluent and minimum in case of irrigated with 5% and control soil i.e. leaf No.5. Interestingly nearly similar trend was noticed after 4 month of sprouting maximum leaf No.11 in the irrigated with 60% effluent and a minimum leaf No. of 7 in case of control Soil. The root length of each plant was measured and it was maximum 13.0cm. in soil irrigated with 60% effluent. Whereas of minimum of 7.2cm. was recorded in the case of plants grown in soil irrigated with 100% effluent. Total growth of plant maximum was 38.9 cm. treated with60% effluent and minimum i.e.29.0 c.m was observed treated with20% effluent. The maximum absorbance at 620nm was 0.737cm. in case of plants grown in soil treated with 60% effluent and a minimum of 0.42cm. in case of plants grown in control soil.

Table 2: Effects of various soil- effluent mixtures on cutting sprouting & growth of *Acorus calamus* on laboratory scale from distillery

S/No	Parameter		UNITS	Dilutions							
				5%	10%	20%	40%	60%	80%	100 %	Control Soil
1	PERCENT SPROUTING		%	80	80	80	80	90	80	70	**80**
2	AFTER TWO MONTH OF SPROUTING	NO .OF LEAVES		5	6	7	5	7	6	6	**5**
4	AFTER FOUR MONTHS OF SPROUTING	NO. OF LEAVES		8	10	9	8	11	9	10	**7**
7	ROOT LENGTH		Cm	10.2	11.4	10.0	10.5	13.0	11.1	7.2	**10.0**
8	TOTAL GROWTH OF PLANTS		Cm	37.5	35.2	29.0	30.3	38.9	33.8	34.9	**36.7**
9	CHLOROPHYL CONTENT (ABSORBANCE VALUE)		620 mm	0.484	0.49	0.535	0.586	0.737	0.563	0.57	**0.42**

Conclusion

A careful analysis of the parameters evaluated show that in general there was a rising trend in various parameters such as chlorophyll content, plant height in the plant grown in soil treated with 5. 10. 20. 40, 60% effluents maximum value being in the last case after which there was sequential fail in the plants grown with 80 & 100% effluents. Root length & total growth of plants showed fluctuations, though it was favour of plants treated with 60% dilution. Thus it may be concluded that the effluents with 60% dilution have the maximum potential for healthy growth of *Acorus calamus* and is recommended to be used as a potential liquid fertilizer.

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