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EFFECT AND APPLICATION OF DIFFERENT CHEMICALS SEED TREATMENT ON SEEDLING DEVELOPMENT DURING SEED GERMINATION IN HYBRID COTTON

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ABSTRACT

Chemicals play an important role in seed treatment act as disinfectants. Many seeds of crops damaged due to the improper seed handling or seed treatment, several chemicals has their own specific ability to kills the infectant micro-organisms present on the seed surface which is causing the decaying the seedling during the germination ;which leads great loss in the seed production; to prevent these problems or to overcome the problems of fungal attack by the various kinds of fungi having their feeding on the seed surface which leads in damaging of seeds during the germination; here we apply the various kinds of chemicals on the Hy.Cotton seeds with different concentrations, the response showed by the chemicals according to their mode of action on the fungal agents which is directly affect and present on the seed surface.

KEYWORDS—chemicals, seed treatment, seed germination, seedling evaluation

INTRODUCTION

Cotton (Gossypium spp.) belonging to family malvaceae is major fiber crop growing in kharif season for the commercial as well as economic purpose. The various countries growing the cotton in large quantity for their economic value the five leading exporters of cotton in 2011 are the United, India, Brazil, Australia, and Uzbekistan. The largest nonproducing importers are Korea, Taiwan, Russia, and Japan. In India, the states of Maharashtra (26.63%), Gujarat (17.96%) and Andhra Pradesh (13.75%) and also Madhya Pradesh are the leading cotton producing states; these states have a predominantly tropical wet and dry climate. Global pests of cotton include the pink bollworm, Pectinophora gossypiella; the chili thrips, Scirtothrips dorsalis; the cotton seed bug, Oxycarenus hyalinipennis; the tarnish plant bug, Lygus lineolaris; and the fall armyworm, Spodoptera frugiperda, Xanthomonas citri subsp. malvacearum.

The cotton affected by the various diseases caused by the (micro-organisms) fungi, bacteria, viruses. The micro-organisms are present in soil as well as on the seed surface during the harvesting stage. Large number of fungi which is invisible to our necked eyes attack on the seed surface during harvesting period which further causing the serious diseases to the seedling as well as in plant growth stages upto maturity period.

Advances in seed treatment technology will refine existing treatment strategies and future research should be focused on biological seed treatments in addition to chemical treatment using microbial inoculants as diseases and pests.
suppressing and/or seed enhancing materials which
will be applied to seeds either alone or in

The industry recognizes that seed
treatment must provide “added seed value” (e.g.
better emergence, higher seedling establishment,
improved crop health, higher yields and improved
crop quality). It expects seed treatments to be easy
to handle and apply to seeds, to complement and
protect genetic improvements, to function as part of
IPM (Integrated Pest Management), to be safe and
cost-effective in use and to reduce personal and
environmental risks. Seed treatments, compared to
conventional application of crop protection
products, offer convenience to the grower, saving
time and energy and reducing application efforts.

MATERIALS AND METHODS

Materials

Hybrid seeds of Cotton variety produced
at Aurangabad, state of Maharashtra growing in
kharif season were selected for Seed treatment.

Method of Seed Treatments

1. 1gm Thiram + 1.5gm Seed star,
2. 2ml Seed star,
3. 1gm Thiram + 1 ml Seed star,
4. 2gm Roar-power + 1gm Thiram + 1.5ml Seed star,
5. 2gm Roar-power + 2ml Seed star,
6. 1gm Roar-power + 2ml Seed star.

The control sample of said cotton crop
dried seedlings kept for comparison with the concentrations of
chemical fungicides.

The various concentrations of different
chemicals, viz. Thiram, Seed star, Roar-power were
made separately added in a transparent plastic bag
containing 250gm of Cotton seed separately and
thoroughly mixed by shaking plastic bag until we
get uniform mixture. Little amount of water was
added and thoroughly mixed in order to facilitate
proper coating and the seeds were allowed to dry
under shade. The dried treated seed was packed
with plastic bags until Use and labeled. Seeds
which are treated by above mentioned chemicals
once and the untreated seeds were used as control.

Methods

The seeds of cotton variety were used in
There were seven Concentrations made for Seed
Treatment including Control, each for Thiram,
Roar-power, and Seed star.

