YIELD AND PHYSIOLOGICAL ASSESSMENT OF SESAME (*SESAMUM INDICUM* L.) VARIETIES IN RESPONSE TO PLANT GROWTH PROMOTERS

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Abstract. Sesame is one of the important oilseeds across the globe for edible, pharmaceutical and cosmetic purposes. Sesame is low water requiring crop and grows well on marginal land with less inputs. The study aimed to evaluate the growth, yield and oil content of three sesame varieties TS-3, TS-5 and TH-6 in response to various foliar applications of salicylate (50 mgL^{-1}), ascorbate (50 mgL^{-1}), hydrogen peroxide (40 μML^{-1}) and L-Methionine (150 mgL^{-1}). Field trial was executed during May 2021 at Agronomic Research Farm, University of Agriculture, Faisalabad by employing factorial design and three replications. Irrigation was applied first at 25 days after sowing and second after 70 days while as the foliar amendments of growth promoters was applied at 50, 60 and 70 days of crop life. From the results of this experiment, it is concluded that, the variety TH-6 is short duration as compared to other varieties. Effect of foliar application showed significant impact on sesame varieties. The best results were recorded under salicylic acid treatments followed by ascorbic acid and L-methionine while as the least response was recorded without foliar application. The number of seeds per pod, harvest index, thousand seed weight, seed yield $kgha^{-1}$ and oil contents were recorded maximum under variety TH-6 when exposed to salicylic acid treatment while as the minimum response was showed in variety TS-3. Moreover, the highest phenolic content was determined by employing ascorbic acid (50 mgL^{-1}) followed by salicylic acid (50 mgL^{-1}) and the lowest findings were recorded where without foliar application. However, the emerged proline content was assessed in all sesame varieties with control treatment whereas the least findings were recorded from L-Methionine (150 mgL^{-1}) treatment.

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Keywords: *sesame, growth promotor substances, yield, oil, sustainable agriculture, foliar application*

Introduction

Sesame (*Sesamum indicum* L.) is described as the oldest oilseed crop and total area under cultivation was 10.17 mha with average yield of 512 kg ha^{-1} (Myint et al., 2020). Sesame is called queen of the oilseed crops, and it contains 5% stearic acid, 8% palmitic acid, 41% linoleic acid and 39% oleic acid and it is also rich in omega-6-fatty acids and after long exposure to air the seeds are protect oxidative rancidity (Al-Yemeni et al., 2000; Bedigian et al., 2010). Different environmental stresses like drought, salinity temperature fluctuations adversely affect crop growth and yield of agricultural systems worldwide. Sesame is referred to as a drought tolerant crop (FAO, 2004; Poor-Esmaeil et al., 2014), but still, it requires moisture for plant growth and high efficiency. Drought is an important environmental factor that limits the number of capsules per plant, oil yield as well as grain yield and quality depending on drought intensity and genotypes (Hassanzadeh et al., 2009; Bahrami et al., 2012; Harfi et al., 2016). The negative effect of drought on both the quality and quantity of sesame oil has also been revealed (Ozkan and Kulak, 2013; Kadkhodaie et al., 2014). So, the main objectives in sesame breeding programs are the improvement of drought tolerance in sesame genotypes that can be attain by integrating new approaches (Pathak et al., 2014).

