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Impact of Polluted Waters of Aquatic Sites of Lucknow on Seed Germination and Root Length in Cicer arietinum

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Abstract:

The present study deals with the physico-chemical characteristics of polluted water of Aquatic sites of Lucknow and its effect on seed germination and root length in Cicer arietinum. Seed germination and seedling length studies, were done for seeds of Cicer arietinum for 12, 24 and 48 hrs of duration. For Cicer arietinum average percent germination of different sites at 12, 24 and 48 hours of treatment revealed that site II showed lowest percent germination (65%) followed by other sites-site III (68.3%) Site-1 (78.3%) Site-V (80%), Site VI (80%) and Site-IV (96.6%). As regards the root length, there has been increasing trend in the length of the root with the increase in the time of treatment. Thus, the water samples used for this study do not have inhibitory effect on the germination and seedling length of the types of seeds tested. The temp was recorded 23^0C at all the six sites. Hydrogen ion concertation was recorded maximum at site 2 (8.1) and minimum at site 4 (7.6). Turbidity and conductivity were maximum at sites 4 (42JTU and 0.59 mmhos/cm) and the minimum were at sites 1 and 2 (19 JTU and 0.38 mmhos/cm). Total hardness was maximum for site 6 (4.45 mg/l) and minimum for 3 (175.5 mg/l). Calcium and magnesium were recorded maximum at site 5 (80 mg/l and 52 mg/l, respectively) and the minimum at sites 3 and z(70 mg) l and 33 mg/l, respectively).

Key words- Cicer arietinum, seed germination, polluted, Aquatic, seedlings, temperature.

1. Introduction

Of all the natural resources, water is one of the most important and highly exploited sources that are being polluted unabatedly. Water bodies, small or big, lotic or lentic, all are getting pollutants into them in varying quantities. This all is because of our rapid growth in population, industrial proliferation, urbanization and wide spheres of other human activities. Sewage becomes a nourishing medium of many forms of life viz., bacteria and fungi. These microorganisms transform several organic and inorganic wastes into simpler but toxic compounds. Such compounds may or may not affect the life in water at a later stage or the end users of those waters.

The present paper aims at assessing the affect of seemingly polluted waters on the germination ability of Cicer arietinum selected seed types. Ghosh & Kumar, 1998; Sharma. & Singh, 1999; Prashanti et al., 1999; Srivastava et al., 2000; Kannan, 2001; Kaushik et al., 2001; Madhusudana Reddy. & Subba Rao, 2001; Ramana et al., 2001; Sharma et al., 2001; Pandey et al., 2002; Sharma et al., 2002; Tiaz & Zeiger, 2002; Tewari et al., 2002; Arora et al., 2003; Chandra et al., 2004)

2. Materials and Methods

Composite water samples were collected from six different sites in Lucknow at fortnight intervals.

Quantitative analyses of water samples were also done for some physico-chemical factors following the standard methods (APHA, AWWA & WPCF, 1985).

The 40 seeds each of Black Gram (Cicer arietinum) were used. The sterilized seeds were soaked in sterilized distilled water over night and then treated with water samples for 12, 24 and 48 hrs. The seeds were placed on the filter paper soaked with the water samples in Petri dishes at room temperature in laboratory. The experiment was run in triplicate along with the control set soaked in sterilized distilled water. After the definite period of treatment, the root length was measured for all

the seeds including the control and percent germination and abnormalities as seen in the roots were noted.

3. Observations

The Physico-chemical factors studied during the period of study are tabulated (Table 1). Germination and root length of Cicer arietinum is shown in Table 2.

Table 1. Average of the physico-chemical factors studied during the period of study.

Factors	Site-1	Site-2	Site-3	Site-4	Site-5	Site-6
Temperature (^{o}C)	23	23	23	23	23	22
pH	8	8.1	7.9	7.6	7.7	7.7
Turbidity (JTU)	19	22	23	42	26	20
Electrical Conductivity (µmhos/cm)	0.38	0.38	0.39	0.59	0.57	0.59
Total Hardness (mg/l)	325	327.5	175.5	357.5	412.5	445
Calcium (mg/l)	74	77	70	75	80	77
Magnesium (mg/l)	34	33	34	41	52	52
Carbonate (mg/l)	77	42	34	17	59	126
Bicarbonate (mg/l)	302	311	336	246	443	354
Total alkalinity (mg/l)	403	405	398	506	490	541
Free CO_2 (mg/l)	2.81	8.4	11.38	31.84	13.25	12.15
Sodium (mg/l)	201.5	198.5	195	282	274	234
Potassium (mg/l)	45	41.5	52.5	96.5	42.5	144
$SO_4^{---}PO_4^{--}Cl^{-}$ (+ = present)	+	+	+	+	+	+

Table 2. Percent germination and Root Length (in mm) of Cicer arietenum after treatment with polluted water of different sites

Site 1

Hr of treatment	Percent Germination		Root Length	
	Control	Pollutant	Control	Pollutant
12 hr	90%	75%	1.7	0.82
24 hr	90%	82.5%	5.95	5.275
48 hr	95%	77.5%	31.15	18.42

Site 2

Hr of treatment	Percent Germination		Root Length	
	Control	Pollutant	Control	Pollutant
12 hr	55%	40%	0.5	0.42
24 hr	65%	62.5%	4.6	3.27
48 hr	90%	90%	27.25	22.25

Site 3

Hr of treatment	Percent Germination		Root Length	
	Control	Pollutant	Control	Pollutant
12 hr	50%	27.5%	.55	0.27
24 hr	90%	87.5%	5.5	5.25
48 hr	100%	90%	36.35	23.2

Site 4

Hr of treatment	Percent Germination		Root Length	
	Control	Pollutant	Control	Pollutant
12 hr	90%	75%	1.25	1.15
24 hr	100%	95%	5..85	5.125
48 hr	100%	100%	22.00	21.4

Site 5

Hr of treatment	Percent Germination		Root Length	
	Control	Pollutant	Control	Pollutant
12 hr	75%	55%	1.30	0.6
24 hr	95%	85%	8.65	7.65
48 hr	100%	100%	21.65	19.7

Site 6

Hr of treatment	Percent Germination		Root Length	
	Control	Pollutant	Control	Pollutant
12 hr	70%	50%	1.45	0.6
24 hr	90%	90%	6.9	6.3
48 hr	100%	100%	41.4	22.65

4. Discussion

There has been increase in the percent germination and also the root length of Cicer arietinum tested during this study. Similar are the observations of Shankar et al., (1989) who have observed maximum percentage of seed germination in case of wheat seed at 100% chemical industrial effluent of IDPL, Rishikesh. But inhibition of seed germination, seedling growth and biomass in Okra has been observed by Om et al., (1994), while studying the combined effect of wastes of distillery and sugar mill. Ghosh & Kumar (1998, 2000) have also observed inhibitory effects of effluents from distilleries and Plywood industries on seed germination and seedling growth of C. arietinum but in our case there is no inhibitory effects seen in C arietinum and other seeds tried.

5. Conclusion

Although no clear-cut reason for this finding can be given at this stage, but it can be presumed that the water tested for their influence on the seed germination and seedling growth have no inhibitory or negative effects. This may possibly be because of the presence of microorganisms that might change the quality of the water to the extent that may not be inhibitory or harmful for the seeds tried. The fact that the temperature and pH along with other chemical factors of the water samples tried are within the tolerable limit of the seeds to germinate, cannot be ignored.

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