The three different chemicals were used to
to determine seed germination and seedling
development in between paper method of
germination; to compare control with treatments.
(I.e. which chemical more vigorous for seed
germination in Seed treatment (between paper
methods of germination)

The seeds of given Hy. Cotton variety
was kept in 4 replications (i.e.100 seeds in each
replication) for germination, the trays was kept in
Germinator/Germination room at 22 degree
temperature. The water is given by Humidifier.

After germination period is over (i.e. after
4 days of germination) the fresh seedlings were
counted. The seedlings were counted in five
categories (Normal seedlings, abnormal seedlings
and fresh seeds, hard seeds, dead seeds). The
weight and length of fresh Normal seedlings were
measured in gm and cm, respectively (i.e. wt.
of plumule, wt. of radical, total wt (mass), length
of plumule, length of radical, total length).

The seedlings after measurement were
kept in Oven at 103 degree temperature for 18 hrs
for the Dry weight. After 18 hrs the dried seedlings
are weighted through the weighing balance. (i.e.
dry wt. of plumule, dry wt. of radical) to calculate
Vigor index and Mass index. The difference of
weight between the initial weight of seedlings and
after drying should be calculated.

Procedures

Working sample

Four hundred seeds are counted at
random from the well-mixed pure seed. Replicates
of 100 seeds are normally used. Spaced sufficiently
far apart on the seed bed to minimize the effect or
adjacent seeds on seedling development. To ensure
adequate spacing, Split replicates of 50 or even 25
seeds may be necessary.

Particularly where there is seed-borne disease.
When the seeds are heavily infected it may also be
necessary with a paper substrate to change the
substrate at an intermediate count. Testing four
hundred seeds is recommended on seed law
enforcement. Seed certification and service samples

Methodology

BP (Between Papers)

The seeds are germinated between two
layers of paper. This may be achieved by loosely
covering the seeds with an additional layer of paper
or by placing the seeds in rolled towels. The rolled
towels are to be placed inside the germinator in an
upright position. Subsequent watering should be
avoided wherever possible as it is likely to increase
the variability between replicates and between
tests. Therefore, precautions should be taken to
ensure that the substrate may not dry out and that
sufficient water is supplied continuously during the
test period.

Temperature

Temperature should be as uniform as
possible throughout the germination apparatus and
care should be taken that the temperature of tests
does not exceed the level prescribed and variation
due to the apparatus should not be more than ±1°c.
The lower temperature should usually be
maintained for 16 hours and the higher for 8 hours.

Light

The substrate from artificial source or by
day light is generally recommended for better
seedling development to avoid etiolating and also
to detect seedlings having chlorophyll deficiency.

Duration of the Test
The tests lasting 4-10 days Intermediate count’s to remove seedlings which are sufficiently well developed are recommended in order to make counting easier to prevent them from affecting the development of other seedlings.

**Seedling Evaluation Criteria**

Seedlings, which have been reached at particular stage when all essential structures can be accurately assessed, Shall be removed from the test at the first or any other intermediate counts, decayed seedlings should be removed in order to reduce the risk of secondary infection. But abnormal seedlings with other defects should be left on the substrate until the final count.

**Categories of seedlings**

**Normal seedlings**

Normal seedling is one which shows the capacity for continued development into mature plant when grown in good quality soil and under favorable conditions of water supply. Temperature and light this capacity for continued development Depends upon the soundness and correct functioning of the developing structures during germination.

**Abnormal seedlings**

An abnormal seedling is one which does not have the capacity to develop into a normal plant when grown in the soil under favorable conditions because one or more of the essential structures is irreparably defective.

**Fresh seeds**

Seeds remain as it is after end of test period with none of the essential structures.

**Dead seeds**

Seeds absorb the water but fail to metabolism due to decaying the food material inside the seed coat and at the end of test period if press the decaying matters emerge out of the seed.

The result of the germination test is calculated as the averages of 4 x 100 seed replicates is expressed as percentage by number of normal seedlings. The percentage is calculated to the nearest whole number. The percentage of abnormal seedlings, hard, fresh and dead seeds is calculated in the same way.