Mitigation of drought stress by foliar amendments of various growth promoters have been reported (Yasir et al., 2023). Foliar application not only increase the crop production as well as it reduces the uses of fertilizer applied through soil. Appropriate timing of foliar spray of endo and exogenous on plant that improve nutritional quality of staple food crops (Jardin, 2015; Hossain et al., 2021; Tahjib-Ul-Arif et al., 2022; Javeed et al., 2023). During the plant growth period, foliar application by salicylic acid is an effective method that reduces the harmful effects of drought and increases crop yield along with reduction in rainfall and termination of underground water resources (Athar et al., 2008; Kazemi, 2014). Salicylic acid is a lipophilic phenolic substance that has greater influence on crop growth (Joseph et al., 2010; Athari and Talebi, 2014). Salicylic acid regulated plant photosynthesis, nitrate metabolism, flower initiation and seed germination have been reported in sesame (Gharib et al., 2007; El-Khallal et al., 2009; Joseph et al., 2010). The significant effect of salicylic acid on the photosynthetic mechanism and membrane function was assessed (Yazdanpanah et al., 2011). Ascorbic acid is a water-soluble antioxidant that acts as a plant growth regulator and plays role in enzyme activity to form various fats, proteins and carbohydrates (Pastori et al., 2003; Ahmad, et al., 2021). Plants have several cellular defense mechanisms consisting of antioxidants such as ascorbate, glutathione and tocopherol and ROS detoxifying enzymes to shield them from adverse conditions (Agarwal and Pandey, 2004; Barth et al., 2006). Moreover, numerous enzymatic and non-enzymatic responses also refer to ascorbic acid on plant growth that control the rate of photosynthesis and leaf senescence (Smirnoff, 2000). Amino acids are used as a growth-enhancing agent and it can be used as a bio stimulant for enhancing the plant growth and development (Rouphael et al., 2018; Chauhan et al., 2022; Hassan et al., 2023). Amino acids act as precursors for different enzymes as well as nonenzymatic reactions, hence, have an important role in respect of plant injury and plant metabolic efficiency, even nitrogen and mineral uptake efficiency are directly connected (Liu et al., 2003; Zhao, 2010; Maeda et al., 2012; Halpern et al., 2015; Teixeira et al., 2017). Application of amino acids facilitates root growth that can stimulate nitrogen fixation and enhanced nutrient uptake from topsoil

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surface (Hildebrandt et al., 2015; Weiland et al., 2016). Thus, our study was executed to assess the, physiological, oil and yield response of sesame varieties against varying growth promoters under semi-arid conditions of Faisalabad.

Materials and Methods

Site selection and land preparation

A field experiment was conducted at the Agronomic Research Facility of the University of Agriculture, Faisalabad with 73° East longitude and 30° North latitude during May 2021. Land was prepared by two ploughing operations with the help of tractor driven cultivator. Before planting, sampling was done at 0-30cm depth by using soil auger and composite sample was analyzed through standard procedure that is given in *Table 1*. Weather attributes during studying period was noted and presented in *Figure 1*.

Table 1. *Soil physical and chemical attributes*

Determination		
Physical Analysis		
Value	Unit	
Sand	%	44
Silt	%	35
Clay	%	12
Texture class	Sandy clay loam	
Chemical Analysis		
Saturation	%	35
pH		7.70
Electrical Conductivity (ECe)	dSm^{-1}	1.65
Organic matter	%	0.60
Nitrogen	Ppm	0.33
Phosphorus	Ppm	3.89
Potassium	Ppm	233

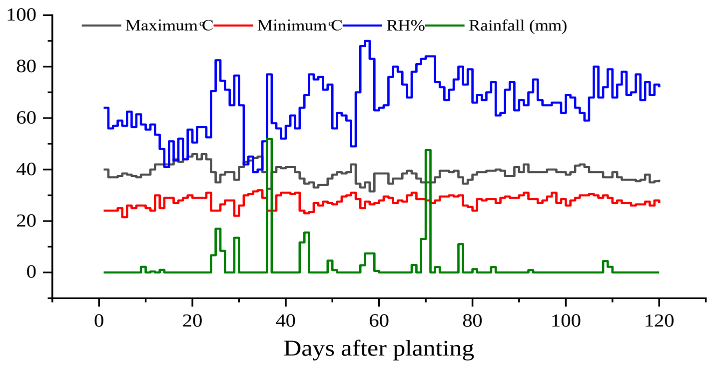

Figure 1. *Weather parameters observed during course of experimentation*

Testing material and trial execution

Research study was executed to determine the yield potential of three sesame varieties comprised of V_1= TS-3, V_2= TS-5 and V_3= TH-6 and efficacy of different exogenous growth promotor substances i-e F_0= control, F_1= salicylic acid (50 mgL^{-1}), F_2=ascorbic

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acid (50 mgL^{-1}), F_3=Hydrogen peroxide (40 μML^{-1}) and F_4= L-mehtionine (150 mgL^{-1}) applied under semi-arid condition. Experiment was conducted under factorial arrangements and replicated three times. Planting of sesame was done at 5 kg ha^{-1} seed rate using hand drill by keeping 45 cm row to row distance. Experimental plot size was 1.8 m × 7.0 m. First irrigation was applied after 25 days of sowing and second irrigation was applied after 60 days and foliar amendments was sprayed at 70 and 80 days of crop life. Recommended dose of NP fertilizer was used 50 and 60 kg ha^{-1} nitrogen and phosphorus, respectively. In intercultural operations such as weeding and thinning was done to maintain the proper plant spacing apart 10cm plant to plant distance.

