This chapter deals with the details of materials used, methods followed and the techniques adopted for carrying out the research work entitled “Effect of different seed treatments on dormancy and seed parameters of fresh sesame seeds (*Sesamum indicum* L.)”

### 3.1 EXPERIMENTAL SITE

The field experiment was conducted at the Instructional Farm, Department of Agronomy, Junagadh Agricultural University, Junagadh, during **Kharif 2016-17** to study the “Effect of different seed treatments on dormancy and seed parameters of fresh sesame seeds (*Sesamum indicum* L.)”. The laboratory study was carried out in the laboratory of Seed Science and Technology Department, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat, India). It is situated at 21.5° N latitude and 70.5° E longitudes with an altitude of 60 meter above the mean sea level on the western side at the foothill of mountain Girnar sierra.

### 3.2 CLIMATE AND WEATHER CONDITIONS

The region enjoys a typical climate characterized by fairly cold and dry winter, hot and dry summer and warm and humid monsoon. The rainfall is received through the South-West monsoon current between the third weeks of June to middle of September. July and August are the months of heavy rainfall. The decennial average rainfall of this area is 848.4 mm. Partial failure of monsoon once in three to four years is common in the area. Winter sets in the month of November and continues till the middle of February. January is the coldest month of the year. Summer season commences during the middle of February and ends at the middle of June. April and May are the hottest month of the year. The daily meteorological data of Junagadh Agriculture University pertaining to the temperature and the relative humidity prevailed during study period are presented in Appendix-B.
3.3 EXPERIMENTAL MATERIAL AND TREATMENT DETAILS

3.3.1 Genotype

The fresh seeds of two sesame genotypes viz., G. Til-3 and G. Til-4 were obtained from Agriculture Research station, Amreli and fresh seeds were grown at Instructional farm, Krishigadh, Junagadh on 29 February 2016 and harvested on 20 June 2016.

Table 3.3.1: List of the genotypes used in the study

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Symbol</th>
<th>Name of the genotypes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>V₁</td>
<td>G. Til-3</td>
</tr>
<tr>
<td>2.</td>
<td>V₂</td>
<td>G. Til-4</td>
</tr>
</tbody>
</table>

3.3.2 Seed treatments

Table 3.3.2: Details of various treatments used in the study

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Symbol</th>
<th>Detail of treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>T₁</td>
<td>Control</td>
</tr>
<tr>
<td>2.</td>
<td>T₂</td>
<td>Water soaking</td>
</tr>
<tr>
<td>3.</td>
<td>T₃</td>
<td>GA₃ @ 100 ppm</td>
</tr>
<tr>
<td>4.</td>
<td>T₄</td>
<td>GA₃ @ 200 ppm</td>
</tr>
<tr>
<td>5.</td>
<td>T₅</td>
<td>GA₃ @ 300 ppm</td>
</tr>
<tr>
<td>6.</td>
<td>T₆</td>
<td>IAA @ 100 ppm</td>
</tr>
<tr>
<td>7.</td>
<td>T₇</td>
<td>IAA @ 200 ppm</td>
</tr>
<tr>
<td>8.</td>
<td>T₈</td>
<td>IAA @ 300 ppm</td>
</tr>
<tr>
<td>9.</td>
<td>T₉</td>
<td>KNO₃ @ 0.10%</td>
</tr>
<tr>
<td>10.</td>
<td>T₁₀</td>
<td>KNO₃ @ 0.20%</td>
</tr>
</tbody>
</table>

3.3.3 Storage periods

Table 3.3.3: Details of various storage periods used in the study

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Symbol</th>
<th>Storage periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>S₁</td>
<td>0 days</td>
</tr>
<tr>
<td>2.</td>
<td>S₂</td>
<td>15 days</td>
</tr>
<tr>
<td>3.</td>
<td>S₃</td>
<td>30 days</td>
</tr>
<tr>
<td>4.</td>
<td>S₄</td>
<td>45 days</td>
</tr>
<tr>
<td>5.</td>
<td>S₅</td>
<td>60 days</td>
</tr>
</tbody>
</table>
Method of seed treatment

Freshly harvested seeds of sesame were treated with water and under different concentrations of 100, 200 and 300 ppm of GA3 and IAA, 0.10% and 0.20% of KNO3 with control (Table 3.3.2) Firstly seeds of G. Til-3 and G. Til-4 were taken out from polythene bag stored under ambient storage conditions (32± 1°C) by using electronic balance. These seeds were then soaked for 24 hours in the above concentrations. Three replicates of each treatment with 100 seeds plated on moistened germination paper inside petriplates in a definite manner and were placed in seed germinator at 25°C.