The germination calculated in percentage by given formula below.

\[
\text{Germination} \% = \frac{\text{Total no. of Germinated seed}}{\text{Total no. of seed kept for germination}} \times 100
\]

\[
\text{R/S ratio} = \frac{\text{Total Length of Radical (mean)}}{\text{Total Length of Plumule (mean)}} \times 100
\]

\[
\text{Vigour index (Length)} = \text{Germination} \% \times \text{Total length (mean)}
\]

\[
\text{Vigour Index (Mass)} = \text{Germination} \% \times \text{Seedling Dry weight (gm)}
\]

\[
\text{Seed Metabolic Efficiency (SME)} = \text{Amount of food material respired (RESP)} \text{ is calculated by }
\text{RESP} = \text{SDW} - (\text{SHW} + \text{RTW} + \text{RSW}) \text{ Where,}
\text{SDW= Dry wt of seed before germination, SHW = Dry wt of Shoot, RTW= Dry wt of Root, RSW = Dry wt of seed after germination, SME = SHW + RTW/ RESP}
\]

\[
\text{Mobilization Efficiency (M.E.) = Dry wt of seedling/Decrease in wt of cotyledon} \times 100
\]
RESULTS AND DISCUSSIONS

**TABLE-1. SEED TREATMENT OF DIFFERENT CHEMICALS ON HY.COTTON**

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Treatment</th>
<th>Germination %</th>
<th>Wt of Plumule (gm)</th>
<th>Wt of Radical (gm)</th>
<th>Total mass Wt (gm)</th>
<th>Length of Plumule (cm)</th>
<th>Length of Radicle (cm)</th>
<th>Total length (cm)</th>
<th>Vigour Index (Length)</th>
<th>Vigour Index (Mass)</th>
<th>Root- Shoot Ratio</th>
<th>Dry wt (gm)</th>
<th>Mobilization Efficiency (ME)</th>
<th>Seed Metabolic Efficiency (SME)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control</td>
<td>83.50</td>
<td>0.4430</td>
<td>0.0910</td>
<td>0.5350</td>
<td>8.2200</td>
<td>9.0040</td>
<td>17.2240</td>
<td>1437.8700</td>
<td>57.0800</td>
<td>109.5300</td>
<td>0.6836</td>
<td>86.9600</td>
<td>0.5670</td>
</tr>
<tr>
<td>2</td>
<td>1gmThiram+1.5ml seed star</td>
<td>82.50</td>
<td>0.4580</td>
<td>0.1130</td>
<td>0.5590</td>
<td>9.1760</td>
<td>11.2760</td>
<td>20.4520</td>
<td>1687.1200</td>
<td>58.5900</td>
<td>122.9000</td>
<td>0.7102</td>
<td>87.2300</td>
<td>0.6170</td>
</tr>
<tr>
<td>3</td>
<td>2ml seed star</td>
<td>84.50</td>
<td>0.4810</td>
<td>0.1010</td>
<td>0.5820</td>
<td>8.8000</td>
<td>10.5680</td>
<td>19.3680</td>
<td>1635.9200</td>
<td>61.6900</td>
<td>120.0000</td>
<td>0.7301</td>
<td>96.1000</td>
<td>0.6160</td>
</tr>
<tr>
<td>4</td>
<td>1gmThiram+1ml seed star</td>
<td>82.50</td>
<td>0.4720</td>
<td>0.1080</td>
<td>0.5800</td>
<td>9.2800</td>
<td>12.0080</td>
<td>21.2880</td>
<td>1755.6000</td>
<td>60.8600</td>
<td>129.3100</td>
<td>0.7378</td>
<td>88.3800</td>
<td>0.6690</td>
</tr>
<tr>
<td>5</td>
<td>2gm Roarpower+1gmThiram+1.5ml seed star</td>
<td>84.25</td>
<td>0.4040</td>
<td>0.1210</td>
<td>0.5260</td>
<td>8.3200</td>
<td>12.4440</td>
<td>20.7640</td>
<td>1749.0300</td>
<td>59.4200</td>
<td>149.5100</td>
<td>0.7054</td>
<td>84.0100</td>
<td>0.6240</td>
</tr>
<tr>
<td>6</td>
<td>2gm Roarpower+2ml seed star</td>
<td>78.75</td>
<td>0.3730</td>
<td>0.1020</td>
<td>0.4760</td>
<td>6.9320</td>
<td>10.8400</td>
<td>17.7700</td>
<td>1399.3800</td>
<td>49.0500</td>
<td>156.3700</td>
<td>0.6229</td>
<td>66.2400</td>
<td>0.5600</td>
</tr>
<tr>
<td>7</td>
<td>1gm Roarpower+2ml seed star</td>
<td>84.25</td>
<td>0.3980</td>
<td>0.1140</td>
<td>0.5130</td>
<td>8.3680</td>
<td>12.1320</td>
<td>20.5000</td>
<td>1727.1200</td>
<td>54.1900</td>
<td>145.0900</td>
<td>0.6433</td>
<td>73.7800</td>
<td>0.5540</td>
</tr>
<tr>
<td>±SD</td>
<td></td>
<td>2.004</td>
<td>0.041</td>
<td>0.010</td>
<td>0.038</td>
<td>0.787</td>
<td>1.185</td>
<td>1.570</td>
<td>148.732</td>
<td>4.395</td>
<td>17.320</td>
<td>0.043</td>
<td>10.005</td>
<td>0.042</td>
</tr>
<tr>
<td>±SE</td>
<td></td>
<td>0.758</td>
<td>0.016</td>
<td>0.004</td>
<td>0.014</td>
<td>0.298</td>
<td>0.448</td>
<td>0.593</td>
<td>56.231</td>
<td>1.662</td>
<td>6.548</td>
<td>0.016</td>
<td>3.783</td>
<td>0.016</td>
</tr>
</tbody>
</table>
Graph- Table-1. Showing Germination %

