##  Assessment on effect of growing seasons on seed yield and quality attributes of sesame (*sesamum indicum* l.) Genotypes

## ABSTRACT

## Sesame (*Sesamum indicum* L.) is a crucial oilseed crop known for its high nutritional value and economic significance. In India, it is cultivated across three seasons. Understanding which season is most suitable for achieving higher yield and good quality seed is essential for optimizing production. In light of this, the present investigation was carried out to assess the effect of growing seasons on seed yield and quality attributes of 20 sesame genotypes in during seasons *Kharif* 2023 and *Rabi* 2023-24 at S.V. Agricultural College, Tirupati. The field experiment was conducted in Randomized Block Design (RBD) for the evaluation of yield traits and for the evaluation of the quality traits Completely Randomized Design (CRD) was used in the laboratory. The Results indicated that under *Rabi* season higher values of traits such as ( Number of branches for plant, Capsule length, Number of capsules per plant, Number seeds per capsule, Test wight, Seed yield per plot, Field emergence percentage, Germination percentage, seedling length, seedling dry weight, seedling vigour index-I, seedling vigour index-II, oil content , protein content )were recorded , except for days to flowering, plant height, capsule breadth, seed moisture content, and electrical conductivity, which were higher during the *Kharif* season. This suggests that the cropping season impacts the growth behavior, leading to variations in seed yield and quality. Among the genotypes, 'Madhavi' demonstrated early maturity in both seasons, making it a potential early-maturing variety. 'Madhavi' also had the highest number of capsules per plant during the *Kharif* season, while 'GT-10' recorded the highest in the *Rabi* season. 'GT-10' excelled in seeds per capsule, capsule length and breadth, and test weight across both seasons, establishing it as a superior genotype for these traits. The highest seed yield was recorded by 'GT-10' in *Kharif* season, while 'Madhavi' had the highest yield in the *Rabi* season. The reduced yield in *Kharif* was attributed to phyllody disease, 'YLM-66' showed the highest field emergence in both seasons, indicating strong germination ability under different conditions. Regarding seed quality, 'Madhavi' had the highest oil and protein content, Seedling vigour index-I as well as the highest germination percentage in both *Kharif* and *Rabi* seasons. The genotype YLM-66 recorded highest seedling length in *kharif* season while YLM-11 recorded highest seedling length in *Rabi* season.

##  Key words : *Kharif*  season , *Rabi* season , attributes, nutritional value, optimizing production

## 1.0 INTRODUCTION

Sesame (*Sesamum indicum* L.) belonging to the family Pedaliaceae is the earliest domesticated oil seed crops of India and grown in the tropics and subtropics, in warm climates. India is among the largest exporters of sesame and ranks first in both acreage (1.523 million hectares) and production (0.802 million tonnes) with the average productivity of 527 kg ha-1 . (Anonymous 2022-23).

Sesame (*Sesamum indicum* L.) is a significant oilseed crop in Indian agriculture and is frequently referred as til. Sesame seeds provide plenty of protein (18-25%) and edible oil (48-55%) and it also comprises antioxidants, especially sesamolin and sesamin, safeguard the oil from going rancid and prolong its shelf life ( Wei *et al* 2022, Nanda and Agrawal, 2009, Nagendra prasad *et.al* 2012) . As a rainfed crop Sesame needs 45-50 cm rainfall. It grows best in areas having 21- 23 degrees temperature, frost, prolonged drought and heavy rains for a longer duration are harmful to this crop. Sesame, being an important oil seed crop of the nation, is grown in all the three growing season. Due to nutritional and medicinal values the crop is now gaining importance among the farmers, for which the demand of quality seed is increased (Monalisa and Swain 2017).

Seed is the basic and most important input in agriculture. Seed quality and yield depends on a large number of factors such as environmental, biotic and abiotic etc. Those factors of the production environment which impact the quality and yield of seeds produced include temperature, available moisture during seed development, maturation, incidence of pests and diseases, management practices, harvest conditions etc (Nema, 1989).

Variations in temperature, precipitation, photoperiod, and pollinator activity significantly impact plant growth, flowering, pollination, and seed production. Extreme temperatures, whether too hot or cold, hinder pollination and fertilization, reducing seed yields and quality (Chakrabarti *et al* 2011). Sufficient, timely rainfall is essential for successful seed development, while inadequate or excessive precipitation during critical growth phases can negatively affect seed quantity and quality (Maity *et al*.2016) Photoperiod sensitivity in some plants means that changes in day length influence flowering time and seed production. Finally, pollinator availability and activity levels directly affect pollination success, impacting seed set and yield. (Singh *et al* 2013).

Seasonal differences influence disease and pest activity, which can directly or indirectly affect seed production and quality. Infections during seed development reduce seed viability and germination rates. Water availability from rainfall or irrigation is crucial, as seasonal droughts can lead to smaller seeds and reduced seed filling, lowering yield. Seasonal variations also affect seed maturity timing, with premature harvesting or dormancy reducing seed quality. Some seeds may enter dormancy, delaying germination until favorable conditions, which vary seasonally.(Chakraborty and Newton 2011)

The planting value of a seed is decided by several number of elements, such as seedling growth rate, moisture content, germination and vigor. The vast majority of features are significantly influenced by the environmental factors present during crop growth and the time following harvest. The key issue among a number of problems is the establishment of regular stands in the field since quality seed is scarce, which lowers production.

Seed quality plays a vital role for successful crop production in sesame as in other crops. For the production and maintenance of higher quality seed, understanding the relationship between the growing season and seed quality is deemed crucial. Moreover, seasonal variations exist in large population in the productivity of many sesame genotypes.

In view of the above, the present investigation is planned to study the influence of two growing seasons (*Kharif* and *Rabi*) on the expression of different parameters of seed quality and yield of 20 sesame genotypes

## 2.0 MATERIAL AND METHODS

##  The study entitled " Assessment on effect of growing seasons on seed yield and quality attributes of sesame (*sesamum indicum* L.) genotypes" aimed to study the impact of different growing seasons on 20 sesame genotypes in which 17 are released varieties and 3(IC-205040,IC- 204159, EC-37019) are germplasm lines.The investigation sought to assess variations in seed yield parameters, seed quality attributes, and genotype-specific performance across seasons. The field experiment was laid out in a Randomized Block Design (RBD) with two replications and laboratory experiment by Completely Randomized Design (CRD) with four replications at S.V. Agricultural College 13.6241 N, 79.3780 E ,Tirupati. during *Kharif*, 2023 and *Rabi*, 2023-24.

## 2.1 Experimental site

##  The experimental site was quite uniform in respect of topography and fertility which is located at 13.6241° N, 79.3780° E. In the Kharif season, the crop was sown on (24-07-2023), and in the Rabi season, it was sown on (28-12-2023).The experiment was conducted on red soil, which is characteristic of the region.

The following methods were used to evaluate the sesame genotypes: **Days to 50% flowering** were recorded by observing plants daily during flowering, noting the day when 50% of the plants in each plot for each genotype flowered. **Days to maturity** was determined by counting the days from sowing until 90% of capsules matured and began browning before drying. **Plant height** was measured in centimeters from five randomly selected plants, excluding border rows, at the harvest stage. The average height was calculated for each genotype and replication. **Number of branches per plant** was recorded from five randomly selected plants at harvest. **Number of capsules per plant** was counted from five randomly selected plants, while **number of seeds per capsule** was calculated by counting seeds from five randomly selected capsules per plant. **Capsule length** and **capsule breadth** were measured by selecting five matured capsules from each plant, with averages c omputed for each trait. **Test weight** was calculated by weighing 1,000 seeds from each genotype after threshing. **Seed yield** (kg/ha) was recorded by harvesting and threshing the plants from each net plot, then converting the weight into kilograms per hectare. **Field emergence** percentage was determined by counting seedlings with shoots ≥10 cm, up to 10 days after sowing. **Oil content** was estimated using a Nuclear Magnetic Resonance (NMR) spectrophotometer at Indian Institute of oilseeds Research (Rajendranagar, Hyderabad). **Protein content** was calculated by multiplying the nitrogen content by a factor of 6.25, as per (Doubetz and Wells 1968). **Moisture content** was measured using an OSAW Digital Moisture Meter, and the average value was computed across replications. **Germination percentage** was determined following ISTA procedures, with the final germination count taken on the 6th day. **Root length** and **shoot length** were measured from 10 normal seedlings per replication, with **seedling length** being the sum of both. **Seedling vigor index-I** was calculated by multiplying germination percentage by seedling length, and **seedling dry weight** was determined by drying 10 representative seedlings at 75 ±1°C for 48 hours, followed by weighing. **Seedling vigor index-II** was calculated by multiplying germination percentage by seedling dry weight. Lastly, **electrical conductivity** of seed leachate was measured from 50 seeds soaked in 50 mL of deionized water for 8 hours, using a conductivity meter and expressed in µS/cm.