Proline content

For the determination of proline content, 0.2 g of fresh sesame leaf was blended with 10 ml of 3% (w/v) sulfosalicylic acid, followed by centrifugation at 15,000×g for 10 minutes. Subsequently, 2 ml of the resulting supernatant was combined with 2 ml of glacial acetic acid and 2 ml of acid ninhydrin in tubes, followed by heating in a boiling water bath for 1 hour. The reaction was concluded by applying 4 ml of toluene to extract the mixture, and the absorbance of the aqueous phase was measured at 520 nm (Pourghasemian et al., 2020).

Chlorophyll content

Ground samples of 0.3 g obtained from fully expanded fourth leaves were mixed with 5 ml of 80% acetone. The resulting extract underwent centrifugation at 10,000 rpm for 5 minutes. Absorbance (A) values were measured at 649 and 665 nm using a V-5000 spectrophotometer for the chlorophyll assay. Pigment concentrations were determined using the formulas outlined (Sinaki et al., 2019).

$$\text{Chlorophyll } a \text{ (mg g}^{-1}\text{)} = (13.95\times A665) - (6.88\times A649) \qquad \text{(Eq.1)}$$

$$\text{Chlorophyll } b \text{ (mg g}^{-1}\text{)} = (24.96\times A649) - (7.32\times A665) \qquad \text{(Eq.2)}$$

Total phenolic content

The phenolic contents were assessed utilizing a modified Folin–Ciocalteu colorimetric method, in which, the extracted sample or gallic acid was combined with Folin–Ciocalteu reagent and allowed to react for 6 minutes. Subsequently, sodium carbonate was introduced into the test tube, and the mixture was left to stand for 90 minutes after thorough mixing. The absorbance was measured at 760 nm, and the outcome was expressed as micrograms of gallic acid equivalents per 100 grams of dry weight sample (mg GAE/100 g, DW).

Total soluble carbohydrates

The total soluble carbohydrates in sesame were determined using a modified version of the colorimetric method established by Dubois et al. (1956). Briefly, finely ground sesame samples were subjected to ethanol extraction, and the resulting supernatant was mixed with anthrone reagent and sulfuric acid. After incubation and cooling, the absorbance of the samples was measured at approximately 620 nm using a spectrophotometer. A calibration curve was constructed using standard glucose solutions, enabling the conversion of absorbance values to carbohydrate concentrations. The

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concentration of soluble carbohydrates in the sesame samples was then calculated based on this calibration curve. The extraction process involved incubating the sesame leaf material in distilled water for 6 hours at room temperature to facilitate the determination of turgid weight.

Relative water content (%)

The Relative Water Content (RWC) was calculated using the leaf fresh weight (FW), turgid weight (TW), and dry weight (DW) through the formula:

$$\text{RWC (\%)} = \frac{(FW-DW)}{(TW-DW)} \times 100 \qquad \text{(Eq.3)}$$

where the turgid weight was determined after the leaf had been incubated in distilled water for 6 hours at room temperature in the laboratory.

Data collection

In data collection, all agronomic parameters were recorded in five plants per plot. The phenological traits included days to flowering, days to capsule formation, days to capsule maturity, height to first capsule, fruiting zone length, branches per plant, capsule length at maturity, capsule diameter at maturity and plant height. While yield traits included number of capsules bearing branches, number of capsules per plant, 1000-seed weight, harvest index and seed oil content. Harvest index (HI, ratio of weight of seeds to weight of aboveground plant part expressed in percentage). Percentage oil content was determined by grinding the seeds and extracting the oil with petroleum ether (bpt 40°C) using Soxhlet extraction method in the analytical laboratory of Coventry University, UK as described by Egan et al. (1981).

Statistical analysis

Phenological and yield traits were analyzed statistically by applying Fisher’s analysis of variance (Steel et al., 1997). Tukey’s Honestly Significance Difference (HSD) test was employed at 5% level of probability to compare statistical differences among the treatments’ means through OriginPro-2021 software.

