REDUCING TOXIC EFFECT OF SEED DRENCHED ORGANIC CONTAMINATION ON GERMINATION OF *TRITIUM AESTIVUM (L.) (WHEET)*

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Abstract

Germination studies in Triticum Aestivum (L.) with dihydroformazan. The experimental data was used to calculate plant growth 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. Cultivar differ fundamentally in their retort to deficiency and those cultivars best adapted to growth in dehydrated and semi dehydrated conditions form the most uniform and vigorous stands when grown under water deficits. The seeds of different size were subjected to five different levels of osmotic stress (distilled water, control) to consider the effect of osmotic stress on germination percentage, chlorophyll content, SGI, shoot length, root length and vigour index., the investigations were performed as experiments under complete randomized design (CRD). Germination percentage, chlorophyll content, SGI, shoot length, root length and vigour index were shown to decrease with increasing osmotic stress, where as a progressive increase in organic contamination were observed with increasing osmotic stress. The response of cultivar examined of osmotic stress differed dramatically.

Keywords:- SGI, Vigour index, Chlorophyll content, Root length, Triticum aestivum, water stress.

INTRODUCTION:

Wheat (Triticum aestivum L.), one of the most important staples food crop, it accounts for about 50% of the human food supply. Like other living organisms, the creation of defense mechanism under stress condition is a natural phenomenon of the plant, and that is why the yield of crops decreases but helps to enhance the seed quality. Despite the some positive impact of stress but it is not suitable for on seed germination, particularly for salt and drought stress. And for this reason, principally salinity and drought seed priming is considered as an effective means to enhance stress tolerance capability of plant under adverse conditions [1-4]. Seed priming is a new innovative technique by which some physiological changes are gained into target grain with the use of natural and synthetic compounds prior to germination Seed priming is the induction of a particular physiological state in plants by the treatment of natural and synthetic compounds to the seeds before germination. The physiological condition of plants in which plants can faster or better activate defense responses or both is called the primed condition of the plant. Priming allows some of the metabolic processes essential for germination to occur without germination take place. During priming, seeds are drenched in various priming solutions. Thus the seeds were prevented from absorbing enough water for radical protrusion and retarding the seeds in the lag phase. Seed priming has been commonly used to minimize the time between seed sowing and seedling emergence and to ensure coordinate appearance [5-7].

In India, wheat is a staple food and occupies a central position in setting farming and agriculture policies. Wheat is mainly grown on rainfed lands without supplementary irrigation but Breeding programmes 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 [8-10].

Wheat is grown under irrigation and rain fed conditions, varying soil fertility situation and a wide range of climatic conditions 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. Germination and seedling stage is considered to be the most critical growth stage, especially under water stress conditions for the successful stand establishment of crop plants

AIM OF THE PRESENT WORK:

Dihydroformazan has a wide range of biological activity covering anticoagulant, bactericidal, fungicidal, neurotropopic *etc*. These are also shown to be active as kairomones such a vast uses of Dihydroformazan, necessitate to concentrate on Dihydroformazan for studying the germination pattern [11-12].

MATERIALS AND METHODS :

Selected Dihydroformazan and related N-heterocycles were.

N'(benzilidene)-3-(pyrid-4-yl) dihydroformazan (S1)

N'(4-methoxy benzilidene)-3-(pyrid-4-yl) dihydroformazan (S2)

N'(2-hydroxyl benzilidene)-3-(pyrid-4-yl) dihydroformazan (S3)

The solutions of S1, S2 and S3 of the concentration 0.001M was prepared using 10 % DMF-water.

