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EFFECT OF DISTILLERY EFFLUENT ON SEED GERMINATION AND VIGOUR INDEX OF AN ENDANGERED MEDICINAL PLANT *Rauwolfia serpentina*Benth

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.ABSTRACT

Presesent paper deals with the physiological response of distillery effluent on a rare medicinal plant *Rauwolfia serpentina* Benth in reference to its conservation and is a part of the Ph.D. disseretation entitled "Studies On Biodiversity And Ex-Situ Conservation of Rare And Endangered Endemic Plants of Ghazipur (U.P.) with Reference to their Medicinal Value.*Rauwolfia serpentina* Benthis at the verse of extinction due to its over-exploitation to fulfil the demands of pharmaceutical industries because of its higher medicinal values. This work was undertaken to study the effect of distillery effluent on two parameters of growth namely, seed germination and vigour index.
The observations delineate that in average concentration of the distillery effluent ranging between 10-35 % v/v, maximum vigour index was recorded at 35% v/v whereas maximum seed germination was found in 10.0 % v/v strength of effluent that was recorded to be 58%. The vigour index was calculated by multiplying percentile germination and length of seedling. This study revealed that use of distillery effluent concentrations ranging from lower (5.0 % v/v) to average (20-35 % v/v) may be useful for conserving this plant.

KEY WORDS : Distillery discharges, Vigour index, *Rauwolfia serpentina*, Conservation

Rapid industrialization for sustaining economic stability is leading to pollute different factors of environment due to disposal of the untreated effluents in it however to ease the pressure and threatening level of industrial effluents on environment they are now being commonly used in agriculture practices for irrigation in dilute state. Somashekhar *et.al.* (1998) put their view on this contradictory statement that the effluents may be beneficial or harmful to the crops, and it depends on type of industry from which the discharged effluents are being poured.

The effluents rich in organic and nitrogenous wastes may be profitable to the crops in preferable dilutions. Effluents from food industries, sugar mills and distilleries belong to beneficial group of industrial effluents. Another type of effluent is that which has higher concentration of chemicals, heavy metals and several other components fatal to life. Thesetype of effluents are generally toxic to crop plants when poured into environment from chemical industries, tanneries, fertilizer factories etc.

In this communication, the effects of distillery effluent on growth of a well known medicinal plant *Rauwolfia serpentina* Benth.has been essayed. Mishra and Gupta, (2005) reported *Rauwolfia serpentina* Benthto be in highly endangered state in surroundings of Ghazipur (U.P.). This species has become endangered due to over-exploitation and over-harvesting (Hemadriand Rao, 1998). For the sake of conservation, germination of seeds and vigour index of plantlets were taken into consideration so as to determine the effects of crude distillery effluent produced from the outlet of Lord's Distillery Ltd., NandGanj, Ghazipur (U.P.) on this plant.

Abdulbaki and Anderson (1993); Siddiqui and Goodwin (2006) have contributed their works related to Vigour of different plant species. Behera and Mishra (1982); Gautam *et.al.*(1992); Choudhury*et.al.*(1987); Sahai and Srivastav (1988); Singh *et.al.*(1985); Sinha *et.al.* (1986,1988), Barman *et.al.*(2001); Jayabalan *et.al.*(2001); Sprag *et.al.* (2005) have evaluated the effects of different industrial effluents on various physiological aspects of plants.

MATERIALS AND METHODS

Crude distillery effluent was collected from the outlet of Lord's Distillery Ltd., NandGanj, Ghazipur (U.P.) and was analysed for its physico-chemical properties following A.P.H.A. (1984). Table 1 depicts the report of this analysis. To determine effect of the distillery effluent it wasdiluted in de-ionized double distilled to prepare concentration grades ranging from 5.00% v/v, 10.00 % v/v, 15.00 % v/v to absolute100.00 % v/v concentration

The soil used in this test was somewhat modified common field soil which was thoroughly homogenized by light grinding and was mixed with

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fine sand in 3:1 ratio to prevent the problem of setting and layering of heavy and suspended solids of the effluent on the soil surface, then the soil was heated thrice in the oven at 120°C for 5 minutes to disinfect it properly against fungal, microbial and nematodal spores.

Seeds of *Withania somnifera* Dunal were collected from Botanical garden of institute of author's affiliation and were tested for their viability and germination in normal conditions. Further, the seeds were presoaked overnight in different strengths of effluent and then thoroughly washed with distilled water, 50.00 % ethyl alcohol and again with distilled water for surface sterilization. Seeds were sown in twenty Petri-plates (marked for different concentration of effluent from 5.00-100.00 % v/v strength by which they were to be irrigated). A control was maintained for comparison and was irrigated with distilled water. Five replicas of this setup were taken for observation.