**3.0 Results and discussion**

 The growing season is known to affect the expression of various plant growth parameters, seed yield attributes and seed quality parameters of corps in the present investigation observations recorded on various yield and quality parameters in twenty sesame varieties/genotypes of sesame grown in two different seasons (*kharif* and *Rabi*). The results of which are discussed below.

**3.1 Days to 50% flowering**

There was a significant difference in the means among the genotypes for days to 50% flowering in both the seasons . In *kharif* season the mean values in respect of this trait ranged from 30.05(Chandhana) to 44.00(IC- 205040) with a general mean of 35.67 (Table 1). In *Rabi*season the mean values in respect of this trait ranged from 31.50(Madhavi) to 38.50 (JCS-36003, EC- 377019) with the general mean of (Table 2.) Comparative studies of the mean values of sesame genotypes on different seasons indicated that the earliest flowering occurred in *Rabi*, while the delayed flowering occurred in *kharif* season. The earliest flowering of the crop in *Rabi* could be due to accumulation of required growing degree days in a shorter period of time owing to favourable conditions during the season.

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety JCS-RF4 was having highest (39.75) and Chandana was lowest (31.25) in days to 50% flowering (Table 3). The similar findings were reported by Malli et al. (2015) . in which the analysis of variance revealed that there is significant difference among the genotypes in *kharif* and *Rabi* .

**3.2 Days to maturity**

 The analysis of variance for this trait showed that there was a significant difference among the genotypes in both *kharif* and *Rabi*. In *kharif* season the mean values in respect of this trait ranged from 86.00 (Madhavi, Chandhana, YLM-66 ) to 90.50 (IC- 205040) with a general mean of 87.82 (Table 1). In *Rabi* season the mean values in respect of this trait ranged from 86.00 (Madhavi) to 94.50 (SKL-8 ) with the general mean of 90.17 (Table 2.) Comparative studies of the mean values of sesame genotypes on different seasons indicated that the earliest maturity occurred in *kharif* , while the delayed maturity occurred in *Rabi* season.

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame varieties JCS-3603 & SKL-8 were having highest (91.25) and Madhavi was lowest (86.00)  in days to maturity (Table 3). The results of present investigation were in line with Monolisa *et a*l.(2017) in which the analysis of variance revealed that there is significant difference among the seasons *kharif* and *Rabi* for days to maturity.

**3.3 Plant height (cm)**

In the present investigation, significant variations among the sesame varieties/genotypes were observed for these character in both *kharif* and *Rabi* seasons. In *kharif* season the mean values in respect of this trait ranged from 96.60(IC-205040) to 143.00(JCS1020) with a general mean of 114.73. In *Rabi* season the mean values in respect of this trait ranged from 82.70(IC-205040) to 112.20 (Madhavi) with the general mean of 103.30. Comparative studies of mean value of sesame varieties in different seasons indicated that the shortest height of plants occurs in *Rabi* season while the tallest plants occurs in *kharif* season. As the length of vegetative phase is closely related to daily average temperature during crop growth, in the *Rabi* season as the minimum temperature was low that restricted vegetative growth resulting in development of shorter plants (Bhaumik et al.,2007).

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame, variety JCS-1020 was having highest (127.20) and IC-205040 was lowest (89.65) in plant height. The results were in harmony of the plant height in *kharif* and *Rabi* shows that the plant height was more in *kharif* than *Rabi*.

**3.4 No. of branches per plant**

There was a significant difference in the means among the genotypes for no. of branches per plant in both the seasons. In *kharif* season the mean values in respect of this trait ranged from 1.20 (JCS-1020) to 6.60(GT-10) with a general mean of 4.74. In *Rabi* season the mean values in respect of this trait ranged from 1.20(JCS-1020) to6.50(GT-10) ) with a general mean of 4.81.

Comparative studies of mean value of sesame varieties in different seasons indicated that the no. of branches per plant were recorded highest in *Rabi* than in *kharif*. The genotype GT-10 showed more no. of branches per plant and JCS- 1020 exhibited less no of branches in both *kharif* and in *Rabi* because the no of branches per plant are also other morphological characters determines yielding ability of crop through development of photosynthetic area and reproductive growth of plant.

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety GT-10 was having highest (6.55) and JCS1020 was lowest (1.20) in no. of branches per plant. The results were in accordance with Nisha Patel *et al*. (2022) for no. of branches per plant.

**3.5 Capsule length (cm)**

In the present investigation, significant variations among the sesame varieties/genotypes were observed for these trait in both the seasons. In *kharif* season the mean values in respect of this trait ranged from 2.17(SKL-8) to2.44(YLM-66) with general mean 2.26 (Table 1). In *Rabi* season the mean values in respect of this trait ranged from 2.32(JCS-3603) to 2.55(Madhavi) with the general mean 2.44 (Table 2).Comparative studies of mean value of sesame varieties in different seasons indicated that the size of capsules at the maturity stage of the crop is also an indicator of number of seeds present in the fruit/capsule which ultimately determines the yield potential of crop, S.P. Monalisa *et.al* 2017.

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety YLM-66 was having highest (2.49) and JCS-RF4 was lowest (2.23) in capsules length. The results were in harmony with with Malli *et al.*2014. for capsule length in *kharif* as well as in *Rabi* showing that there is a significant differences among seasons and genotypes and also had effect on yield.

 **3.6 Capsule breadth (cm)**

The analysis of variance for this character showed that there was a significant difference among the genotypes in both *kharif* and *Rabi* seasons. In *kharif* season the mean values in respect of this trait ranged from 0 .43(IC-2050400 to 0.58(GT-10) general mean recorded for the capsule breadth is 0.53. In *Rabi* season the mean values in respect of this trait ranged from 0.46(Rajeshwari) to 0.57(GT-10,YLM-66) general mean recorded for the capsule breadth is 0.52. Comparative studies of mean value of sesame varieties in different seasons indicated that Capsule breadth was more in *kharif* than in *Rabi* and GT-10 exhibited highest capsule breadth in both the seasons.

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety GT-10 was having highest (0.58) and Chandana was lowest (0.49) in capsules breadth. The results were reported by S.P. Monalisa *et.al* 2017. for capsule breadth among the genotypes and seasons which have positive effect on seed yield.

**3.7 No. of capsules per plant**

The analysis of variance for this trait showed that there was a significant difference among the genotypes in both *kharif* and *Rabi* seasons. In *kharif* season the mean values in respect of this trait ranged from 59.52(RMT-204) to 86.54(YLM-66) general mean for no. of capsules per plant in was 75.50. In *Rabi* season the mean values in respect of this trait ranged from 61.60 (RMT-204) to89.26(GT-10) with a general mean for no. of capsules per plant in was 79.16. Comparative studies of mean value of sesame varieties in different seasons indicated that Initiation of capsules is an important character of this crop. Significant variations among the sesame varieties/genotypes were observed in two seasons and the restricted vegetative growth of the plants in *kharif* season might be the reason for development of reduced number of capsules per plant.

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety YLM-66 was having highest (86.54) and RMT-204 was lowest (60.56) in no. of capsules per plant. The results were in harmony with Malli *et.al* 2015. for plant height in *kharif* and *Rabi* shows that the plant height was more in *kharif* than *Rabi*.

**3.8 No. of seeds per capsule**

In the present investigation, significant variations among the sesame varieties/genotypes were observed for these trait in both the seasons. In *kharif* season the mean values in respect of this trait ranged from 61.77(RMT-236, RMT- 204) to 74.13 (GT-10) with general mean 66.68 . In *Rabi* season the mean values in respect of this trait ranged from 60.56 (SI-554) to 73.30(GT-10) with the general mean of 70.78(Table 2).

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety GT-10 was having highest (73.32) and SI-554 was lowest (63.26) in no. of seeds per capsule The results were in harmony with Malli *et.al* 2015. for these trait in *kharif* and *Rabi* shows that the no.of seeds per capsule is positively significant on yield .

**3.9 Test weight (g)**

There was a significant difference in the means among genotypes for test weight in both *kharif* and *Rabi* seasons. In *kharif* season the mean values in respect of this trait ranged from 2.26 (YLM-11) to 2.78(GT-10) general mean recorded for the test weight is 2.42. In *Rabi* season the mean values in respect of this trait ranged from 2.78(YLM-11) to 3.65(Madhavi) ) general mean recorded for the test weight is 3.20. Comparative studies of mean value of sesame varieties in different seasons indicated that among the genotypes GT-10 and Madhavi performed well in both the seasons. The test weight has significant effect on yield and the test weight in *kharif* is very less when compared to *Rabi* due to high incidence of phyllody during the crop period.