Selection of System -

In common observe, assorted chemicals are used in agricultural as an important component of various pesticides, insecticides, fertilizers etc. to improve the crop yield. Amongst several economically important plants, *Triticum Aestivum* (L.) were 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 durom. Bread (wheat) triticum aestivum is the stable 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 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 $HgCl_2$ 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. After that data collected on various parameters such as mean data of germination percentage, speed of germination index (SGI), shoot length, root length, shoot dry weight, root dry weight, relative water content, water saturation deficit, water retention capacity, germination coefficient and vigor index were recorded. Germination was recorded one day after placing seeds for germination and continued up to eleven day with an interval of 24 hr. More than 2 mm long plumule and radicle seed was considered as germinated seed [13-15]

The germination rate was calculated using following formula:

$$\text{Germination percentage (\%)} = \frac{\text{Total number of germinations seeds}}{\text{Total seeds place for germination}} \times 100$$

The speed of germination index (SGI) was calculated as [16-18]

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

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 [19] and expressed in mg/Lit.

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

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

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

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. Vigor index was determined according to Abdul-Baki and Anderson, J. D. [20] as –

Vigour index = percent germination [(root length+shoot length)mm]

At the eleventh day five seedlings of each petri dish were sampled. Shoot and root length of single seedling was measured with meter scale. Then the shoot and root of the seedling were dried for 48 hr then dry weight of shoot and root were recorded using electric balance.

After recording the fresh weight leaf of each seedling place into ptridish for 24 hr then leaf soaking with distilled water turgid weight was recorded when it was dried for 48 hr the dry weight was measured [21-22].

RESULTS AND DISCUSSION:

The effect of organic contaminant on *Triticum Aestivum* (L.) plants was reported to be depending on the concentration and the kind of contamination. In the current research study, the effect of different dihydroformazans on seed germination was assessed. dihydroformazan was selected as a compound representing N-group was chosen as representative of biological activity covering anticoagulant, bactericidal, fungicidal, neurotropopic of organic contaminants. The effect of these compounds on seed germination was observed at varying concentrations and the comparison was made.

Early attempts have been made study the effect of tannery sewage on seed germination, seedling growth and chloroplast pigment content in mungbean. it have observed the effect of raw sewage water on wheat.

In the present investigation, effect of different solutes of dihydroformazans on the chlorophyll, dry matter, percent germination, SGI, vigour index, root length, shoot length, root shoot ratio of *Triticum Aestivum* (L.) have been studied [23].

Chlorophyll – Basically, among the smallest group of coordinating pigment molecules necessary to affect a photochemical act, the most important pigments involved in photosynthesis are chlorophyll and carotenoid. There are five types of chlorophyll viz.; a, b, c, d and e amongst which only a and b are present in higher plants. 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 S1, S2, S3 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	**2.9823**	**1.3741**	**1.9974**	**2.72**
10% DMF	**1.7722**	**1.2888**	**1.2017**	**1.20**
S1	**2.2012**	**1.7723**	**1.7560**	**1.0**

S2	**2.2221**	**1.2871**	**1.7451**	**1.02**
S3	**2.3249**	**1.3484**	**1.6843**	**1.06**

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

Systems	Percent Germi-nation	Percent Reducti-on over Control	SGI	Percent Reducti-on over Control	Vigor Index	Percent Reducti- over Control
Water	**100**	**--**	**486**	**--**	**11543.00**	**--**
10% DMF	**91**	**--**	**267**	**--**	**5876.50**	**--**
S1	**83**	**1.81**	**315**	**4.15**	**6234.21**	**11.90**
S2	**88**	**1.23**	**312**	**25.95**	**7124.27**	**21.08**
S3	**90**	**3.55**	**419**	**39.10**	**9432.11**	**47.60**

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

Systems	Root length	Percent Reducti-on over Control	Shoot length	Percent Reducti-on over Control	Root/Shoot	Percent Reducti-on over Control
Water	**57.71**	**--**	**58.92**	**--**	**1.1834**	**--**
10%DMF	**32.19**	**--**	**35.06**	**--**	**0.9626**	**--**
S1	**36.22**	**22.37**	**35.31**	**10.55**	**1.0175**	**7.7122**
S2	**38.25**	**25.25**	**34.67**	**13.02**	**1.0252**	**8.4923**
S3	**39.57**	**50.02**	**44.02**	**44.72**	**1.0101**	**9.3221**

Dry Matter – Dry weights of root differed with seed sizes under osmotic stress levels and osmotic agents. In control condition, dry weights of root obtained in larger seeds size were significantly higher than those of medium and small seeds. Besides, the experimental results for root weight indicated that large seeds had higher root dry weight than those of seeds under various NaCl conditions [24] However, dry root matters from seeds were in intermediate 0.001 M of dihydroformazan concentrations, comparatively dry root materials were increased with the concentration 0.001 M of dihydroformazan in seeds of wheat.

