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Evaluating the Role of Temperature on the Germination of Sesame (*Sesamum indicum* L.)

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Abstract: The experiment was conducted in September 2016 at Ethiopian Biodiversity Institute genebank, germination laboratory, Ethiopia to investigate the effect of temperature on the three accessions of *sesame indicum* L. viz., *9015, 9026* and *241335 and (25°c, 30°c, 35°c, 40°c)* were used as the constant temperature gradient. The experiment was comprised of two factors, accession and temperature. And it was designed in factorial CRD with four replications. Analysis of variance showed that the main effects and the interaction effect were highly significant (*P<0.001*) for standard germination percentage. The result showed that, the highest germination (94%) was recorded at a temperature of 35°c though it was at par with the germination percentage obtained at a temperature of 30°c. However, at 40°c germination percentage decreased (86%). Whereas the lowest germination percentage (53%) was recorded at room temperature (25°c).This means that, higher temperatures are more suitable for germination of sesame accessions. Among the three sesame accessions considered for the study, the highest and the lowest germination percentage was obtained by (9015) and the (241335) respectively. This indicated that there is variation among the sesame accession.

Keywords: Accession, *Sesamum indicum*, Temperature, Germination

1. Introduction

Sesame is a flowering plant belonging to the family Pedaliaceae and genus Sesamum. The Genus consists of about 36 described species out of which the most commonly cultivated is *Sesamum indicum* L. (Falusi, 2006).

Cultivated sesame *(Sesamum indicum* L.) is an important and very ancient oil-yielding species cultivated extensively from the tropical to the temperate zones of the world; Africa, the Mediterranean, Central Asia, India, Burma, the Indies, Indo-China, China and Central and South America.

Sesame seeds (approximately 50% oil and 25% protein) are used in baking, candy making, and other food industries. Oil from the sesame seed is used in cooking and salad oils and margarine, and contains about 47% oleic and 39% linoleic acid. Sesame oil and foods fried in sesame oil have a long shelf life because the oil contains an antioxidant called sesamol. The oil can be also used in the manufacture of soaps, paints, perfumes, pharmaceuticals and insecticides. Sesame meal, left after the oil is pressed from the seed, is an excellent high-protein (34 to 50%) feed for poultry and livestock (Oplinger *et.al.*, 1990).

Despite all these benefits and uses, sesame seed germination rate and percentage were very low under room temperatures**.**

Germination is a crucial stage in the life cycle of plants and tends to be highly unpredictable over Space and time (S.S.Jamian *et.al.* 2014) and the optimum germination temperature differ by species (Kim *et.al*. 2016). The minimum and maximum temperature is very important for seed germination and there is not ample investigation about cardinal temperatures and the response of seed germination to varying temperatures for *Sesamum indicum* L. accessions. Moreover, high temperature may affect seed germination (Canadell *et. al*., 1991). In general, temperature has a great influence on the seed quality (Liu *et al.*, 2008).

Therefore, this study was initialed to evaluating role of temperature on seed germination and also to find the best range for germination of these sesame accessions.

2. Materials and Methods

The seeds of the three sesame accessions namely; 9015(white), 9026(black) and 241335(grey) were taken from Ethiopian Biodiversity Institute (EBI) genebank, Addis Ababa, Ethiopia. And germination tests were carried out at EBI genebank germination

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laboratory unit. The tests were done on the top of petridishe having size of 11 cm with the same size moisten filter paper.

2.1. Experimental design and treatments

3x5 factorial CRD design with four replications was used. Temperature gradients (25 ^{o}C, 30 ^{o}C, 35^{0}c, 40^{o}c, 45^{o}c) were used as the treatments with the three sesame accessions (9015, 9026 and 241335). In case of temperature, 25^{o}C was used as a control treatment. For each accession, 50 seeds were taken for germination testing.

2.2. Data collection

Standard germination tests were carried out and the petri dishes were incubated at temperatures mentioned above. Then seedlings were evaluated at 3 and 6 days after sowing and the mean normal seedlings were calculated as (ISTA, 2016).

Normal and abnormal seedlings and dead seeds were identified and recorded. The average germination % was calculated based on the final count by using the formula given below.

$$\text{Germination\%} = \frac{\text{Total number of normal seedling}}{\text{Total number of seeds planted}} \times 100$$

2.3. Data analysis

The collected data were subjected to statistical analysis as per the design using Statistical Analysis System (SAS, 2001) computer software. Where significant differences were detected, the mean separations were carried out using the least significant differences (LSD) at 0.05 level of probability.

3. Results and Discussions

Germination response of the three sesame accessions germplasm to temperature was studied over the range (25-40^{o}c) at a 5^{o}c interval by keeping other factors constant.

Analysis of variance showed that there was highly significant difference between different temperature regime, accessions as well as the interaction effect was also highly significant on germination of sesame(<0.001).

Regarding the different temperature regime, the highest germination (94%) was recorded at a temperature of 35^{o}c though it was at par with the germination percentage obtained at a temperature of 30^{o}c. However, at 40^{o}c germination percentage decreased (86%). The same result was also reported by (IIoh *et a*l., 2014) that at 40 and beyond, the germination percentage of Maize, rice and sorghum declined. Whereas the lowest germination percentage (53%) was recorded at room temperature (25^{o}c).This finding was in favor with that of (S.S.Jamian *et.al*., 2014).This means that, higher temperature are more suitable for germination of sesame accessions. This may be due to that high temperature may break innate dormancy, allowing their subsequent germination of seed (Koduru *et.al*.,2006) According to (Finch Savage *et.al*, 2001), increasing temperature has been reported to increase total germination percentage but exposure to any temperature beyond the optimum range for germination can negatively affect seed germination. Among the three sesame accessions considered for the study, the highest and the lowest germination percentage was obtained by (9015) and the (241335) respectively. This indicated that they have different optimum temperature requirement for germination. This may be due to the existence of variation among sesame germplasm.

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