https://doi.org/10.29321/MAJ.10.A02859

Madras agric. J. 67 (7) : 441–444, July, 1980

Effect of Tannery Effluent on Germination and Nutrient uptake of *Ragi*

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To ascertain the effect of tannery effluent on seed germination and nutrient uptake of *ragi*, a Neubauer experiment was conducted. Germination, dry matter production and nutrient uptake of the crop were reduced significantly by increased concentration of the effluent. This effect was more pronounced in black soil. The adverse effect of the effluent was mainly due to the high total soluble salt content.

The response of a plant to a liquid pollutant is an integration of the effects of many factors such as soil type, climate and the nature of the pollutant. Larson et *al*. (1975) stated that industrial organic wastes could be used safely and effectively with proper precautions to increase soil productivity, De Haan et *al*. (1973) felt that the utilisation of industrial wastes for agricultural purposes was the solution to the waste disposal problem. Rajannan and Oblisami (1978) observed a reduction in germination and growth of rice, blackgram and tomato with the use of paper mill effluent; but the diluted effluent enchanced the growth of these crops.

MATERIAL AND METHODS

In order to ascertain the effect of tannery effluent on germination, dry matter production and nutrient uptake by ragi from the effluent treated soils, a Neubauer experiment was conducted.

Samples of 100 g of effluent treated soils were taken in a dish (11 cm diameter and 7 cm height). Fifty g acid washed sand was added to it and thoroughly mixed. One hundred ragi (Co. 10) seeds were sown in each dish. The seedlings were grown in the dish for 17 days. Germination count was taken on 3rd and 7th days. After 17 days, the seedlings were removed from the dish, dried in the oven after complete washing with water and dry matter yield recorded (Table I). The ground plant samples were analysed for major nutrients, N, P_2O_5 and K_2O. From the nutrient concentration, uptake was calculated by multiplying with dry matter yield.

RESULTS AND DISCUSSION

The dry matter yield of *ragi* was decreased significantly by higher concentration of tannery effluent. Germination percentage, root and shoot length were also reduced by the increased concentrations of the effluent. This effect was more pronounced in black soil, followed by gardenland soil. These can be attributed to the high concentra-

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TABLE I Effect of tannery effluent on ragi (Co 10) (Mean of three replications)

Particulars of analysis.	Black Soil						Red Soil					
	0—15 cm			15—30 cm			0—15 cm			15—30 cm		
	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3
Germination(%)	100.0	84.7	92.7	96.7	88.3	84.0	99.7	100.0	92.6	100.0	98.7	99.3
Dry matter (g/dish)	0.17	0.13	0.12	0.12	0.12	0.12	0.17	0.17	0.15	0.15	0.16	0.15
Uptake of N (mg/dish)	6.1	4.6	5.6	4.4	6.6	4.6	5.1	6.3	6.5	5.9	6.2	6.3
Uptake of P_2O_5 (mg/dish)	3.6	2.7	2.2	2.3	2.3	4.5	3.4	3.1	2.8	2.0	3.1	1.4
Uptake of k_2O (mg/dish)	18.1	17.7	13.0	15.6	16.1	13.6	14.7	11.4	13.5	22.1	21.4	3.9
Shoot and Root length (cm)	15.83	5.67	5.90	16.10	9.53	6.75	16.70	11.80	11.50	14.10	10.20	10.20

	Gardenland Soil						Alluvial Soil					
	0—15 cm			15—30 cm			0—15 cm			15—80 cm		
	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3
	96.3	71.3	63.0	82.3	60.3	49.0	96.3	96.7	92.0	93.6	97.3	97.3
	0.21	0.12	0.13	0.13	0.32	0.10	0.14	0.14	0.13	0.13	1.15	0.14
	12.5	6.1	12.4	4.7	5.6	2.3	5.5	5.3	4.1	4.7	5.3	5.3
	3.6	2.5	2.7	2.2	0.7	2.0	2.4	3.0	1.9	1.9	2.3	4.2
	22.8	11.8	10.3	19.8	13.6	8.7	13.9	12.2	9.4	14.3	14.5	11.4
	15.60	8.50	6.00	10.53	3.90	6.25	8.50	5.00	7.17	8.63	4.50	5.47

Treatments

T_1 : Control (water alone)

T_2 : 50 per cent effluent and 50 per cent water

T_3 : 100 per cent effluent

TABLE II Composition of Tannery Effluent

Particulars of analysis		Concentration
Total solids	...	3,271.0
Suspended solids	...	328.0
Calcium bicarbonate	...	388.9
Calcium sulphate	...	88.0
Magnesium sulphate	...	97.5
Magnesium chloride	...	1,066.0
Sodium chloride	...	1,381.0
Ammoniacal nitrogen	...	57.0
Nitrate nitrogen Nitrite nitrogen	...	Absent
Water soluble phosphorus	...	6.7
Electrical conductivity (mmhos/cm)	...	3.2
pH	...	7.8
Organic carbon (%)	...	1.26
Biochemical Oxygen Demand (5 day period)	...	752.0
Chemical Oxygen Demand	...	4,6000.0
Total copper	...	0.05
Total manganese	...	0.20
Total zinc	...	0.35
Total iron	...	2.0

tion of chloride, sulphate, sodium and total soluble salts (Table II).

Nitrogen uptake was not influenced by treating with tannery effluent. Uptake of P and K decreased with increasing concentration of the effluent. This was in accordance with the observation of Thabaraj *et al.* (1964) who reported that excessive amounts of N, Na and Cl

present in the effluents interfered with and inhibited the uptake of other elements like K, P and magnesium by the plants.

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