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.

Percent Germination – The percentage germination of the wheat seeds in organic contaminant amended solute is presented in table2. The percentage seed germination did not vary significantly between dihydroformazan contaminated and control . However the percentage seed germination reduced and delayed along the increasing concentrations of solution. The differences in seed germination rate observed to be non significant between 10 to 50 mg/kg. At higher concentrations of the chlorpyrifos (75 and 100 mg/kg); seed germination resulted to be 58% and 44% compared to the 76% of the control where fewer seeds could tolerate and germinate with delay in the organic contaminated [25-26].

It was cleared from table-2 that in all cases, the percent germination in all the treatments decreases than that of control; but, S3 shows increase in it.

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 adoptation. 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 [26].

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.

Vigour Index: - The seed quality is having the synonymous terms seed vigour in literature. On the basis of seed vigour, one can predict about the seed germination and yield of grain. 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 [27].

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 S3

Root Length, Shoot Length and Root Shoot Ratio :- Germination starts when the seed shows emergence phase of growth which begins with penetration of embryo from the seed coat and ends with the development of root and shoot system.

The root apical meristem appears structurally less complex than the shoot apical meristem, in part because the apical meristem is not responsible for producing branch roots. Branch roots arise some distance back from the root tip. The tip of the root is covered by a root cap, which provides mechanical protection to the meristem as the root grows through the abrasive soil medium. The rate and extent of elongation is subjected to a variety of controls, including nutrition, harmones and environmental factors [28].

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.

The changes in the growth pattern of root and shoot was studied by the proportionate growth in both. The root-shoot ratio reflects the same and represents the development in root and shoot simultaneously.

10% DMF is playing a negative role but the compounds shows positive effects. It can be due to presence of 3e- donating $–CH_3$ groups. The results indicated that root to shoot length ratio increased with the increasing concentration. But greater increase in root to shoot length ratio was in the increase of dihydrofprmazan concentration