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame varieties GT-10 & Madhavi were having highest (3.19) and YLM11 was lowest (2.52) in test weight. The results were in accordance with Nisha Patel *et al*. 2022. for test weight in *kharif* and *Rabi* and revealed the prevalence of significant differences among the genotypes.

**3.10 Seed yield per plot (kg/ha)**

The analysis of variance for this trait showed that there was a significant difference among the genotypes in both *kharif* and *Rabi* seasons. In *kharif* season the mean values in respect of this trait ranged from 149.42(SI-554) to 190.01(GT-10) general mean recorded for the test weight 171.86. In *Rabi* season the mean values in respect of this trait ranged from 361.45(EC-204159) to 544.13 (Madhavi) general mean recorded for the test weight 445.84. Comparative study of mean value of sesame varieties in different seasons indicated that there was a significant difference among the seasons for seed yield per plot.

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety GT-10 was having highest (365.96) and IC-205040 was lowest (261.68) in seed yield per plot. The result was the greater differences between the seasons for the seed yield is due to the disease incidence of phyllody during *kharif* season. The studies of Ahmed *et al*. (2022) revealed that due to the infection of phyllody the infected plants had 37.9% lower yield and 42.5% oil content and similar findings were noticed in the present investigation

**3.11 Field emergence percentage**

In the present investigation, significant variations among the sesame varieties/genotypes were observed for these trait in both *kharif* and *Rabi* seasons. In *kharif* season the mean values in respect of this trait ranged from 70.63(JCS-3603) to 83.13(YLM-66) general mean recorded for the field emergence percentage is 67.15. In *Rabi* season the mean values in respect of this trait ranged from 86.95(IC204159 to 97.51(GT-10) general mean recorded for the test weight 79.93. Comparative study of mean value of sesame varieties in different seasons indicated that YLM-66 emerged better in the field in both *Kharif* and *Rabi* seasons. The means of two seasons for field emergence in *kharif* (77.00) and *Rabi* (93.59) showed that the more field emergence was recorded in *Rabi* than *kharif* due to the conditions in the field where seed germinate and seedlings emerge out from the soil are less favourable.

 The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety YLM-66 was having highest (90.41) and IC204159 was lowest (79.48) in field emergence.

**3.12 Oil content (%)**

The analysis of variance for this character showed that there was a significant difference among the genotypes in both *kharif* and *Rabi*. In *kharif* season oil content was ranged from 21.95(SI46-1) to 37.77 (Madhavi) with a general mean of 28.39 (Table 4). In *Rabi* season the mean values in respect of this trait ranged from 38.80 (IC- 204159) to 51.50 (Madhavi, JCS1020) with general mean of 45.35 (Table 5). The means of the two seasons showed that the *kharif* season recorded less oil content due to phyllody incidence. Across the seasons, Madhavi yielded higher oil content among all the genotypes.

 The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety Madhavi was having highest (44.46) and SI46-1 was lowest (31.10) oil content (Table 6). The results of present investigation are in harmony with Ahmed *et al*. (2022) .

 **3.13 Protein content (%)**

The analysis of variance for this trait showed that there was a significant difference among the genotypes in both *kharif* and *Rabi*. In *kharif* season the mean values in respect of this trait ranged from 12.83 (SKL-8) to 16.12 (Madhavi) with a general mean of 14.32 (Table 4). In *Rabi* season the mean values in respect of this trait ranged from 15.40 (IC- 204159) to 19.65 (Madhavi) with general mean of 17.14 (Table 5). The means of the two seasons showed that the *kharif* season recorded less protein content than the *Rabi* due to disease infection by phyllody disease The phyllody shows greatest impact on seed coat membrane which leads to decrease of endosperm content so that less protein content was observed in *kharif*.

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety Madhavi was having highest (17.89) and IC-205040 was lowest (14.62) protein content (Table 6). The results of present investigation are in line with Ahmed, E et al. (2022) .

 **3.14 Moisture content (%)**

In the present investigation, significant variations among the sesame varieties/genotypes were observed for these trait in both *kharif* and *Rabi* seasons in *kharif* season the mean values in respect of this trait ranged from 6.52(Madhavi) to 8.53 (IC-205040 and SKL-8) with general mean of 7.55 (Table 4). In *Rabi* seasons the mean values in respect of this trait ranged from 6.60 (Madhavi, YLM-66, YLM-17) to (8.32) with general study this trait showed presence of significant variation among the sesame mean of 7.43(Table5).

**Table 1. Influence of *Kharif* season on seed yield parameters of twenty sesame genotypes**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Genotypes** | **Days to 50% flowering** | **Days to maturity** | **Plant height** | **No. of branches per plant** | **Capsule length** | **Capsule breadth** | **No. of capsules per plant** | **No. of seeds per capsule**  | **Test weight** | **Seed yield per plot** | **Field emergence percentage**  |
| **1** | **RMT-204** | 35.00 | 88.50 | 118.00 | 4.80 | 2.37 | 0.50 | 59.52 | 61.77 | 2.27 | 173.15 | 77.00 (61.34) |
| **2** | **IC-205040** | 44.00 | 90.50 | 96.60 | 4.60 | 2.34 | 0.43 | 72.50 | 67.20 | 2.24 | 156.31 | 73.00(58.69) |
| **3** | **SI146-1** | 38.50 | 89.50 | 97.50 | 4.80 | 2.18 | 0.47 | 71.60 | 62.60 | 2.38 | 178.20 | 75.45 (60.30) |
| **4** | **IC204159** | 36.50 | 88.00 | 105.80 | 4.80 | 2.29 | 0.47 | 73.50 | 62.30 | 2.41 | 172.22 | 72.00 (58.05) |
| **5** | **EC-377019** | 39.00 | 90.00 | 106.90 | 4.60 | 2.37 | 0.55 | 75.08 | 68.27 | 2.37 | 166.20 | 71.75 (57.89) |
| **6** | **RMT-236** | 39.50 | 88.00 | 114.80 | 5.20 | 2.21 | 0.51 | 70.00 | 61.77 | 2.44 | 153.24 | 76.00 (60.67) |
| **7** | **JCS-3603** | 38.50 | 89.00 | 118.00 | 4.40 | 2.26 | 0.55 | 74.74 | 68.31 | 2.27 | 158.53 | 70.63 (57.18) |
| **8** | **SKL-8** | 39.50 | 88.00 | 109.40 | 4.50 | 2.17 | 0.53 | 75.50 | 64.70 | 2.45 | 157.52 | 75.00 (60.00) |
| **9** | **YLM-17** | 33.50 | 88.50 | 107.30 | 5.20 | 2.26 | 0.53 | 75.64 | 63.50 | 2.39 | 181.70 | 77.38(61.60) |
| **10** | **SI-554** | 38.00 | 88.50 | 103.90 | 4.40 | 2.13 | 0.56 | 71.00 | 65.95 | 2.28 | 149.42 | 76.25 (60.83) |
| **11** | **RAJESHWARI** | 31.50 | 88.00 | 134.00 | 4.30 | 2.34 | 0.55 | 73.63 | 63.50 | 2.43 | 175.41 | 76.63(61.09) |
| **12** | **JCS-RF-4** | 41.00 | 89.50 | 119.60 | 4.70 | 2.04 | 0.51 | 75.76 | 64.59 | 2.46 | 160.83 | 75.50(60.33) |
| **13** | **GT-10** | 31.50 | 87.00 | 126.70 | 6.60 | 2.39 | 0.58 | 85.43 | 74.13 | 2.78 | 190.01 | 82.25(65.08) |
| **14** | **GOURI** | 36.00 | 88.50 | 107.90 | 4.70 | 2.22 | 0.54 | 71.82 | 68.32 | 2.46 | 171.19 | 77.53(61.70) |
| **15** | **MADHAVI** | 31.50 | 86.00 | 120.70 | 5.60 | 2.36 | 0.57 | 85.48 | 71.60 | 2.72 | 189.40 | 81.00(64.16) |
| **16** | **YLM-66** | 31.50 | 86.00 | 107.10 | 5.40 | 2.44 | 0.58 | 84.88 | 71.50 | 2.64 | 188.35 | 83.13(65.75) |
| **17** | **YLM-146** | 32.50 | 87.50 | 116.10 | 5.30 | 2.36 | 0.53 | 81.80 | 71.50 | 2.41 | 187.83 | 80.63(63.89) |
| **18** | **YLM-11** | 33.50 | 86.50 | 106.50 | 5.40 | 2.30 | 0.56 | 76.50 | 71.10 | 2.26 | 182.65 | 81.50(64.53) |
| **19** | **JCS1020** | 32.50 | 88.50 | 143.00 | 1.20 | 2.21 | 0.52 | 78.67 | 62.78 | 2.40 | 161.43 | 77.59(61.75) |
| **20** | **Chandhana** | 30.50 | 86.00 | 134.80 | 4.40 | 2.29 | 0.56 | 80.62 | 69.27 | 2.47 | 183.38 | 79.93(63.38) |
|  | **Grand mean** | **35.67** | **87.82** | **114.73** | **4.74** | **2.26** | **0.53** | **75.50** | **66.68** | **2.42** | **171.86** | **77.00** |
|  | **SEm (±)** | **0.68** | **0.41** | **4.48** | **0.18** | **0.07** | **0.02** | **2.67** | **2.41** | **0.09** | **5.56** | **2.13** |
|  | **CD (0.05)** | **2.00** | **1.24** | **13.44** | **0.54** | **0.23** | **0.07** | **8.01** | **7.24** | **0.27** | **16.68** | **6.40** |
|  | **CV** | **2.70** | **0.66** | **5.52** | **5.38** | **4.87** | **6.75** | **5.00** | **5.12** | **5.43** | **4.57** | **3.92** |

