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### Original Article

## Effect of Organic Contaminations on Seed Germination Studies in *Triticum Aestivum* (L.)

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#### ABSTRACT

An attempt has been made for germination studies in *Triticum Aestivum* (L.) with 1,2,4,5-tetrazine. It has a wide range of biological activity covering anticoagulant, bactericidal, fungicidal, neurotropic. Such a vast use of 1,2,4,5-Tetrazines, necessitates to concentrate on 1,2,4,5-Tetrazines for studying the germination pattern. The experimental data was used to calculate plant growth which in turn is decided on the basis of parameters such as percentage of germination survival, seedling height, chlorophyll content, SGI, shoot length, root length and vigour index.

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### 1. Introduction

Good seed germination behavior is important for horticulture and agriculture. Uneven or poor germination and subsequently inhomogeneous seedling growth can lead to great financial losses. Crop yield and grain protein content are important in the production and marketing of wheat (*Triticum aestivum* (L.)). Recent changes in the balance of supply and demand as a result of the new global economy mean that growers must produce crop that matches demand more closely and reliably according to Moss, Laubscher, Van Lill and Purchase [1-4]. In India wheat is grown under irrigation and rain fed conditions, varying soil fertility situation and a wide range of climatic conditions. Breeding programmers' are aimed at developing high yielding cultivars with appropriate quality characteristics. The factors determining wheat yield, grain protein content have been investigated by many researchers Takeda and Frey [5-6].

One of the important contributions of the nineteenth century experimental plant physiology to agriculture was the discovery that soil fertility and crop yields could be increased by adding several nutrients to the soil. Prior to the nineteenth century, the

common method for increasing crop production was to apply plant and animal debris (manures, composts etc.) to soil. It was not realized that this treatment returned to the soil. Only a portion of nutrients that had been extracted by plants. Rotation of crops periodically with other crops resulted in increased growth of crops. Only in the early 1800s, agricultural scientists realized that crop plants grow in proportion to the amounts of various nutrients present in soils. This principle was adopted by nineteenth-century agronomists. Today the application of various salts to soils is a basic feature of agricultural practice. Without the application of these and other fertilizers to soils, the large crop yields obtained in developing countries throughout the world during the past 50 years or more could not be possible. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed onto the crop plants within the object of accelerating and modifying the plant growth and development.

### 2. Materials and Methods

1,2,4,5-Tetrazines has a wide range of biological activity covering anticoagulant, bactericidal, fungicidal, neurotropic [7] etc. These are also shown to be active as kairomones [8]. Such a vast use of 1,2,4,5-Tetrazines, necessitates to concentrate on 1,2,4,5-Tetrazines for studying the germination pattern.

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## 2. Cardiac markers

Selected 1,2,4,5-Tetrazines and related N-heterocycles were.

S8] N' [(3Z)-6-pyridine-4-yl-1,4 dihydro-1,2,4,5-tetrazin-3(2H)-ylidene] aniline.

S9] 4-methyl-N-[(3Z)-6-pyridine-4-yl-1, 4 dihydro-1,2,4,5-tetrazin-3(2H)-ylidene] aniline.

S10] 2-methyl-N-[(3Z)-6-pyridine-4-yl-1,4 dihydro-1,2,4,5-tetrazin-3(2H)-ylidene] aniline.

The solutions of S8, S9 and S10 of the concentration 0.001M was prepared using 10% DMF-water.

### 2.1. Selection of System

In general practice, various chemicals are used in agricultural as an important ingredient of various pesticides, insecticides, fertilizers etc. to improve the crop yield. Amongst several economically important plants, *Triticum Aestivum (L.)* was selected as a plant system. *Triticum Aestivum (L.)* is a basic food crop around the world. *Triticum Aestivum (L.)* is ideal system to study the germination and growth pattern, commonly known as wheat and used as an important ingredient in spices. *Triticum* it has 16 species and 2 cultivated species are *triticum aestivum* and *triticum durum*. Bread (wheat) *triticum aestivum(L.)* is the staple food of majority of Indians and contributes some calories and protein to diet than any other cereal seeds have always been vital to human existence. Seeds are currently a major source of food, drink and numerous drays and as a raw material for vast array of products. *Triticum aestivums(L.)* are store proteins, carbohydrates, starch, amino acid. Such a widespread use of *Triticum aestivum (L.)* in daily life is persuasive to study its response against different solutes, regarding to physiological processes; particularly germination is a vital process for the growth of plants.

For Germination tests, healthy seeds of *Triticum aestivum (L.)* of same generation were taken and thoroughly washed using doubly distilled water. The germination trays sterilized with 0.01% of HgCl<sub>2</sub> for 2 minutes and were prepared by keeping 100 seeds in folded blotting paper for each treatment.

The test solutions of 0.001 M were added. A controlled set was similarly run using distilled water. The percent germination was recorded daily up to seven days. The protrusion of radical through seed coat was taken as the criteria of seed germination. The speed of germination index (SGI) was calculated as [9-11].

$$SGI = (10g + 9g + 8g + 7g + 6g + 5g + 4g + 3g + 2g)$$

Where; g represents number of germinated seeds after 24 hours. For the study of growth and chlorophyll content, the same conditions were kept and estimation of total chlorophyll, chlorophyll-a, chlorophyll-b were made according to Jahagirdar [12] and expressed in mg/Lit.

$$\text{Chlorophyll (total) (gm/lit)} = 0.0202(\text{O.D.})_{645} + 0.00802(\text{O.D.})_{663}$$

$$\text{Chlorophyll-a (gm/lit)} = 0.0127(\text{O.D.})_{663} - 0.00269(\text{O.D.})_{645}$$

$$\text{Chlorophyll-b (gm/lit)} = 0.0229(\text{O.D.})_{645} - 0.00488(\text{O.D.})_{480}$$