Finally, experimental details are as under:

1. Total number of treatments: 10
2. Design of experiment: Factorial Completely Randomized Design (FCRD)
3. Number of repetitions: Three
4. Quantity of seeds used for each treatment: 100 seeds
5. Storage period: seeds were stored from June to August and seeds were withdrawn at 15 days interval for each treatment.

3.4 OBSERVATIONS RECORDED

1. Seed moisture content (%)

Seed moisture content was determined at the time of starting the experiment in each treatment by the method described by Agrawal (1980).

2. Germination percentage (%)

Germination percentage was calculated by using the method given by International Seed Testing Association (Anon., 1983). Hundred seeds from each treatment will be kept for germination test at 25 ± 1°C temperature by using petri plate over moist germination paper method in three repetitions. The seedlings will be categorized as normal seedlings and abnormal seedlings (Anon., 1993).

Germination percentage will be calculated by the following formula,

\[
\text{Germination percentage} = \frac{\text{Number of seeds germinated}}{\text{Total number of seeds kept for germination}} \times 100
\]
a. First count
The number of seedlings was counted as first count at 4\textsuperscript{th} day after commencement of germination (Burris et al., 1969).

b. Final count
The number of seedlings was counted as final count at 8\textsuperscript{th} day after commencement of germination.

3. Speed of germination
Number of germinated seeds was counted every day from the first day to eight day and the cumulative index will be counted as suggested by Maguire (1962) as per following formula,

$$N = n_1/1 + n_2/2 + \cdots + n_x/x$$

Where, \(n_1\ldots n_x\) = Number of seed germinated.

1\ldots x = Number of days.

4. Shoot length of seedlings (cm)
Ten normal seedlings were taken on the final count day to measure the shoot length in centimetre. The length between the collar region and the tip of the shoot will be measured as shoot length (cm).

6. Root length of seedling (cm)
Ten normal seedlings were taken on the final count day to measure root length in centimetre. The length between the collar region and the tip of primary root will be measured as root length (cm).

8. Seedling length (cm)
The length of ten normal seedlings grown in petri plate over moist germination paper at optimum temperature was measured in centimetres on the day of final count. The length between the collar region and the tip of the shoot will be measured as shoot length (cm) and the length between the collar region and the tip of primary root will be measured as root length (cm) both length measured as seedling length (cm).

Seedling length = Root length of seedling (cm) + Shoot length of seedling (cm).

7. Seedling fresh weight (g)
The weight of seedling excluding the cotyledons was taken on the final count before oven drying.
8. Seedling dry weight (g)

The weight of seedling excluding the cotyledons were taken on the final count after oven drying at 80°C for 24 hours in grams (Woodstock, 1976).

9. Strong and weak seedlings

After germination test seedlings were evaluated as strong or weak. Seedlings will be designated as weak when primary root, cotyledon or primary leaf, spindly or poor developed seedling (Anon., 1983).

10. Seed vigour index (length)

A combination of standard germination test with seedling length provides evaluation of seedling vigour index. Vigour index will be calculated as per following formula given by Abdul-Baki and Anderson (1973),

\[ \text{Vigour index} = \text{Germination percentage} \times \text{Seedling length} \]

11. Seed vigour index (mass)

Vigour index is determined by multiplication of germination percentage with seedling dry weight on the day of final count. Abdul- Baki and Anderson (1973),

\[ \text{Vigour index mass} = \text{Germination percentage} \times \text{Seedling dry weight} \]

3.5 STATISTICAL ANALYSIS

Statistical analysis of the data was worked out using, factorial completely randomized design (Snedecor and Cochran, 1988) for each character and treatments will be compared by critical difference at 5 per cent level of significance.