**Table 2. Influence of *Rabi* season on seed yield parameters of twenty sesame genotypes**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Genotypes** | **Days to 50% flowering** | **Days to maturity** | **Plant height** | **No. of branches per plant** | **Capsule length** | **Capsule breadth** | **No. of capsules per plant** | **No. of seeds per capsule**  | **Test weight** | **Seed yield per plot** | **Field emergence percentage**  |
| **1** | **RMT-204** | 34.50 | 91.00 | 92.80 | 4.60 | 2.34 | 0.52 | 61.60 | 69.30 | 3.21 | 412.75 | 89.65(71.23) |
| **2** | **IC-205040** | 34.00 | 91.50 | 82.70 | 4.70 | 2.48 | 0.57 | 74.50 | 70.80 | 3.00 | 367.04 | 89.38(70.98) |
| **3** | **SI146-1** | 38.50 | 92.50 | 100.20 | 4.70 | 2.44 | 0.54 | 74.20 | 72.60 | 3.00 | 405.12 | 89.04 (70.67) |
| **4** | **IC204159** | 38.00 | 93.00 | 106.90 | 4.20 | 2.44 | 0.52 | 80.00 | 69.60 | 3.30 | 440.15 | 86.95 (68.82) |
| **5** | **EC-377019** | 38.50 | 90.50 | 104.20 | 4.40 | 2.38 | 0.57 | 75.65 | 70.70 | 2.80 | 361.45 | 95.42(77.64) |
| **6** | **RMT-236** | 37.00 | 91.00 | 99.00 | 5.30 | 2.46 | 0.52 | 81.80 | 69.00 | 2.90 | 396.08 | 93.98(75.80) |
| **7** | **JCS-3603** | 38.50 | 93.50 | 108.10 | 4.50 | 2.32 | 0.52 | 70.00 | 66.00 | 3.40 | 387.34 | 93.98(75.80) |
| **8** | **SKL-8** | 38.00 | 94.50 | 92.80 | 4.50 | 2.36 | 0.47 | 87.10 | 69.50 | 3.00 | 451.18 | 88.75(70.40) |
| **9** | **YLM-17** | 37.00 | 89.50 | 103.60 | 5.30 | 2.52 | 0.53 | 77.43 | 68.20 | 3.20 | 480.17 | 94.50(76.44) |
| **10** | **SI-554** | 38.00 | 87.50 | 97.60 | 5.00 | 2.35 | 0.46 | 81.30 | 60.56 | 3.25 | 391.52 | 94.00(75.82) |
| **11** | **RAJESHWARI** | 36.00 | 92.50 | 109.10 | 4.30 | 2.36 | 0.53 | 78.30 | 71.80 | 3.10 | 440.09 | 96.00 (78.46) |
| **12** | **JCS-RF-4** | 38.50 | 92.50 | 106.60 | 4.70 | 2.42 | 0.49 | 71.10 | 69.10 | 3.15 | 375.75 | 93.66 (75.42) |
| **13** | **GT-10** | 33.00 | 88.00 | 106.60 | 6.50 | 2.54 | 0.57 | 89.26 | 73.30 | 3.60 | 541.90 | 97.51(80.92) |
| **14** | **GOURI** | 33.50 | 91.00 | 110.40 | 4.70 | 2.39 | 0.55 | 78.60 | 69.80 | 3.20 | 396.39 | 94.50 (76.44) |
| **15** | **MADHAVI** | 31.50 | 86.00 | 112.90 | 5.50 | 2.55 | 0.57 | 88.30 | 73.00 | 3.65 | 554.13 | 97.50(80.90) |
| **16** | **YLM-66** | 33.00 | 86.50 | 99.20 | 5.40 | 2.53 | 0.52 | 87.49 | 72.80 | 3.55 | 541.34 | 97.69 (81.26) |
| **17** | **YLM-146** | 36.50 | 90.00 | 111.20 | 5.20 | 2.51 | 0.52 | 87.10 | 70.30 | 3.45 | 529.30 | 96.15(78.68) |
| **18** | **YLM-11** | 35.50 | 89.50 | 101.60 | 5.30 | 2.53 | 0.52 | 81.90 | 70.20 | 2.78 | 525.05 | 93.75 (75.52) |
| **19** | **JCS1020** | 35.50 | 87.00 | 111.40 | 1.20 | 2.42 | 0.47 | 80.40 | 72.50 | 3.42 | 425.24 | 93.63(75.38) |
| **20** | **Chandhana** | 32.00 | 87.50 | 105.00 | 4.40 | 2.51 | 0.42 | 84.48 | 72.50 | 3.21 | 495.93 | 92.50 (74.11) |
|  |  **Grand mean** | **35.57** | **90.17** | **103.30** | **4.81** | **2.44** | **0.52** | **79.16** | **70.78** | **3.20** | **445.84** | **93.59** |
|  |  **SEm (±)** | **0.97** | **0.98** | **4.11** | **0.17** | **0.04** | **0.01** | **3.16** | **2.98** | **0.11** | **4.80** | **2.60** |
|  |  **CD (0.05)** | **2.91** | **2.94** | **12.32** | **0.52** | **0.14** | **0.04** | **9.54** | **8.93** | **0.34** | **14.44** | **7.81** |
|  |  **CV** | **3.86** | **1.54** | **5.62** | **5.13** | **2.83** | **4.16** | **5.64** | **5.98** | **5.11** | **1.52** | **3.93** |