Results

Our results showed that the main effects of studied traits were significant excluding days to flowering which showed insignificant effect under plant growth promoters (*Table 2* and *Table 3*). Conversely, the interactive effects of varieties and plant growth promoters was exhibited significant effect for days to maturity, capsule length, plant height, number of capsules per plant, thousand seed weight, phenolic content, total soluble carbohydrates and proline content.

Main effects

Statistically the highest days for flowering were counted in variety TS-5 that was resulted similar value in TS-3 cultivar whereas, the least days for flowering were recorded in TH-6 cultivar. Moreover, number of branches per plant had the highest in variety TS-3 and the minimum branches were collected from TH-6 variety.

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Table 2. *The main effect of foliar amendments of growth promotors on days to flowering (DF), days to maturity (DM), number of branches per plant (NBP), capsule length (CL) plant height cm (PH), number of capsules per plant (NCP) seed weight g (TSW), seed yield kg/ha (SY), harvest index (HI) of sesame varieties under different foliar treatments*

Treatments	Variables								
	DF	**DM**	**NBP**	**CL**	**PH**	**NCP**	**TSW**	**SY**	**HI**
V_1 = TS-3	72.46[a]	128.46[a]	6.40[a]	26.02[b]	153.89[b]	48.29[b]	2.51[b]	807.47[b]	17.24[b]
V_2 = TS-5	73.73[a]	126.86[b]	6.33[a]	25.83[b]	170.29[a]	51.09[b]	2.61[b]	837.73[b]	19.33[a]
V_3 = TH-6	61.13[b]	102.93[c]	1.00[b]	32.71[a]	139.26[c]	63.40[a]	2.76[a]	906.87[a]	20.22[a]
HSD ($p \leq 0.05$)	**6.9**	**1.01**	**0.76**	**2.24**	**5.97**	**3.27**	**0.14**	**31.54**	**1.81**
F_0 = Control	69.22	120.55[a]	5.25[a]	26.91[b]	157.74[ab]	45.00[d]	2.39[b]	777.11[c]	17.44[b]
F_1= Salicylic acid (50 mg L^{-1})	69.88	118.88[bc]	4.62[ab]	30.15[a]	151.07[bc]	62.33[a]	2.86[a]	927.00[a]	21.16[a]
F_2 = Ascorbic acid (50 mg L^{-1})	69.11	117.66[c]	4.25[b]	30.19[a]	152.63[bc]	56.38[b]	2.70[a]	869.11[b]	18.65[b]
F_3 = H_2O_2 (40 µML$^{-1)}$	69.22	120.22[a]	4.25[b]	27.95[ab]	149.63[c]	52.04[c]	2.48[b]	817.22[c]	18.27[b]
F_4 = L-Methionine (150 mg L^{-1})	68.11	119.77[ab]	4.48[ab]	25.73[b]	161.33[a]	55.56[bc]	2.71[a]	863.00[b]	19.13[ab]
HSD ($p \leq 0.05$)	**NS**	**1.30**	**0.98**	**2.89**	**7.71**	**4.22**	**0.18**	**40.72**	**2.34**
Interaction	**NS**	*****	**NS**	******	*****	*****	******	**NS**	**NS**

* and ** symbolizes $P \leq 0.01$ and $P \leq 0.05$ respectively

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Table 3. *The main effect of foliar amendments of growth promotors on seed oil content % (SOC), chlorophyll a (Chl a), chlorophyll b (Chl b), total chlorophyll (T.Chl), relative water content% (RWC), Phenolics (Phen), total soluble carbohydrates mg/g dry matter (TSC) and proline (Pro) on sesame varieties under different foliar treatments*

