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Research Paper

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Effect of Detergent on Selected Morphological and Biochemical Parameters of Green Gram *(Vigna radiata L.)*

N. Poongodi Assistant Professor, PG & Research department of Biotechnology, Hindusthan College of Arts &Science, Coimbatore – 641 028, Tamil Nadu, India.

T. Sasikala Assistant Professor in chemistry, PG & Research department of Biotechnology, Hindusthan College of Arts & Science, Coimbatore – 641028, Tamil Nadu, India

ABSTRACT

An investigation was carried out to study the efficacy of synthetic detergent on seed germination, seedling growth and certain biochemical parameters of Green gram (Vigna radiata L.) for a period of seven days. The green gram seeds were raised in petriplates irrigated with different concentrations of detergents (0.01, 0.02, 0.03, 0.04 & 0.05%). There was gradual decline in the selected parameters with increase in detergent concentrations. The lower concentration of detergent (0.01%) enhanced the growth and development of green gram better than control. Higher concentration of the detergent (0.02% & above) inhibited the growth and biochemical parameters of green gram seedlings.

KEYWORDS: Synthetic detergents, Green gram, Seed germination.

INTRODUCTION

Environmental pollution is a matter of great concern and has been accepted as global problem because of its adverse effect on human health, plants, animals and exposed materials (Irshad *et al.,* 1977). Land pollution occurs from different degradable and non-degradable materials. These materials may be solid waste, trash, chemicals and leaf litter etc., (Sofia Nawaz, 2006).The everlasting growth of different industries, pollution of natural water has been increased tremendously (Baskaran *et al.,* 2006). Pollution may be toxic organic, inorganic or dissolved and suspended solids. (Moeller and Dade, 1992). Major pollutants are the waste from food processing, cosmetic, paper and dye manufacturing, processing and textile color left by dyes. The use of waste waters (industrial effluent as well as municipal sewage) for irrigation has emerged in the recent past as an important way of utilization. Waste water takes the advantage of the presence of considerable quantities of nitrogen and essential elements. Over advantages and waste water irrigation includes an important aspect of pollution removal. The pollutants are partly taken up by the plant and partly transformed in the soil without causing any damage. Industrialization is an important tool for the development of any nation. Consequently the industrial activity has expanded so much all over the world. Today it has become a matter of major concern in the deterioration of the environment (Tiwari and Indu, 1993). Industrial effluents also contain detergent contents, chemicals and dyes. There has been sustained increase in the liquid waste which is traditionally discharged into the open land or into nearby water courses without proper treatment.

Synthetic detergents constitute one of the most important water pollutants by contaminating the lakes and rivers through climatic industrial views. Considerable information is now available for the adverse effect of using detergent son aquatic fauna including fish (Divo 1974, Misra *et al*., 1984, Lal *et al.,* 1983). Synthetic detergents consist of surface active agent builders (phosphates) and fillers. In addition it has additives e.g., anti deposition agents optical brighteners, bluing agent, bleaching agent, foam regulators, organic sequestering agent and enzymes. Since most of the waste water is being discharged in to the surrounding water bodies which disturbs the ecological balance deteriorate the water quality, therefore the present research work has been carried out to the study the impact of detergent water at different concentrations on seed germination, seedling growth and biochemical parameters on green gram.

MATERIALS AND METHODS

The seeds of green gram were purchased from registered seed centre at Coimbatore. It was treated with 0.2 N Mercuric chloride for 2 minutes and washed with running water to remove contamination of seed coat. Sterilized petriplates prepared with filter paper and known volume of different concentration of the detergent (0.01%, 0.02%, 0.03% 0.04% and 0.05%) was poured in to different petriplates marked with the concentration. All the seeds germinated and grown in tap water were kept as control.30 seeds were placed in each sterilized petriplates. Number of seeds responded for germination was observed on the 7th day, were taken and separated into root and shoot.

5 gram of shoot from each petriplates were crushed and used for the estimation of chlorophyll content (Sadhasivam and manickam, 2005, protein estimation (Lowry *et al*., 1951) and starch estimation (Summer and Somers, 1949).

RESULTS AND DISCUSSION

The seedling growth, chlorophyll, starch and protein content are presented in table1, 2, 3 and 4 respectively. Maximum germination was recorded at 0.01 concentration. Result of present investigation is in accordance with the previous work of effect of detergent on certain parameter on pearl millet (Vijayakumari, 2003). The soap factory effluent was toxic to seed germination and seedling growth but the effluent was diluted to 2.5% to 5%, in enhanced the seed germination and seedling growth. Inhibition of germination may be due to osmotic pressure of the effluent at higher concentration of total salts making inhibition (Nagada *et al.,* 2006).

Biochemical parameters viz., chlorophyll, starch and protein content increased up to some extent of lower concentration. The high amount of chlorophyll, starch and protein was observed at 0.01% concentration. The enhancement of protein content of crop plants might be due to increased rate of amino acid synthesis which may be attributed to the higher rates of both RNase and transaminase activity. The effect of detergent on chlorophyll content of green gram was widely varied. The increase in concentrations of detergent increased the chlorophyll content up to some extent. The higher concentration of the detergent decreases the amount of pigment content in green gram. The significance fall in the chlorophyll content under the higher percentage of the detergent concentration might have been due to inhibitory effects of toxicants on chlorophyll synthesis in exposed plants (Singh *et al.,* 2004) the protein and starch content were constantly increased when detergent concentration increases up to certain level. The maximum increase in amount of starch and protein were observed at 0.01% concentration. Whereas the increase in concentrations above 0.01 % decrease the amount of protein and starch content. Similar results were observed by Kumar& Kumar (1990) that seed germination percentage was decreased with increase in concentration of detergent. The possible facts explain that in higher concentrations of detergent the toxic chemicals are present in higher amount possibly affects the protein and starch content. Sahai *et al.,* 1983 reported similar kind of observation in some crop varieties.

Table1: Effect of different concentrations of detergent on seedling growth, fresh & dry

Weight of Green gram

Concentration (%)	Fresh Weight(g)	Dry weight(g)	Seedling growth	
			Shoot length(cm)	Root length(cm)
Control	0.31	0.14	2.15	0.65
0.01	0.22	0.11	2.25	0.67
0.02	0.23	0.09	1.80	0.25
0.03	0.20	0.08	1.35	0.55
0.04	0.22	0.09	1.80	0.45
0.05	0.22	0.08	1.55	0.35

Table2: Effect of different concentrations of detergent on photosynthetic pigments in Green gram

Detergent Concentration (%)	Chlorophyll Content(mg/g)		
	Chlorophyll a	Chlorophyll b	Total Chlorophyll
Control	0.0016016	0.0028832	0.0045152
0.01	0.0007007	0.0012614	0.0019754
0.02	0.000404	0.0007208	0.0011288
0.03	0.000303	0.0005406	0.0008466
0.04	0.0002002	0.0003604	0.0005644
0.05	0.000000	0.000000	0.000000

Table3: Effect of different concentration of detergent on starch & Protein content in Green gram

Concentration (%)	Starch (mg/5g)	Protein (mg/5g)
Control	96	96
0.01	78	89
0.02	60	54
0.03	48	36
0.04	36	18
0.05	18	0.00

CONCLUSION

Different concentrations of Synthetic detergents significantly inhibit the growth of Green gram. All the growth parameters were gradually declined with increase in concentration from 0.02 to 0.05%.It can be concluded that the higher concentration of detergent is toxic to the plant growth hence it is recommended that only after proper treatment it can be used for irrigation purpose.

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