Graph- Table-1. Showing Total Fresh Mass wt. (gm)

Graph- Table-1. Showing Total Seedling Length (cm)

Graph- Table-1. Showing Vigour index Length (%)
DISCUSSIONS

The Seed treatment of three chemicals (Thiram, Roar-power, Seed star) with given concentrations each for tested The Seed treatment 1gm Thiram+1.5gm Seed star, showed 0.5590gm mass wt., 20.4520cm total length, 1687.1200 vigour index length, 58.5900 vigour index mass index, 122.9000 root-shoot ratio, 0.7102gm dry wt., 87.230 mobilization efficiency, 0.6170 seed metabolic efficiency; in 2ml Seed star, showed 0.5820gm mass wt., 19.3680cm total length, 1635.9200 vigour index length, 61.6900 vigour index mass index, 120.0000 root-shoot ratio, 0.7301gm dry wt., 96.1000 mobilization efficiency, 0.6160 seed metabolic efficiency; 1gm Thiram+1ml Seed star showed 0.5800gm mass wt., 21.2880cm total length, 1755.6000 vigour index length, 60.8600 vigour index mass index, 129.3100 root-shoot ratio, 0.7378gm dry wt., 88.3800 mobilization efficiency, 0.6690 seed metabolic efficiency; more significant stimulating effect on seed germination and seedling development, vigour index (mass, length), root-shoot ratio, dry wt, m.e, s.m.e.; as that of control; while Seed treatment of 2gm Roar-power+1gm Thiram+1.5ml Seed star showed less effect on seed germination and positive seedling development, vigour index (mass, length), root-shoot ratio, dry wt as compared to control. The 2gm Roar-power+2ml Seed star, showed lower the seed germination % and other parameters except total length and root-shoot ratio found to be positive; in 1gm Roar-power+2ml Seed star, showed the high germination percentage, total length, length index and root-shoot ratio as compare to control.

These results suggest that the some concentrations of chemicals were more effective and significant than Control used for Seed treatment of seed germination and seedling development in between paper method.

CONCLUSION

Seed treatment is an effective on cotton seed in the given study to improve quality parameters with respect to control. The study
reveals that the various concentrations of chemicals acts antimicrobial activity; hence it suggest for further investigations to made the proper suitable concentrations of chemicals for seed treatment and also advise to the followers researchers made suitable concentrations during the seed treatments.

All mentioned Results concluded that the several chemicals recorded most significant seed germination, vigour index and other parameters than control recorded less seed germination, vigour index.

The Chemicals has ability to increase or enhance germination % & seedling development. These are available and it can be used as fungicide in combination with each other by making the suitable concentrations or in single for Seed treatment.

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