Treatments	**Variables**							
	SOC	**Chl *a***	**Chl *b***	**T. Chl**	**RWC**	**Phen**	**TSC**	**Pro.**
V_1 = TS-3	40.87^c	3.90^c	1.07^c	4.97^c	63.40^b	741.07^c	227.66^b	4.39^b
V_2 = TS-5	42.83^b	3.94^b	1.10^b	5.03^b	66.80^a	746.00^b	234.53^a	4.56^a
V_3 = TH-6	47.60^a	4.01^a	1.13^a	5.14^a	63.93^b	753.07^a	229.73^b	4.43^b
HSD (p≤0.05)	**0.77**	**0.02**	**0.018**	**0.025**	**1.28**	**3.28**	**2.86**	**0.05**
F_0 = Control	41.33^c	3.62^e	0.95^e	4.57^e	60.55^d	717.11^e	214.87^d	7.14^a
F_1= Salicylic acid (50 mg L^{-1})	46.22^a	4.13^b	1.17^b	5.30^b	67.87^a	760.44^b	244.31^a	4.04^b
F_2 = Ascorbic acid (50 mg L^{-1})	45.28^a	4.25^a	1.22^a	5.47^a	66.00^b	774.78^a	234.00^b	3.80^c
F_3 = H_2O_2 (40 µM$L^{-1)}$	42.61^b	3.80^d	1.04^d	4.84^d	65.00^{bc}	734.78^d	231.75^{bc}	3.71^d
F_4 = L-Methionine (150 mg L^{-1})	43.39^b	3.93^c	1.11^c	5.05^c	64.11c	746.44^c	228.21^c	3.61^e
HSD (p≤0.05)	**1.00**	**0.026**	**0.024**	**0.033**	**1.66**	**4.23**	**3.69**	**0.07**
Interaction	**NS**	**NS**	**NS**	**NS**	**NS**	*****	*****	******

* and ** symbolizes P≤0.01 and P≤0.05 respectively

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Similarly, the highest branches were recorded with no foliar application and the least reading were assessed in ascorbic acid (50 mgL^{-1}) and H_2O_2 (40 µML$^{-1)}$ treatments. With respect to the seed yield, TH-6 variety gave the highest yield followed by TS-5 and TS-3. Conversely, salicylic acid (50 mgL^{-1}) application significantly improved seed yield as compared to other foliar treatments. In addition, TH-6 variety had the leading for harvest index that was shown similar response TS-5 and the least value was calculated in variety TS-3. On the contrary, foliar amendment of salicylic acid (50 mg L^{-1}) significantly contributed to harvest index that was resulted at par findings of L-Methionine (150 mg L^{-1}) and control treatment where foliar was applied. Moreover, seed oil content significantly influenced by sesame varieties and plant growth promotors (*Table 3*). The highest seed oil content was extracted from TH-6 variety followed by TS-5 and the least percentage was observed in TS-3 variety. Conversely, the highest seed oil content was squeezed by imposition of salicylic acid (50 mg L^{-1}) and ascorbic acid (50 mg L^{-1}), and the least value was determined from control treatment. Nonetheless, the highest chlorophyll *a*, *b* and total chlorophyll content was determined from TH-6 variety and least value was assessed from TS-3. Whereas growth promotor application of ascorbic acid (50 mg L^{-1}) significantly increased chlorophyll *a*, *b* and total chlorophyll value was observed and least value of chl *a*, chl *b* and total chlorophyll was taken where no foliar was used. Data regarding relative water content, statistically the highest value was found from TS-5 variety and the least value was observed from TS-3. On the other hand, salicylic acid (50 mg L^{-1}) had the highest value followed by ascorbic acid (50 mg L^{-1}) whereas, the least value was determined from control treatment.

Interactive effects

Days to maturity, capsule length and plant height

Interactive effect for days to capsule maturity was significantly influenced (*Figure 2*). Statistically the highest days for maturity observed in TS-3 with no foliar (F_0) application, that was at par with L-Methionine (150 mg L^{-1}) namely F_4 treatment. The least value was demonstrated by salicylic acid (50 mg L^{-1}) application. However, variety TS-5 consume maximum days for harvest maturity where no foliar was used that was statistically not differ with H_2O_2 (40 µML$^{-1)}$ treatment while the least days were counted by imposition of ascorbic acid (50 mg L^{-1}). In case of TH-6 variety, statistically the highest days were counted along with application of L-Methionine (150 mg L^{-1}) and the least days were observed by using ascorbic acid (50 mg L^{-1}) treatment. Statistically the maximum plant height was recorded in variety TS-5 when exposed L-Methionine (150 mg L^{-1}) and least height was documented by utilization of H_2O_2 (40 µML^{-1}). On the other hand, TS-5 variety was the leading one along with no foliar application and the minimum height was measured from ascorbic acid (50 mg L^{-1}) treatment (*Figure 2*). Similarly, TH-6 had found for tallest plants where no foliar was imposed and the least value was ensured from salicylic acid (50 mg L^{-1}) treatment.

