

Toxic Effect of Dyes on Seed Germination and Early Seedling Growth of *Zea Mays*

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Abstract

The aim of this study was to determine the toxic effect of different dyes, which are use in different industries, on seed germination and early seedling growth of plants. Different dyes were collected from local market of Agra, which were Congo red and *Curcuma longa* L. The seed of *ze* mays were selected to grow in different concentration (Control, 10%, 20%, 30% and 50%) and duration (24, 48, 72 and 96 hours) of dyes. With the increase in dyes concentration, growth of plant was found more affected in Conge red while, low effect was seen in *Curcuma longa* L. This phytotoxicity may be related to antibacterial ,antifungal and cytotoxic nature of dyes.

Key words:

Zea mays ,*Curcuma longa* L.,Congo red ,seed germination and early seedling growth.

Introduction

Dyes are the coloured substance that was an affinity to the substrate to which it is being applied. The earliest written record of the use of natural dyes was dated back to 2600 B.C. in China. There is ever increasing demand of dyes in various Indian industries like, textile cosmetics tannery paper and pulp, pharmaceutical and food processing units etc. the dyes are also used in medicine and clinical investigations. The textile industries are the oldest and largest in the country, consuming about 50% of the total dye production in dyeing process and out of this 10-20% of dye comes back. Through the effluents which enters into different environmental segments (Clarke and Anliker, 1980; Brown and Anliker, 1988; Chen et al., 1997; Ince et al., 1997).

In this study two dyes Congo red and *Curcuma longa* L. have been taken to determine the toxic effect on germination and early seedling growth of plants. The use of Congo red in the cellulose industries (Catton, textile, wood, pulp, paper) has long abandoned, primarily because of its tendency to change colour when touched by Sweaty fingers, to run and because of its toxicity. *Curcuma longa* L. (Turmeric) has been used as a dye for mustards, baked products, dairy, ice creams, biscuits, sweet etc.

Materials and Methods

The stock solution of turmeric has been prepared by dissolving 10 gm crushed turmeric rhizomes in 100ml of distilled water and filtered through whatman's 42 filter paper. The different concentrations 10%, 20%, 30% and 50% will prepared from the stock solution of *Curcuma longa* L. and Congo red that has collected from local

market. Dry as well as pre-soaked seeds of *Zea mays* subjected to treatment of turmeric and Congo red for varying concentration (10%, 20%, 30% and 50%) and duration (24, 48 and 72), respectively.

Results and Discussion

In this present investigation decreasing trend in germinability was observed with the increase concentration of turmeric and Congo red. The decreasing trend of germination and rate of seedling growth of *Zea mays* is indicative of physiological

disturbances. Reduction in germination at higher dose may be due to the limited water uptake or water stress inhibition. Seed soaked treatment of turmeric and Congo red has delayed the epicotyls emergence and subsequently retarded the shoot growth. This inhibition of seedling growth is due to the damage of nuclei by turmeric and Congo red. Antimicrobial, antibacterial and cytotoxic nature of turmeric may be related to the phytotoxicity (Mahady et al. 2002; Han and Yang 2005, Strimpakos and Sharma 2008).

Table 1. Effect of *Curcuma longa* on germination and early seedling growth of *Zea mays*

S.No.	% of germination	Conc.	24 hrs		48 hrs		72 hrs		Root/shoot
			Root	Shoot	Root	Shoot	Root	Shoot	
1	85.66	C	1.06	0.40	1.90	0.75	2.60	1.25	2.31
2	81.33	10	0.65	0.30	1.50	0.50	2.20	0.95	2.48
3	78.00	20	0.42	0.21	1.25	0.40	1.90	0.80	2.53
4	73.67	30	0.29	0.18	1.10	0.31	1.70	0.72	2.55
5	60.33	50	0.15	0.12	0.80	0.20	1.35	0.60	2.50
	Mean		0.38	0.20	1.16	0.35	1.79	0.77	2.51

Table 2. Effect of Congo red on germination and early seedling growth of *Zea mays*

S.No.	% of germination	Conc.	24 hrs		48 hrs		72 hrs		Root/shoot
			Root	Shoot	Root	Shoot	Root	shoot	
1	80.50	C	1.10	0.30	1.90	0.65	2.50	0.98	2.84
2	75.25	10	0.95	0.26	1.75	0.60	2.35	0.92	2.83
3	72.30	20	0.75	0.21	1.57	0.54	2.15	0.86	2.77
4	69.10	30	0.62	0.18	1.42	0.49	2.02	0.80	2.76
5	55.60		0.45	0.13	1.25	0.44	1.80	0.70	2.75
	Mean		0.69	0.19	1.49	0.52	2.08	0.82	2.77

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