Table 1 : Physico-chemical Properties of treated distilleries effluent

Sl. No.	Property	Records	Remark
1.	Colour	Dark yellowish Brown	
2.	Odour	Sweet Foul	
3.	Temperature	34°C	
4.	Boiling Point	105°C	
5.	Freezing Point	- 4°C	
6.	pH	4.44	
7.	Conductivity	88.1768	
8.	Total solid	7.0092 g	per 25 ml.
9.	Total Dissolved solid	2.8910 g	per 25 ml
10.	Total suspended solid	4.1182 g	per 25 ml
11.	Oil & Grease	1.3260 g	per 25 ml
12.	BOD	30,800	
13.	Total Alkalinity	Nil (Acidic)	pH 4.44
14.	Dissolved Oxygen	Nil	
15.	Reducing Sugar	11.80 mg	per25ml of 1% strength
16.	Non-reducing Sugar	20.45 mg	-do-
17.	Total Sugar	32.25 mg	-do-
18.	Bicarbonate	5.86 g	per 1000 ml
19.	Calcium	4.22 g	per 1000 ml
20.	Chloride	3.95 g	per 1000 ml
21.	Nitrate	37.00 mg	per 1000 ml
22.	Phosphate	22.00 mg	per 1000 ml

Emergence of radicle was taken as the criteria of germination. Germination pattern was recorded by 30 days daily inspection and the percentage of germination in each Petri-plate of every setup fortnightly by simple counting. The observations on length of seedling was done on a centimeter/ millimeter scale at stage just before the appearance of foliar leaves in the seedling. Vigour index was calculated following Abdulbaki and Anderson (1993).

OBSERVATION

Thepercentile germination of *Rauwolfia serpentine* Benth.seeds was observed to be 60% in normal conditions (R.T. 30°C; Soaked in tap water) in control the germination started on 15th day with 50% germination at temperature ranging between 36°C to 44°C and was remained constant till the termination of experiment.

On the treatment with effluent, the percentile germination was maximum in 10.00% v/v strength of effluent, started on 10th day after sowing at temperature ranging between 34°C to 40°C with10 % germination which elevated to 58% on 15th day at temperature ranging between 37°C to 46°C. The germination was found to be lesser in higher concentration. A gradual decrease in germination percentage was noted with increase in

strength of effluent. A drastic fall in germination percentage was noted in 40% v/v strength. The strength of effluent above 45.00% v/v was hazardous to the plant and strength above this range inhibited germination completely. (Table 2).

The observations on mean length of seedlings reflect that in control conditions it was observed to be 1.90 cM. The maximum mean length of seedlings was recorded in the strength of 35.00% v/v that is 2.86cM.after which the harder strengths above 35.00% v/v cause unhealthy and stunted plantlets. The strength in range of 20.00-35.00% v/v was observed to be recommendable for getting good seedlings.(Table 2).

Observations on the effects of distillery effluent on seedling germination and vigour index of *Rauwolfiaserpentina* revealed that the diluted effluent (10.00% v/v – 35.00% v/v strength) may be helpful for better cultivation, growth and massive production of the plants of *Rauwolfiaserpentina* because the value of vigour index is significantly elevated in this range. Maximum value (160.16) was found on 35.00% v/v strength. (Table 2).

Table 2 : Effect of different grades of concentration on germination of seeds, seedling growth and vigour index of *Withania somnifera* seeds

[A] Sl. No.	[B] Concentration Grade of Efflnt. (% v/v)	[C] Percentile Germination (%)	[D] Mean length of seedling (cM)	Vigour index {[B]X[C]}
1.	Control	50	1.90	95.00
2.	05.0	58	1.82	105.56
3.	10.0	59	1.86	109.74
4.	15.0	58	1.99	115.42
5.	20.0	57	2.60	148.20
6.	25.0	57	2.60	148.20
7.	30.0	57	2.65	151.05
8.	35.0	56	2.86	160.16
9.	40.0	23	1.73	39.79
10.	45.0	14	1.20	16.80
11.	50.0	00	0.00	00.00
12.	55.0	00	0.00	00.00
13.	60.0	00	0.00	00.00

RESULTS AND DISCUSSION

Observations made on the effects of distillery effluent on seedling germination and vigour index of *Rauwolfia serpentina*, revealed that the diluted effluent (15.00-35.00% v/v) may be helpful for better cultivation, luxuriant growth and massive production of the plants of *Rauwolfia serpentine* because the vigour index is higher (115.42-160.16) in this range which may lead further to a healthy plant cultivation while the germination was super fast and maximum in 5.00% v/v strength of effluent.

The plantlets growing in 30.00% v/v and 35.00% v/v strength turned into healthy and vigourous plants because of significantly higher seedlings (2.86cM.) and higher value of vigour index (160.16), which may satisfy the severe exploitation due to higher demands and production rate because of attaining the ability to produce more and more.

Rauwolfia is facing the threat of extinction due to over-exploitation and relatively lesser production. This is how? The species may be escaped from the threat of endangerment and extinction. The higher concentrations above 50.00% v/v and crude discharges of distilleries may be a serious cause of the extinction of such other plants.

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