Number of capsules per plant and 1000-seed weight

Data regarding number of capsules, statistically the maximum number of capsules were recorded in variety TS-3 when treated with ascorbic acid (50 mg L^{-1}) and the lowest value was recorded where no foliar was executed. Variety TS-5 had the emerged number of capsules under salicylic acid (50 mg L^{-1}) amendment and the least count was ensured from control treatment.

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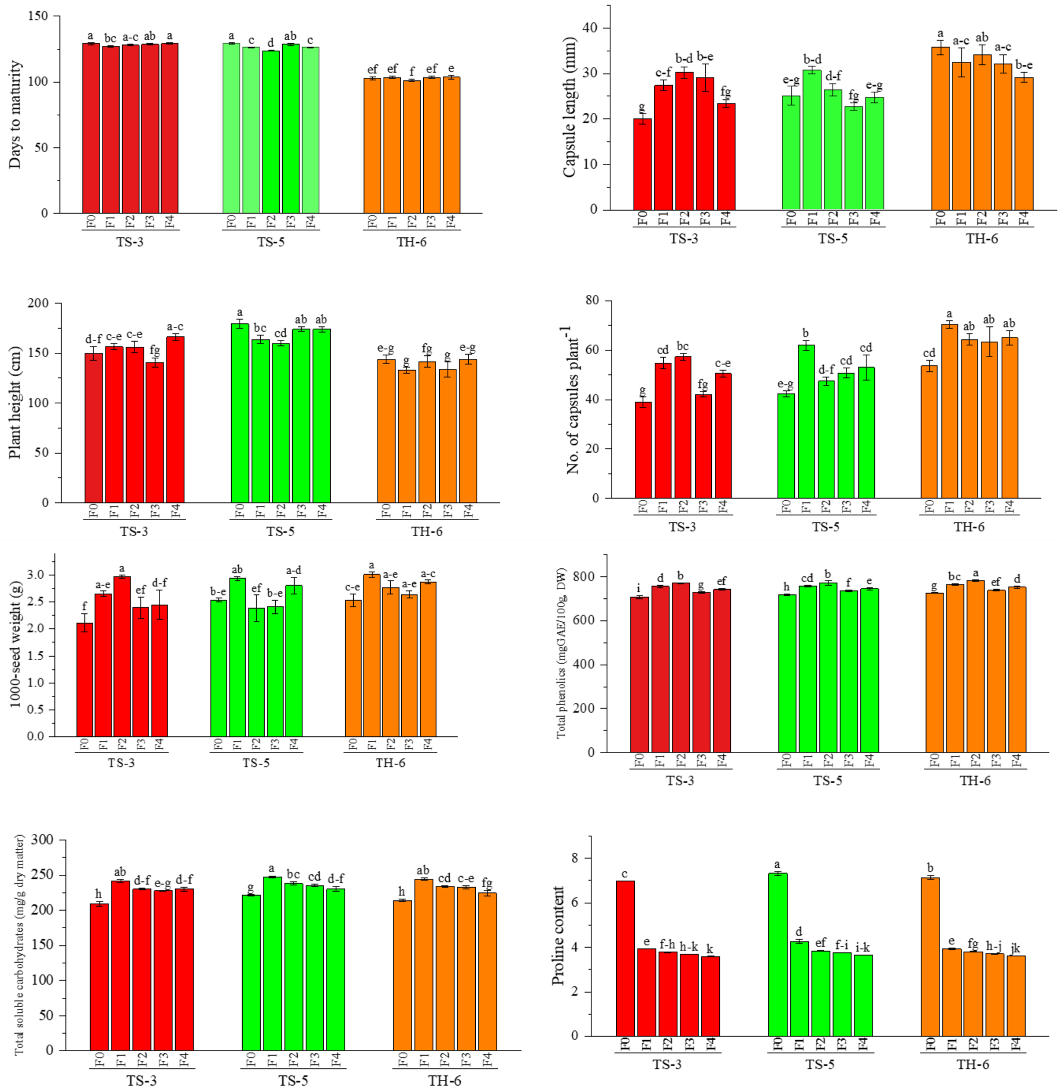