 **Table. 3 Influence of growing seasons (*kharif*, *Rabi*) on seed yield parameters of twenty sesame genotypes (Mean of two seasons)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Genotypes** | **Days to 50% flowering** | **Days to maturity** | **Plant height** | **No. of branches per plant** | **Capsule length** | **Capsule breadth** | **No. of capsules per plant** | **No. of seeds per capsule**  | **Test weight** | **Seed yield per plot** | **Field emergence percentage**  |
| **1** | **RMT-204** | 34.75 | 89.75 | 105.40 | 4.70 | 2.36 | 0.51 | 60.56 | 65.54 | 2.74 | 292.95 | 83.33 |
| **2** | **IC-205040** | 39.00 | 91.00 | 89.65 | 4.65 | 2.41 | 0.50 | 67.03 | 69.00 | 2.62 | 261.68 | 81.19 |
| **3** | **SI146-1** | 38.50 | 91.00 | 98.85 | 4.75 | 2.31 | 0.51 | 73.26 | 67.60 | 2.69 | 291.66 | 82.25 |
| **4** | **IC204159** | 37.25 | 90.50 | 106.35 | 4.60 | 2.37 | 0.50 | 74.88 | 65.95 | 2.86 | 306.19 | 79.48 |
| **5** | **EC-377019** | 38.75 | 90.25 | 105.55 | 4.50 | 2.38 | 0.56 | 76.06 | 69.49 | 2.59 | 263.83 | 89.59 |
| **6** | **RMT-236** | 38.25 | 89.50 | 106.90 | 5.25 | 2.34 | 0.52 | 76.63 | 65.39 | 2.67 | 274.66 | 84.99 |
| **7** | **JCS-3603** | 38.50 | 91.25 | 113.05 | 4.45 | 2.29 | 0.54 | 75.14 | 67.16 | 2.84 | 272.94 | 82.31 |
| **8** | **SKL-8** | 38.75 | 91.25 | 101.10 | 4.50 | 2.27 | 0.50 | 76.84 | 67.10 | 2.73 | 304.35 | 81.88 |
| **9** | **YLM-17** | 35.25 | 89.00 | 105.45 | 5.25 | 2.39 | 0.53 | 78.92 | 65.85 | 2.80 | 330.94 | 85.94 |
| **10** | **SI-554** | 38.00 | 88.00 | 100.75 | 4.70 | 2.24 | 0.51 | 76.34 | 63.26 | 2.77 | 270.47 | 85.13 |
| **11** | **RAJESHWARI** | 33.75 | 90.25 | 121.55 | 4.30 | 2.35 | 0.54 | 76.06 | 67.65 | 2.77 | 307.75 | 86.32 |
| **12** | **JCS-RF-4** | 39.75 | 91.00 | 113.10 | 4.70 | 2.23 | 0.50 | 74.70 | 66.85 | 2.81 | 268.29 | 84.58 |
| **13** | **GT-10** | 32.25 | 87.50 | 116.65 | 6.55 | 2.47 | 0.58 | 80.39 | 73.72 | 3.19 | 365.96 | 89.88 |
| **14** | **GOURI** | 34.75 | 89.75 | 109.15 | 4.70 | 2.31 | 0.55 | 81.22 | 69.06 | 2.83 | 283.79 | 86.02 |
| **15** | **MADHAVI** | 31.50 | 86.00 | 116.80 | 5.55 | 2.46 | 0.57 | 81.00 | 72.25 | 3.19 | 371.77 | 89.25 |
| **16** | **YLM-66** | 32.25 | 86.25 | 103.15 | 4.95 | 2.49 | 0.55 | 86.54 | 72.15 | 3.10 | 364.85 | 90.41 |
| **17** | **YLM-146** | 34.50 | 88.75 | 113.65 | 5.35 | 2.44 | 0.53 | 84.99 | 70.95 | 2.93 | 358.57 | 88.39 |
| **18** | **YLM-11** | 34.50 | 88.00 | 104.05 | 5.35 | 2.42 | 0.54 | 81.50 | 70.65 | 2.52 | 353.85 | 87.63 |
| **19** | **JCS1020** | 34.00 | 87.75 | 127.20 | 1.20 | 2.42 | 0.50 | 79.37 | 67.64 | 2.91 | 293.34 | 85.61 |
| **20** | **Chandhana** | 31.25 | 86.75 | 119.90 | 4.80 | 2.40 | 0.49 | 81.04 | 70.89 | 2.84 | 339.66 | 86.22 |

Comparative studies of the mean values of sesame genotypes on different seasons indicated that the lowest content of moisture percentage occurred in *Rabi* season (7.43), while the highest occurs in *kharif* season (7.55) . This indicated that the moisture content in the seed is influenced by climatic conditions and genotypes. The genotypes IC-205040 and Madhavi exhibited highest and lowest moisture content in both the seasons.

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety IC-205040 was having highest (8.43) and Madhavi was lowest (6.56) moisture content (Table 6). The results are in line with Kulkarni *et.al*. (2017).

 **3.15 Germination percentage (%)**

In the present investigation, significant variations among the sesame varieties/genotypes were observed for these trait in both *kharif* and *Rabi* seasons.. In *kharif* season the mean values in respect of this trait ranged from 56.50 (SI46-1) to 77.75 (Madhavi) with general mean of 67.15 (Table 4). In *Rabi* season the mean values in respect of this trait ranged from 71.00 (SI- 554) to 86.00 (Madhavi) with general mean of 79.93 (Table 5). The germination percentage in *kharif* was recorded very less when compared to the *Rabi* due to heavy infestation by phyllody during the growth period resulted in poor germination percentage.

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety Madhavi was having highest (81.88) and YLM-11 was lowest (66.25) in germination percentage (Table 6).

 **3. 16 Shoot length (cm)**

The analysis of variance for this trait showed that there was a significant difference among the genotypes in both the seasons. In *kharif* season the highest shoot length was recorded by YLM-11 (8.06) and the lowest shoot length was recorded by IC-204159 (7.18) with general mean of 7.57 (Table 4). In *Rabi* season the highest shoot length was recorded by Madhavi (8.79) and lowest is in RMT-204 (7.41) (Table 5) .The mean values of *kharif* and *Rabi* shows that the highest shoot length was recorded in *Rabi* (8.27) than *kharif* (7.57).

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety YLM-11 was having highest (8.39) and RMT-204 was lowest (7.33) in shoot length (Table 6 ).

 **3.17 Root length (cm)**

In the present investigation, significant variations among the sesame varieties/genotypes were observed for these trait in both *kharif* and *Rabi* seasons. In *kharif* season the mean values in respect of this character ranged from 8.03 (RMT-204) to 9.41(GT-10) with general mean of 8.75 (Table 4). In *Rabi* season the mean values in respect of this trait ranged from 8.54(JCS-1020) to 9.69(RMT-204) with general mean of 9.14(Table 5). Comparative study of this trait revealed that the smallest root length occurs in *kharif* while the longest root length occurs in *Rabi* .

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame varieties SKL-8, GT-10 were having highest (9.39) and JCS-1020 lowest (8.36) in root length (Table 6).

**3.18 Seedling length (cm)**

There was a significant difference in the means among genotypes for these character in both *kharif* and *Rabi*seasons.. In *kharif* season the mean values in respect of this trait ranged from 15.27(RMT-204) to 16.97(YLM-66) with general mean of 16.32 (Table 4) . In *Rabi* season the mean values in respect of this trait ranged from 16.71 (EC-377019) to 18.10(YLM-11) with general mean of 17.45 (Table 5). The mean for seedling length in *kharif* and *Rabi* showed that the length of the seedling is more in *Rabi* season than *kharif* season .

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety GT-10 was having highest (17.42) and SI46-1 was lowest (16.17) in seedling length (Table 6).

**3.19 Seedling vigour index-I**

In the present investigation, significant variations among the sesame varieties/genotypes were observed for these trait in both *kharif* and *Rabi* seasons. In *kharif* season the mean values in respect of this character ranged from795.74 (Rajeshwari) to 1313.60(Madhavi) with general mean of 1096.71 (Table 4). In *Rabi* season the mean values in respect of this character ranged from 1216.81 (SI-554) to 1526.17(Madhavi) with general mean of 1396.25(Table 5). The mean for Seedling vigour index-I in *kharif* and *Rabi* showed that the Seedling vigour index-I is more in *Rabi* season than *kharif* season .

 The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety Madhavi was having highest (1419.89) and Rajeshwari was lowest (1130.51) in shoot seedling vigour index-I(Table 6)*.*

**3.20 Seedling dry weight (g)**

There was a significant difference in the means among genotypes for these trait in both *kharif* and *Rabi*seasons. In the present investigation, significant variations among the sesame varieties/genotypes were observed for these trait in both *kharif* and *Rabi* seasons. In *kharif* season the highest Seedling dry weight was recorded by Madhavi (0.045) and the lowest Seedling dry weight was recorded by Rajeshwari (0.032) with general mean of 0.038 (Table 4). In *Rabi* season the Seedling dry weight the highest shoot length was recorded by GT-10 (0.049) and lowest is in SI46-1 (0.032) With general mean of 0.039 (Table 5). The mean values of *kharif* and *Rabi* shows that the highest shoot length was recorded in *Rabi* than *kharif* .

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety GT-10 was having highest (0.047) and EC-377019 was lowest (0.0325) in seedling dry weight (Table 6). Seasonal variation in respect of this character has been reported earlier in sorghum varieties (Deshpande et al., 2002) and in hybrid bajra BJ104 (Raja Rao, 1986).

**3.21 Seedling Vigour index- II**

The analysis of variance for this character showed a significant difference among the genotypes in both *kharif* and *Rabi* seasons. In *kharif* season the mean values in respect of this character ranged from 1.89 (Rajeshwari) to 3.26 (GT-10, YLM-66) with general mean of 2.54 (Table 4). In *Rabi* season the mean values in respect of this character ranged from 2.51 (SI-554) to 3.64 (Madhavi, GT-10 ) with general mean of 3.15 (Table 5). The mean for Seedling vigour index-II in *kharif* and *Rabi* showed that the Seedling vigour index-II is more in *Rabi* season than *kharif* season

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety GT-10 was having highest (3.28) and Rajeswari was lowest (2.32) in   seedling vigour index-II(Table 6)*.* Seasonal variation in respect of this character has been reported earlier in sorghum varieties (Deshpande et al., 2002) and in hybrid bajra BJ104 (Raja Rao, 1986).