Table 3.5.1 Structure of ANOVA for Factorial CRD

<table>
<thead>
<tr>
<th>Sources of variation</th>
<th>d. f.</th>
<th>Sum of squares</th>
<th>Mean sum of squares</th>
<th>Cal. F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genotypes (V)</td>
<td>(V-1)</td>
<td>( S_V )</td>
<td>( MS_V )</td>
<td>( MS_V / MS_E )</td>
</tr>
<tr>
<td>Storage period (S)</td>
<td>(S-1)</td>
<td>( S_S )</td>
<td>( MS_S )</td>
<td>( MS_S / MS_E )</td>
</tr>
<tr>
<td>Seed treatment (T)</td>
<td>(T-1)</td>
<td>( S_T )</td>
<td>( MS_T )</td>
<td>( MS_T / MS_E )</td>
</tr>
<tr>
<td>V×S</td>
<td>(V-1) (S-1)</td>
<td>( S_{V×S} )</td>
<td>( MS_{V×S} )</td>
<td>( MS_{V×S} / MS_E )</td>
</tr>
<tr>
<td>V×T</td>
<td>(V-1) (T-1)</td>
<td>( S_{V×T} )</td>
<td>( MS_{V×T} )</td>
<td>( MS_{V×T} / MS_E )</td>
</tr>
<tr>
<td>S×T</td>
<td>(S-1)(T-1)</td>
<td>( S_{S×T} )</td>
<td>( MS_{S×T} )</td>
<td>( MS_{S×T} / MS_E )</td>
</tr>
<tr>
<td>V×S×T</td>
<td>(V-1)(S-1)(T-1)</td>
<td>( S_{V×S×T} )</td>
<td>( MS_{V×S×T} )</td>
<td>( MS_{V×S×T} / MS_E )</td>
</tr>
<tr>
<td>Error</td>
<td>VSTR-1</td>
<td>( S_E )</td>
<td>( MS_E )</td>
<td>-</td>
</tr>
</tbody>
</table>
Where,

\[ R = \text{Number of repetition} \]
\[ V = \text{Number of genotypes} \]
\[ S = \text{Number of storage period} \]
\[ T = \text{Number of Seed treatments} \]
\[ S_V = \text{Sum of square due to genotypes} \]
\[ S_S = \text{sum of square due to storage} \]
\[ S_T = \text{Sum of square due to seed treatment} \]
\[ S_{V \times S} = \text{Sum of square due to genotype x storage period} \]
\[ S_{V \times T} = \text{Sum of square due to genotype x seed treatments} \]
\[ S_{S \times T} = \text{Sum of square due to storage period x seed treatments} \]
\[ S_{V \times S \times T} = \text{Sum of square due to genotype x storage period x seed treatment} \]
\[ S_E = \text{Sum of square due to error} \]
\[ MS_V = \text{mean sum of square of genotypes} \]
\[ MS_S = \text{mean sum of square of storage period} \]
\[ MS_T = \text{Mean sum of square of seed treatment} \]
\[ MS_E = \text{Mean sum of square of error} \]
\[ MS_{V \times S} = \text{Mean sum of square of genotype and storage} \]
\[ MS_{V \times T} = \text{Mean sum of square of genotypes and seed treatment} \]
\[ MS_{S \times T} = \text{Mean sum of square of storage period and seed treatment} \]
\[ MS_{V \times S \times T} = \text{Mean sum square of genotype x storage period x seed treatments} \]
\[ S.E_M = \sqrt{\frac{\text{EMS}}{t}} \]
\[ C. \ D. = S.E_M \times \sqrt{2} \times t \text{ (at cal t value at 5%)} \]
\[ C. \ V. \ (%) = \sqrt{\frac{\text{EMS}}{t}} \times 100 \]

Where,

\[ \text{EMS} = \text{Error mean square} \]
\[ \overline{X} = \text{Mean of particular character} \]