Figure 2. *Mean comparison of significant (P≤0.05) interaction (foliar × varieties) effect regarding aforementioned traits. Similar alphabets on graph bars showed insignificant (P≥0.05) effect*

Subsequently, the maximum number of capsules were counted in variety TH-6 when exposed to salicylic acid (50 mg L^{-1}) treatment that is statistically similar to rest of all foliar treatments excluding control that was resulted minimum number of capsules.. The maximum thousand seed weight recorded in variety TS-3 when treated with ascorbic acid (50 mg L^{-1}) and the lowest weight was observed where no foliar application. Similarly, variety TS-5 identified with the highest thousand seed weight by employing salicylic acid (50 mg L^{-1}) application while the lowest value was confirmed by applying ascorbic acid (50 mg L^{-1}). Variety TH-6 resulted the leading value of thousand seed weight when exposed to foliar application of salicylic acid (50 mg L^{-1}) and the lowest weight was gathered where no foliar spray was employed.

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Total phenolics, total soluble carbohydrate and proline content

The phenolics, total soluble carbohydrates and proline content of sesame varieties significantly influenced by plant growth promoters (*Figure 2*). The highest phenolic content was determined in TS-3 and TS-5 by employing ascorbic acid (50 mg L^{-1}) foliar spray and the minimum content was assessed with no usage of foliar spray. Variety TH-6 had also shown the highest phenolic concentration when treated with ascorbic acid (50 mg L^{-1}) followed by salicylic acid (50 mg L^{-1}) and the lowest findings were recorded where no foliar was used. Moreover, statistically the leading total carbohydrates was accumulated in TS-3, TS-5 and TH-6 varieties where salicylic acid (50 mg L^{-1}) was tested followed by Ascorbic acid (50 mg L^{-1}) while the minimum amount was ensured from control treatment of subject varieties. However, the emerged proline content was assessed in all sesame varieties with control treatment whereas the least findings were recorded from L-Methionine (150 mg L^{-1}) treatment.

Correlation description

Pearson correlation was made to assess the association among studied traits of sesame under Faisalabad conditions (*Figure 3*). Number of branches per plant (NBP) had positive correlation with days to maturity. Seed yield (SY) had positively correlated with number of capsules per plant (NCP), thousand seed weight (TSW) thus it showing that these traits significantly contribute in seed yield. Moreover, seed oil content (SOC) positively correlated with NCP, TSW, SY and harvest index (HI) consequently these traits had the considerable contribution in seed oil content. Chlorophyll *a*, *b*, total chlorophyll and relative water content (RWC) resulted positive correlation with TSW, SY, HI and SOC. In addition, phenolics exhibited positive association with NCP, TSW, SY, HI, SOC, chlorophyll *a*, *b*, total chlorophyll and RWC. Similarly, total soluble carbohydrates (TSC) negatively correlated with chlorophyll *a*, *b*, total chlorophyll, RWC and phenolics whereas, proline negatively correlated with TS.