 **3.22 Electrical conductivity (µS/cm)**

 There was a significant difference in the means among genotypes for these trait in both *kharif* and *Rabi*seasons. In *kharif* season the mean values in respect of this trait ranged from 31.86 (YLM-66) to 51.61 (SI46-1) with general mean 41.83 (Table 4). In *Rabi* season the mean values in respect of this trait ranged from 30.68 (Madhavi) to 50.35 (EC-377019) with general mean of 40.05 (Table 5). The Electrical conductivity in *kharif* was recorded more when compared to the *Rabi*. The high electrical conductivity in *kharif* season is due to the shrivelled seed which have less integrity of membrane which results in in more leakage of organic solutes.

The pooled mean values of the varieties / genotypes over two seasons shown that the sesame variety EC-377019 was having highest (50.21) and Madhavi was lowest (32.86) in EC (Table 6 ).

**CONCLUSIONS**

This study demonstrated the substantial influence of growing seasons on the yield and quality attributes of sesame genotypes. While the *Rabi* season generally produced higher values for most traits, the *Kharif* season posed challenges such as disease incidence, which affected yield outcomes. Genotype-specific performance also varied across seasons, with 'Madhavi' and 'GT-10' emerging as superior genotypes in terms of yield, quality, and seedling vigor. These findings can guide future sesame breeding and cultivation practices, helping to optimize yield and quality under different seasonal conditions. The genotypes which were showed better performance in kharif , Rabi and in both seasons were represented in (Table 7).

**Table 4. Influence of *kharif* season on seed quality parameters of twenty sesame genotypes**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Genotypes** | **Oil content(%)**  | **Protein content(%)** | **Moisture content(%)** | **Germination percentage(%)** | **Shoot length(cm)** | **Root length(cm)** | **Seedling length(cm)** | **Seedling****Vigour index-I** | **Seedling dry weight** | **Seedling Vigour index-II** | **Electrical conductivity (µs cm-1)**  |
| **1** | **RMT-204** | 24.53 | 13.36 | 7.22 | 70.00 (56.79) | 7.24 | 8.03 | 15.27 | 1068.68 | 0.033 | 2.28 | 41.59 |
| **2** | **IC-205040** | 27.6 | 13.83 | 8.53 | 64.75 (53.58) | 7.45 | 8.25 | 15.7 | 1016.96 | 0.035 | 2.30 | 45.27 |
| **3** | **SI146-1** | 21.95 | 13.07 | 8.23 | 56.50 (48.73) | 7.54 | 7.92 | 15.45 | 908.39 | 0.042 | 2.08 | 51.61 |
| **4** | **IC204159** | 23.91 | 14.2 | 8.23 | 67.75 (55.4) | 7.18 | 8.95 | 16.13 | 1093.10 | 0.035 | 2.41 | 45.39 |
| **5** | **EC-377019** | 29.21 | 14.08 | 7.82 | 70.00 (56.79) | 7.56 | 9.07 | 16.63 | 1187.69 | 0.032 | 2.30 | 50.06 |
| **6** | **RMT-236** | 22.13 | 14.5 | 8.23 | 68.50 (55.86) | 7.50 | 9.01 | 16.76 | 1153.17 | 0.034 | 2.32 | 42.59 |
| **7** | **JCS-3603** | 27.77 | 13.34 | 7.42 | 60.50 (51.06) | 7.41 | 7.69 | 15.1 | 1017.28 | 0.036 | 2.36 | 46.71 |
| **8** | **SKL-8** | 27.51 | 12.83 | 8.53 | 73.25 (58.86) | 7.26 | 9.39 | 16.65 | 1068.00 | 0.042 | 2.82 | 47.4 |
| **9** | **YLM-17** | 25.01 | 14.92 | 6.82 | 65.50 (54.03) | 6.83 | 9.25 | 16.08 | 1015.55 | 0.042 | 3.03 | 43.85 |
| **10** | **SI-554** | 24.12 | 13.84 | 7.42 | 68.25 (55.7) | 7.71 | 9.1 | 16.81 | 1147.01 | 0.035 | 2.46 | 40.11 |
| **11** | **RAJESHWARI** | 28.1 | 13.86 | 7.32 | 59.00 (50.18) | 7.82 | 8.93 | 16.76 | 795.74 | 0.032 | 1.89 | 38.79 |
| **12** | **JCS-RF-4** | 28.79 | 13.87 | 8.23 | 61.00 (51.35) | 7.40 | 8.95 | 16.65 | 1012.37 | 0.042 | 2.23 | 46.95 |
| **13** | **GT-10** | 35.79 | 15.29 | 6.82 | 74.25 (59.51) | 7.75 | 9.41 | 16.84 | 1244.88 | 0.044 | 3.26 | 34.59 |
| **14** | **GOURI** | 28.83 | 13.86 | 7.22 | 72.75 (58.53) | 7.47 | 8.93 | 16.4 | 1192.89 | 0.036 | 2.53 | 35.69 |
| **15** | **MADHAVI** | 37.77 | 16.12 | 6.52 | 77.75 (61.86) | 7.88 | 9.01 | 16.89 | 1313.60 | 0.045 | 3.10 | 35.03 |
| **16** | **YLM-66** | 37.39 | 15.97 | 6.82 | 75.50 (60.33) | 7.90 | 9.07 | 16.97 | 1255.39 | 0.042 | 3.26 | 31.86 |
| **17** | **YLM-146** | 32.84 | 15.18 | 6.93 | 70.75 (57.26) | 7.90 | 8.91 | 16.82 | 1219.93 | 0.042 | 3.03 | 35.57 |
| **18** | **YLM-11** | 29.18 | 14.73 | 7.62 | 57.25 (49.17) | 8.06 | 7.92 | 15.97 | 1074.27 | 0.036 | 2.63 | 37.04 |
| **19** | **JCS1020** | 34.39 | 14.35 | 7.82 | 62.25 (52.09) | 7.60 | 8.18 | 15.78 | 982.42 | 0.036 | 2.39 | 47.04 |
| **20** | **Chandhana** | 30.32 | 15.28 | 7.42 | 69.00 (56.17) | 7.86 | 9.06 | 16.92 | 1166.79 | 0.036 | 2.82 | 39.59 |
|  |  **Grand mean** | **28.39** | **14.32** | **7.55** | **67.15** | **7.57** | **8.75** | **16.32** | **1096.71** | **0.038** | **2.54** | **41.83** |
|  |  **SEm (±)** | **0.05** | **0.26** | **0.09** | **0.87** | **0.15** | **0.19** | **0.24** | **23.77** | **0.001** | **0.05** | **0.46** |
|  |  **CD (0.05)** | **0.14** | **0.73** | **0.28** | **2.46** | **0.42** | **0.54** | **0.7** | **67.26** | **0.002** | **0.16** | **1.32** |
|  |  **CV** | **0.23** | **3.65** | **2.62** | **2.59** | **3.98** | **4.36** | **3.06** | **4.33** | **2.9** | **4.64** | **2.23** |