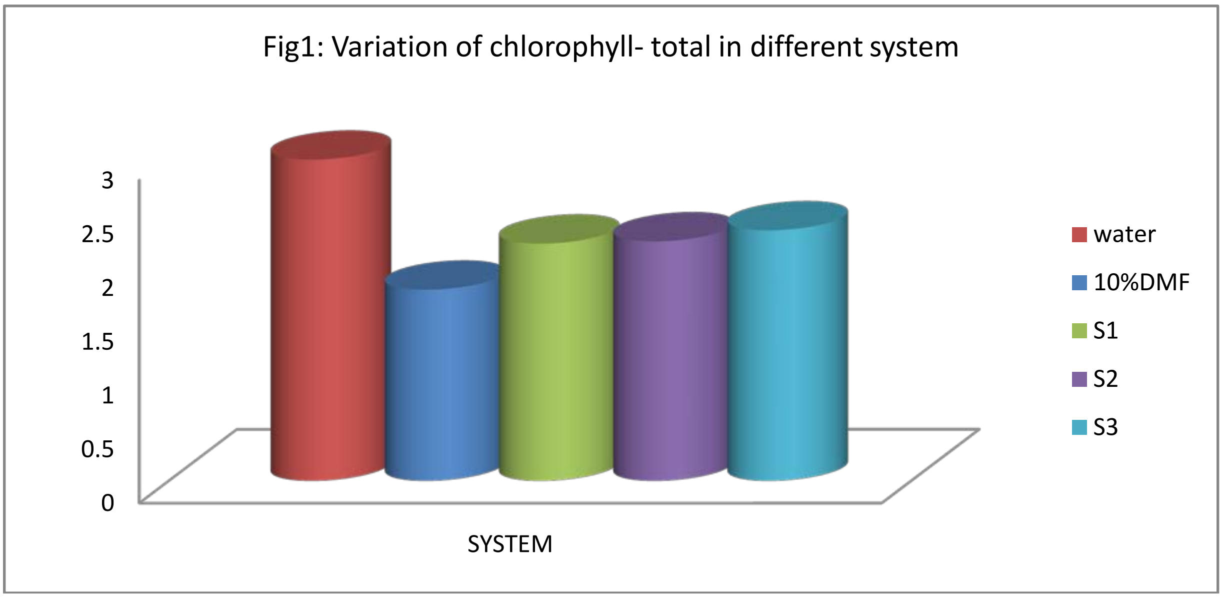


Fig1: Variation of chlorophyll- total in different system
3
2.5
2
1.5
1
0.5
0
SYSTEM
water
10%DMF
S1
S2
S3

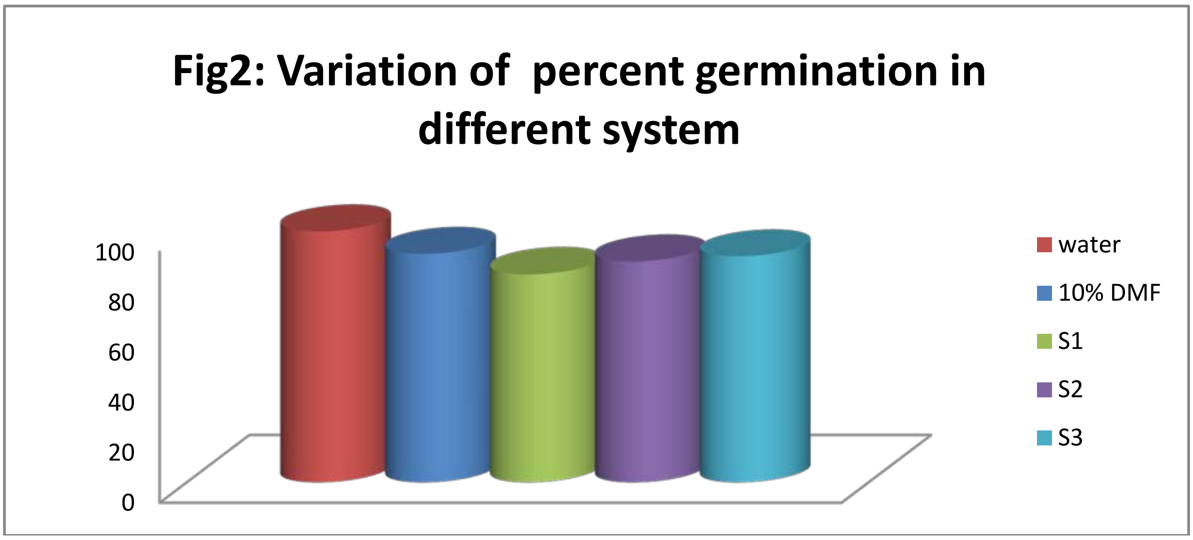


Fig2: Variation of percent germination in different system
100
80
60
40
20
0
water
10% DMF
S1
S2
S3