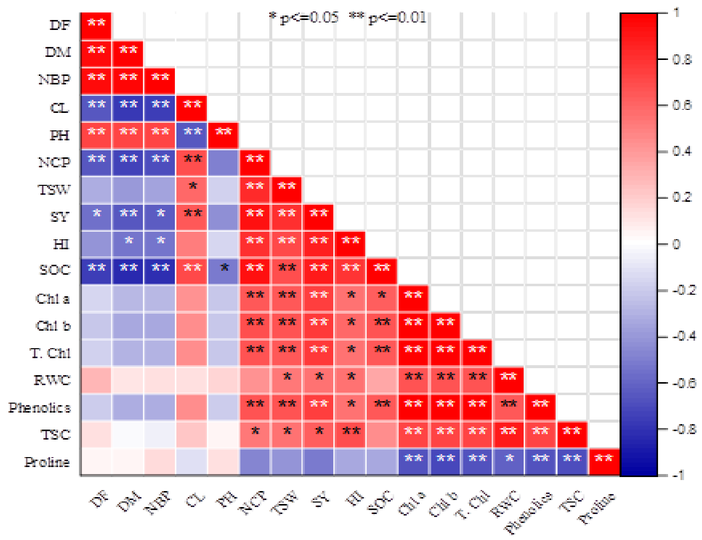

Figure 3. *Person correlation analysis among collected traits i.e. days to flowering (DF), days to maturity (DM), number of branches plant*$^{-1}$ *(NBP), capsule length (CL), plant height (PH), number of capsules palnt*$^{-1}$ *(NCP), thousand seed weight (TSW), seed yield (SY), harvest index (HI), seed oil content (SOC), chlorophyll a (chl a), chlorophyll b (chl b) total chlorophyll (T.chl) relative water content (RWC), phenolics, total soluble carbohydrates (TSC) and proline*

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Discussion

Drought has negative impact on growth and crop productivity. Plants have evolved different complex mechanisms to avoid different stress conditions to counter the low water potential which is caused by drought in the soil (Yazdanpanah et al., 2011; Vaseva et al., 2012). Drought stands out as a major constraint to global crop productivity. Uncovering genetic diversity within various genetic resources is a crucial stride in identifying drought-tolerant/resistant individuals within any effective breeding initiative (Sajid et al., 2023). Despite the predominant cultivation of sesame in arid and semiarid regions, there has been a limited endeavor to unveil drought tolerance in this crop. Consequently, the identification of superior lines under water deficit conditions becomes exceedingly significant for ensuring sustainable sesame production (Bhattarai and Subudhi, 2019; Shoaib et al., 2023). Several studies have highlighted the adverse impact of drought on plant height across various crops, including barley and maize (Kinat and Lutus, 2001; Hussain et al., 2019), rice and sugarcane (Misra et al., 2020). The decrease in plant height may stem from reduced cell expansion and compromised mitosis in drought conditions. Insufficient water availability can also constrain nutrient uptake due to limited soil moisture, resulting in a shorter plant stature. Insufficient water availability can constrain nutrient uptake, as the limited soil moisture hinders the absorption of essential nutrients, ultimately contributing to a reduction in plant height (Hussain et al., 2008). Sesame is characterized as an indeterminate plant with acropetal flowering, meaning it continues to produce leaves, flowers, and capsules as long as favorable conditions persist (Srivastava and Dwivedi, 2000). Drought conditions likely restricted the flowering trait, leading to a reduced number of capsules per plant. Similarly, previous studies on sesame have reported a decrease in the number of branches and capsules under conditions of limited water and the finding of our results are algin to Pandey et al. (2021). The exogenous application of foliar especially salicylic acid helps to mitigate the adverse effect of drought in sesame. The current study indicates that the exogenous application of salicylic acid could potentially alleviate the detrimental impacts of drought in sesame (Medvedev and Markova, 1991). The foliar application of salicylic acid was observed to mitigate the adverse effects of drought on both plant growth and seed yield, effectively reversing the stress-induced impacts (Salarizdah et al., 2012). A notable decrease in the growth and yield of sesame under water deficit conditions during flowering and pod filling, as compared to well-irrigated conditions, clearly underscores the susceptibility of sesame to soil water deficiency. This finding aligns with the results reported by Ucan and Killi (2010) and Bagheri et al. (2013). Data regarding some parameters relates with the work of Sanjeevaiah and Joshi (1974) that showed environment has minute effect on plant height, number of branches per plant and number of capsules per plant. The number of branches per plant was recorded lowest in TH-6 due to its genetic character but number of capsules, number of seeds per capsule were higher than TS-3 and TS-5 varieties. The same results were recorded by Suhasiniks (2006) who reported that the number of primary branches is different among different sesame genotype varieties. Seed oil content was seen different in different genotypes like present study showed the maximum seed oil contents which was also reported by Tahir et al. (2012). Tahir et al. (2012) found that significant results in seed oil content was seen in different varieties due to variability in genetic makeup.

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Conclusion

Results of this study concluded that the positive response of various foliar application of growth promotors on different sesame varieties. Better response was depicted in variety TH-6 regarding yield components and oil contents under salicylic acid application that is followed by ascorbic acid treatment and lesser response was showed when no foliar application was applied whereas, variety TS-3 was showed least response with respect to yield and oil contents. Hence variety TH-6 short duration is recommended for better growth and yield under less irrigation requirement.

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