**Table 5. Influence of *Rabi* season on seed quality parameters of twenty sesame genotypes**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Genotypes** | **Oil content(%)**  | **Protein content(%)** | **Moisture content(%)** | **Germination percentage(%)** | **Shoot length(cm)** | **Root length(cm)** | **Seedling length(cm)** | **Seedling****Vigour index-I** | **Seedling dry weight** | **Seedling Vigour index-II** | **Electrical conductivity (µs cm-1)**  |
| **1** | **RMT-204** | 47.60 | 16.33 | 7.11 | 82.50(65.27) | 7.41 | 9.69 | 17.10 | 1430.92 | 0.0430 | 3.29 | 39.83 |
| **2** | **IC-205040** | 46.06 | 15.40 | 8.32 | 80.25 (63.61) | 7.77 | 9.31 | 17.09 | 1371.11 | 0.0420 | 3.44 | 40.75 |
| **3** | **SI146-1** | 40.24 | 16.47 | 7.92 | 79.50 (63.08) | 7.85 | 9.03 | 16.88 | 1357.99 | 0.0320 | 2.76 | 48.26 |
| **4** | **IC204159** | 38.80 | 15.58 | 7.31 | 80.75 (63.98) | 7.75 | 9.24 | 16.99 | 1371.54 | 0.0380 | 2.83 | 41.47 |
| **5** | **EC-377019** | 41.58 | 16.17 | 6.90 | 81.00 (64.16) | 7.60 | 9.10 | 16.71 | 1350.45 | 0.0330 | 2.83 | 50.35 |
| **6** | **RMT-236** | 43.38 | 15.65 | 8.02 | 79.50 (63.08) | 7.93 | 9.38 | 17.31 | 1366.54 | 0.0430 | 3.29 | 42.16 |
| **7** | **JCS-3603** | 46.27 | 17.28 | 7.31 | 72.25 (58.21) | 8.35 | 9.10 | 17.45 | 1262.91 | 0.0370 | 2.63 | 44.57 |
| **8** | **SKL-8** | 45.87 | 17.48 | 7.61 | 76.25 (60.83) | 8.09 | 9.39 | 17.48 | 1358.72 | 0.0450 | 3.13 | 43.58 |
| **9** | **YLM-17** | 44.61 | 17.47 | 6.60 | 77.00 (61.34) | 8.26 | 9.51 | 17.77 | 1368.10 | 0.0430 | 3.51 | 39.83 |
| **10** | **SI-554** | 47.07 | 16.75 | 7.41 | 71.00 (57.42) | 8.14 | 8.99 | 17.13 | 1216.81 | 0.0430 | 2.51 | 47.27 |
| **11** | **RAJESHWARI** | 43.83 | 15.48 | 7.36 | 81.00 (64.16) | 8.69 | 9.31 | 18.00 | 1465.27 | 0.0350 | 3.03 | 42.24 |
| **12** | **JCS-RF-4** | 46.48 | 17.17 | 8.07 | 78.75 (62.55) | 8.45 | 8.91 | 17.36 | 1365.99 | 0.0350 | 2.74 | 42.43 |
| **13** | **GT-10** | 49.05 | 18.40 | 6.82 | 83.00 (65.65) | 8.64 | 9.37 | 18.00 | 1502.47 | 0.0490 | 3.64 | 33.27 |
| **14** | **GOURI** | 43.08 | 18.42 | 7.11 | 85.25 (67.41) | 8.50 | 8.87 | 17.37 | 1398.50 | 0.0350 | 3.03 | 39.46 |
| **15** | **MADHAVI** | 51.15 | 19.65 | 6.60 | 86.00 (68.03) | 8.79 | 8.97 | 17.76 | 1526.17 | 0.0470 | 3.64 | 30.68 |
| **16** | **YLM-66** | 48.78 | 18.76 | 6.60 | 80.25 (63.61) | 8.50 | 8.93 | 17.43 | 1482.84 | 0.0350 | 3.59 | 34.25 |
| **17** | **YLM-146** | 45.94 | 18.41 | 6.90 | 81.50 (64.53) | 8.50 | 9.16 | 17.71 | 1443.20 | 0.0410 | 3.52 | 35.38 |
| **18** | **YLM-11** | 46.07 | 17.39 | 7.92 | 75.25 (60.17) | 8.72 | 9.38 | 18.10 | 1362.20 | 0.0340 | 3.37 | 35.82 |
| **19** | **JCS1020** | 51.15 | 16.73 | 7.71 | 84.25 (66.62) | 8.71 | 8.54 | 17.25 | 1474.70 | 0.0350 | 2.87 | 36.03 |
| **20** | **Chandhana** | 46.86 | 17.84 | 7.31 | 83.50 (66.03) | 8.65 | 8.81 | 17.45 | 1448.64 | 0.0430 | 3.45 | 36.16 |
|  | **Grand mean** | **45.35** | **17.14** | **7.43** | **79.93** | **8.27** | **9.14** | **17.41** | **1396.25** | **0.0390** | **3.15** | **40.05** |
|  | **SEm (±)** | **1.39** | **0.20** | **0.12** | **1.03** | **0.14** | **0.19** | **0.25** | **25.87** | **0.0010** | **0.07** | **0.52** |
|  | **CD (0.05)** | **4.18** | **0.57** | **0.36** | **2.92** | **0.55** | **0.54** | **0.73** | **73.19** | **0.0020** | **0.20** | **1.47** |
|  | **CV** | **4.35** | **2.36** | **3.84** | **2.58** | **3.60** | **4.22** | **2.98** | **3.71** | **2.9900** | **4.58** | **2.60** |

 **Table.6 Influence of growing seasons (*kharif*, *Rabi*) on seed quality parameters of twenty sesame genotypes (Mean of two seasons)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Genotypes** | **Oil content(%)**  | **Protein content(%)** | **Moisture content(%)** | **Germination percentage(%)** | **Shoot length(cm)** | **Root length(cm)** | **Seedling length(cm)** | **Seedling****Vigour index-I** | **Seedling dry weight** | **Seedling Vigour index-II** | **Electrical conductivity (µs cm-1)**  |
| **1** | **RMT-204** | 36.07 | 14.85 | 7.17 | 76.25 | 7.33 | 8.86 | 16.19 | 1249.80 | 0.038 | 2.96 | 40.71 |
| **2** | **IC-205040** | 36.83 | 14.62 | 8.43 | 72.50 | 7.61 | 8.78 | 16.40 | 1194.04 | 0.039 | 2.87 | 43.01 |
| **3** | **SI146-1** | 31.1 | 14.77 | 8.08 | 68.00 | 7.70 | 8.48 | 16.17 | 1133.19 | 0.037 | 2.61 | 49.94 |
| **4** | **IC204159** | 31.36 | 14.89 | 7.77 | 74.25 | 7.47 | 9.10 | 16.56 | 1232.32 | 0.037 | 2.62 | 43.43 |
| **5** | **EC-377019** | 35.4 | 15.13 | 7.36 | 75.50 | 7.58 | 9.09 | 16.67 | 1269.07 | 0.033 | 2.88 | 50.21 |
| **6** | **RMT-236** | 32.76 | 15.08 | 8.13 | 74.00 | 7.72 | 9.20 | 17.04 | 1259.86 | 0.039 | 2.81 | 42.38 |
| **7** | **JCS-3603** | 37.02 | 15.31 | 7.37 | 66.38 | 7.88 | 8.40 | 16.28 | 1140.10 | 0.037 | 2.36 | 45.64 |
| **8** | **SKL-8** | 36.69 | 15.16 | 8.07 | 74.75 | 7.68 | 9.39 | 17.07 | 1213.36 | 0.044 | 3.08 | 45.49 |
| **9** | **YLM-17** | 34.81 | 16.2 | 6.71 | 71.25 | 7.55 | 9.38 | 16.93 | 1191.83 | 0.043 | 3.17 | 41.84 |
| **10** | **SI-554** | 35.6 | 15.3 | 7.42 | 69.63 | 7.93 | 9.05 | 16.97 | 1181.91 | 0.039 | 2.75 | 43.69 |
| **11** | **RAJESHWARI** | 35.97 | 14.67 | 7.34 | 70.00 | 8.26 | 9.12 | 17.38 | 1130.51 | 0.034 | 2.32 | 40.52 |
| **12** | **JCS-RF-4** | 37.64 | 15.52 | 8.15 | 69.88 | 7.93 | 8.93 | 17.01 | 1189.18 | 0.039 | 3.11 | 44.69 |
| **13** | **GT-10** | 42.42 | 16.85 | 6.82 | 78.63 | 8.20 | 9.39 | 17.42 | 1373.68 | 0.047 | 3.28 | 33.93 |
| **14** | **GOURI** | 35.96 | 16.14 | 7.17 | 79.00 | 7.99 | 8.90 | 16.89 | 1337.87 | 0.036 | 2.78 | 37.58 |
| **15** | **MADHAVI** | 44.46 | 17.89 | 6.56 | 81.88 | 8.34 | 8.99 | 17.33 | 1419.89 | 0.046 | 3.18 | 32.86 |
| **16** | **YLM-66** | 41.88 | 17.37 | 6.71 | 78.88 | 8.20 | 9.00 | 17.20 | 1326.95 | 0.039 | 3.01 | 33.06 |
| **17** | **YLM-146** | 39.39 | 16.8 | 6.92 | 76.13 | 8.20 | 9.04 | 17.27 | 1331.57 | 0.042 | 3.24 | 35.48 |
| **18** | **YLM-11** | 37.63 | 16.06 | 7.77 | 66.25 | 8.39 | 8.65 | 17.04 | 1218.24 | 0.035 | 2.44 | 36.43 |
| **19** | **JCS1020** | 44.27 | 15.54 | 7.77 | 73.25 | 8.16 | 8.36 | 16.52 | 1228.56 | 0.036 | 2.55 | 41.54 |
| **20** | **Chandhana** | 38.59 | 16.56 | 7.37 | 76.25 | 8.26 | 8.81 | 17.19 | 1307.72 | 0.004 | 3.01 | 37.88 |