On the same day, root length, shoot length and fresh weight of seedlings were measured. The dry weight was measured by keeping 25 fresh plantlets in oven first at 70°C and later at 100°C to obtain a constant weight [13-15]. Vigor index was determined according to Abdul-Baki and Anderson, J. D. [16] as -Vigour index = percent germination [(root length+shoot length)mm]

## 3. Results and Discussion

Early attempts have been made by Bera et al [17] to study the effect of tannery effluent on seed germination, seedling growth and chloroplast pigment content in mungbean. Adhikari et al [18] have observed the effect of raw sewage water on mustard. In the present investigation, effect of different solutes on the chlorophyll, dry matter, percent germination, SGI, vigour index, root length, shoot length, root shoot ratio of *Triticum Aestivum (L.)* have been studied.

### 3.1. Chlorophyll

Chlorophyll a appears blue green in transmitted light but reddish in reflected light and is the principal pigment involved in trapping the light of wavelength 670 nm. Chlorophyll b is yellowish green in transmitted light but reddish in reflected light and traps the light of wavelength 645 nm.

These photosynthetic pigments were found affected in *Triticum Aestivum (L.)* by the treatments. It can be seen from Table-1 that, the total chlorophyll content of S8, S9, S10 were found to be increased over control due to increase in chlorophyll b.

**Table 1: Chlorophyll and Dry Matter Content for Control and Treated Plants.**

Systems	Chlorophyll-total (mg/lit)	Chlorophyll-a (mg/lit)	Chlorophyll-b (mg/lit)	Dry matter
Water	2.8556	1.1683	1.8904	2.67
10%DMF	1.3450	1.2405	1.1371	1.18
S8	2.77684	1.17223	1.7300	1.13
S9	2.822	1.2076	1.7231	1.07
S10	12.8249	1.2484	1.7149	1.12

### 3.2. Dry Matter

Growth of cells is sometimes measured as an increasing cell number or the fresh weight of packed cells. However, fresh weight is not always reliable measure, because most of the plant tissue approximately content 80% water. Therefore, a more reliable parameter, 'dry weight' is used more often than fresh weight. Dry matter is a measure of amount of protoplasm or organic matter in the plants synthesized during various metabolic processes. A vital process, photosynthesis is responsible for the production of organic matter, which is available as dry matter, when the moisture content has been evaporated.

It can be seen from table-1, that the dry matter content decreases, which may be due to the effect on the chlorophyll content-a, ultimately on the rate of food production. This fact is also confirmed from the changes in the chlorophyll content.

### 3.3. Percent Germination

Understanding seed germination is one of the major goals of plant physiology. Such an important phenomenon will be affected by different conditions.

It was cleared from table-2 that in all cases, the percent germination in all the treatments decreases than that of control; but, S10 shows increase in it.

**Table 2: Percent Germination, Speed of Germination Index and Vigor Index for Control and Treated Plants.**

Systems	Percent Germination	Percent Reduction over Control	SGI	Percent Reduction over Control	Vigor Index	Percent Reduction over Control
Water	100	-	476	-	11477.00	-
10%DMF	90	-	289	-	5908.50	-
S8	88	2.22	301	4.15	6671.28	12.90
S9	89	1.11	364	25.95	7095.08	20.0
S10	95	5.5	402	39.10	9311.90	857.60

### 3.4. Speed of Germination Index (SGI)

The response of seeds to the hydration varies. This variation is in the initiation of germination or emergence. The seeds may start emerging on the first day or it requires some period for necessary adaptation. Such time requirement will be studied by determining the speed of germination on the basis of the day of starting the germination multiplied by suitable factors.

As in the percent germination, the treatments showed remarkable decrease over control, while, the speed of germination index was increased surprisingly and again S10 shows a large increase in SGI.

### 3.5. Vigour Index

The seed quality is having the synonymous terms seed vigour in literature. The seed vigour may be improved by using fertilizers, irrigation and paste control and soil management. Whatever chemicals are used to improve the seed vigour contain different groups which can negatively affect the basic purpose of that chemical.

In the present investigation, it has been observed (Table-2) that, vigour index of treated seeds was effectively increased over control. This increase was predominantly observed in case of S10.

### 3.6. Root Length, Shoot Length and Root Shoot Ratio

Though the root and shoot developments start within a fraction of time but the further developments may vary according to the nutrients required for the development of root and shoot independently. Therefore, root and shoot lengths differ. Table-3 clearly indicates that, root length and shoot length shows tremendous increase over control.

**Table 3: Root Length, Shoot Length and Root/Shoot for Control and Treated Plants.**

Systems	Root length	Percent Reduction over Control	Shoot length	Percent Reduction over Control	Root /Shoot	Percent Reduction over Control
Water	59.79	-	54.98	-	1.0874	-
10%DMF	31.89	-	33.76	-	0.9446	-
S8	38.42	20.47	37.39	10.75	1.0275	8.7762
S9	40.55	27.15	39.17	16.02	1.0352	9.5913
S10	49.50	55.22	48.52	43.72	1.0201	114.32

### 4. Conclusion

The changes in the growth pattern of root and shoot was studied by the proportionate growth in both. The root-shoot ratios reflect the same and represent the development in root and shoot simultaneously. 10% DMF is playing a negative role but the compounds shows positive effects specially S10. It can be due to presence of 3e- donating -CH<sub>3</sub> groups, which enhances the reactivity of S10.

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