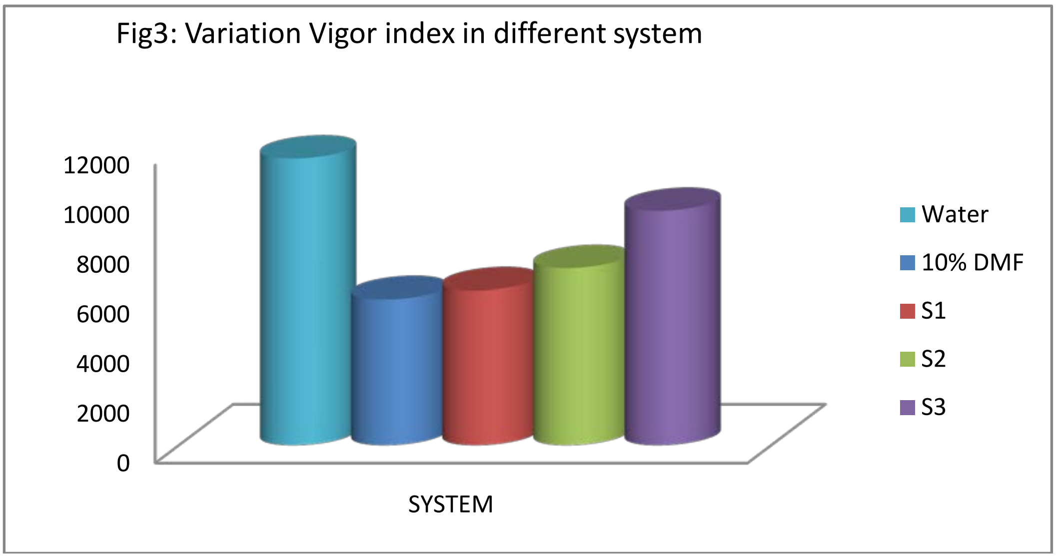
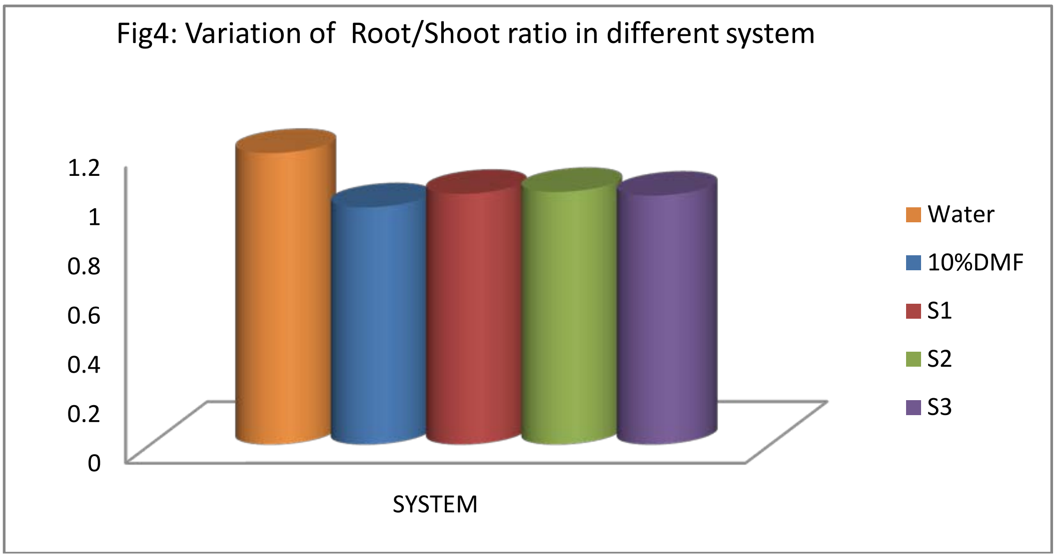


Fig3: Variation Vigor index in different system
12000
10000
8000
6000
4000
2000
0
SYSTEM
Water
10% DMF
S1
S2
S3



Conclusions

Considering the above results obtaining from the present piece of work it may be concluded that dihydroformazans has a positive effect on germination, seedling growth and water relation behavior on wheat seed. All the parameters of wheat genotypes gave the best results when seeds treated with S1,S2,S3 dihydroformazans solution compared to 10% DMF solvent shows negative role on germination.

Acknowledgement

The authors acknowledge with thanks the support of the Principal, Head of Department, Dr. I. N. Nimdeokar P. G. and Research Center for Chemistry, Hislop College Nagpur and the Principal, Department of chemistry Lemdeo Patil Mahavidyalaya Mandhal.

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