**Table 7. Best performing sesame genotypes in different seasons for yield and seed quality traits**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.No.** | **Character/ trait** | ***Kharif*** | ***Rabi*** | **Pooled over seasons** |
| 1. | Days to 50 % flowering | Chandhana, GT-10, Madhavi, Rajeshwari, YLM-66 | Madhavi, Chandhana, GT-10, YLM-66 | Chandana, Madhavi, GT-10, YLM-66 |
| 2. | Days to maturity | Madhavi, Chandhana, YLM-66 | Madhavi, YLM-66, JCS-1020 | Madhavi, Chandhana, YLM-66 |
| 3. | Plant height (cm) | JCS-1020, Chandhana, YLM-66 | Madhavi, JCS-1020, YLM-66 | JCS-1020, Rajeshawari, Chamdhana |
| 4. | No. of branches per plant | GT-10, Madhavi, YLM-66, YLM-66 | GT-10, Madhavi, YLM-66 | GT-10, Madhavi, YLM-66, YLM-11 |
| 5. | No. of Capsules per plant | Madhavi, GT-10, YLM-66 | GT-10, Madhavi, YLM-66 | YLM-66, YLM-146, YLM-11 |
| 6. | No .of seeds per capsule | GT-10, Madhavi, YLM-66 | GT-10, Madhavi, YLM-66 | GT-10, Madhavi, YLM-66. |
| 7. | Capsule length(cm) | YLM-66, GT-10, Madhavi | Madhavi, GT-10, YLM-11 | YLM-66, GT-10, Madhavi |
| 8. | Capsule breadth(cm) | YLM-66, GT-10, Madhavi | Madhavi, GT-10, YLM-66 | GT-10, Madhavi, EC-377019 |
| 9. | Test weight(g) | GT-10, Madhavi, YLM-66 | Madhavi, GT-10, YLM-66 | Madhavi, GT-10, YLM-66 |
| 10. | Seed yield per plot(kg/ha) | GT-10, Madhavi, YLM-66 | Madhavi, GT-10, YLM-66 | Madhavi, YLM-66, GT-10 |
| 11. | Filed emergence percentage (%) | YLM-66, GT-10, Madhavi | YLM-66, GT-10, Madhavi | YLM -66, GT-10, Madhavi |
| 12. | Oil content (%) | Madhavi, YLM-66, GT-10 | Madhavi, JCS-1020 GT-10 | Maadhavi, GT-10 |
| 13. | Protein content | Madhavi, YLM-66 | Madhavi, YLM- 66, GT-10 | Madhavi, YLM-6 |
| 14. | Moisture percentage | Madhavi , YLM-66, YLM-17, GT-10 | Madhavi, YLM-66, YLM-4, GT-10 | Madhavi, YLM-66, YLM-17 |
| 15. | Germination percentage (%) | Madhavi, YLM -66, GT -10 | Madhavi, Rajeshwari, Gt-10 | Madhavi, Gouri, YLM-66 |
| 16. | Root length(cm) | GT-10, Madhavi | Rajeshwari, SI-46-1 | SKL-8, YLM-17 |
| 17. | Shoot length(cm) | YLM-11, YLM-66, YLM-146 | Madhavi, GT-10, YLM-66, GT-10 | YLM -11, Chandhana , Rajeshwari. |
| 18. | Seedling length(cm) | Madhavi, GT-10, YLM-66 | YLM-66, GT-10, Rajeshwari | GT-10, Rajeshwari, Madhavi. |
| 19. | Seedling vigour index- I | GT-10, YLM-66, Madhavi | Madhavi, Gt-10, YLM-66 | Madhavi, Gt-10, YLM-146 |
| 20. | Seedling Dry weight(g) | Madhavi, GT-10, Rajeshwari | GT-10, Madhavi | Madhavi, GT-10 |
| 21. | Seedling vigour index -II | YLM-66, GT-10, Madhavi | Madhavi, GT-10, YLM-66 | GT-10, YLM-146, Madhavi. |
| 22. | Electrical conductivity(µ/cm) | YLM-66, Madhavi, GT-10 | Madhavai, GT-10, YLM-66 | Madahvi , YLM-66, GT-10 |

**Disclaimer (Artificial intelligence)**

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1. No AI technologies used in the ms.

2.

 3

 **REFERENCES**

Ahmed, E.A., Farrag, A.A., Kheder, A.A and Shaaban, A. 2022. Effect of phytoplasma associated with sesame phyllody on ultrastructural modification, physio-biochemical traits, productivity and oil quality. *Plants* *Basel*. 11: 477.

Anonymous ( 2022-23) *< https:// www. Indiastat.com.*

Baraki, F and Berhe, M. 2019. Evaluating performance of sesame (*Sesamum indicum* L.) genotypes in different growing seasons in northern Ethiopia. *International Journal of Agronomy*. (1): 7804621.

Baraki, F., Tsehaye, Y and Abay, F. 2016. Analysis of genotype × environment interaction and seed yield stability of sesame in Northern Ethiopia. *Journal of Plant Breeding and Crop Science*. 8(11): 240-249.

Bhaumik, S.B., Sharma, S.P and Dadlani, M. 2007. Effect of season on crop growth, flowering, synchronization pattern and seed yield in the parental lines of maize hybrids. *Seed Research.* 35(2): 139-147.

Chakrabarti, B., Singh, S.D., Nagarajan, S. and Aggarwal, P.K. (2011). Impact of temperature on phenology and pollen sterility of wheat varieties. Australian Journal of Crop Science, 5, 1039-1043.

Chakraborty, S. and Newton, A.C. (2011), Climate change, plant diseases and food security: an overview. Plant Pathology, 60: 2-14.

Deshpande, C.A., Shekhargouda, M., Shashidhara, S.D and Ravikumar, R.L. 2002. Effect of growing seasons on performance of parental lines and varieties of sorghum (*Sorghum bicolor* L.). *Seed Tech News*. 32(1): 57-58.

https://[www.](http://www/) Indiastat.com

ISTA. 1999. International Rules for Seed Testing. Seed Science and Technology.

Supplement Rules. 13:209- 335.

Kulkarni, C.C., S.P. Monalisa, S.K. Swain and Behera, M. 2017. Effect of Growing Season on the Seed

 Quality Attributes of Sesamum Genotypes. *Int.J.Curr.Microbiol.App.Sci*. 6(9): 293-301.

Lewis, L.J. and Woods, D.L. 2002. Germplasm release of long podded summer turnip rape (*Brassica rapa*

 Cruciferae *News*l., (24): 63.

Malli, R.D., Yamgar, S.V., Kharade, M.R and Ghodake, M.K. 2015. Estimation of stability parameter for yield and yield contributing characters in sesame (*Sesamum indicum* L.). *Journal of Agriculture and Veterinary Science.* (49): 50.

Maity, A. (2013). Effect of environmental factors on hybrid seed quality of Indian mustard (Brassica juncea). African Journal of Agricultural Research, 8, 6213-6219.

Monalisa, S.P., Swain, SK., Kulkarni, C.C. and Behera, M., 2018. Seed development and maturation in

 Sesame (CV. Prachi ) as influenced by growing seasons. *Journal of phytochemistry*, 7(2), 804-806.

Monalisa, S.P., Swain, S.K., Kulkarni, C.C and Behera, M. 2018. Seed development and maturation in sesame (CV. Nirmala) as influenced by growing seasons. *Journal of Pharmacognosy and Phytochemistry*. 7(2): 804806.

Monalisa S.P. and Swain S.K. 2017. Chemo-Morphic Traits Determining Seed Yield in Sesame As Influenced By Growing Seasons. Int.J.Curr.Microbiol.App.Sci. 6(5): 2561-2570.

Nagendra Prasad, M.N., Sanjay, K.R., Prasad, D.S., Vijay, N., Kothari, R. and Nanjunda Swamy, S., 2012. A review on nutritional and nutraceutical properties of sesame. *J Nutr Food Sci*, *2*(2), pp.1-6.

Nanda, J.S. and Agrawal, P.K. 2009. Botany of Field Crops, vol.1, Kalyani Publishers., Ludhiana. pp: 287-292

Nishi Patel, B., Rajendra, R.A., Vishwas, R.A., Akarsh, Vishwas, R.A., Akarsh, P., Sneha, M.M and Dinesh, D.P. 2022. Stability analysis over different environments for seed yield and its contributing traits in sesame. *The Pharma Innovation Journal.* 11: 346-350.

Panse, V.G and Sukhatme, P.V. 1985. Statistical Methods for Agricultural Workers. Indian Council of

 Agricultural Research. New Delhi. 150-157.

Singh, R.P., Prasad, P.V. and Reddy, K.R., 2013. Impacts of changing climate and climate variability on seed production and seed industry. *Advances in agronomy*, *118*, pp.49-110.

Wei, P., Zhao, F., Wang, Z., Wang, Q., Chai, X., Hou, G., & Meng, Q. (2022). Sesame (*Sesamum indicum* L.): A Comprehensive Review of Nutritional Value, Phytochemical Composition, Health Benefits, Development of Food, and Industrial Applications. *Nutrients*, *14*(19), 4079.