Effect of environmental conditions and sawiong date on Growth, and Yield PERFORMANCE OF Chia (*Salvia hispanica* l.) Cultivated in Nubaria, egypt

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ABSTRACT:

Chia (*Salvia hispanica* L.) an annual herbaceous plant belonging to the Lamiaceae family. To investigate the impact of various environmental factors and sowing dates on the growth and oil content of Chia (*Salvia hispanica* L.) at various sowing dates (SD1 = September 20th, SD2 = October 5th, and SD3 = October 20th, 2021), field tests were carried out in the 2021–2022 seasons at the experimental farm of the National Research Centre, Nubaria, Behira governorate, Egypt. The results findings revealed that SD1 have the tallest plants (118.2 cm), followed by SD2 (92.6 cm) and SD3 (63.8 cm). The quantity of shoots per plant, was did not significantly affected. The results indicated significant difference in the plant fresh weight, with SD1 significantly effected with sowing dates. Also,the results indicated that sowing dates were significant differences for the protein and fixed oil percentages. Similar to crude fibre content, where SD1 displayed the highest value (34.181), SD1 displayed the highest values (28.06 and 19.97), but there was no appreciable difference between SD1 and SD2. SD3, however, had the lowest value. Also,the results showed that first sowing date gave the maximum values for most studied traits compared with third sowing date in 20 october under experiment soil conditions.

Keywords: Chia (*Salvia hispanica* L.); sowing date; oil content; phonological stage; growing degree days (GDD).

INTRODUCTION

Future challenges for agricultural cropping systems, with very limited water resources, population growth, and evidence of climate change, Egypt is classified as an arid or semi-arid country. These factors increase pressure on the environment and natural resources, which in turn affects per capita sharing of water and land, human security, and ultimately political stability. Food, water, and climate all have connections that have an impact on sustainable development generally, and particularly green sustainable development. The rapid rise in Egypt's water and food needs is primarily the result of numerous issues like population growth and climate change (Omran and Negm 2020). Egyptian policymakers give the agricultural sector special consideration because of its significance in ensuring food security for the country's rapidly expanding population through essential activities like better utilising agricultural resources, improving water use efficiency, managing groundwater resources, and developing a horizontal expansion area by reclaiming new lands (Negm, 2019). Chia is a species that can help Egypt conserve its limited water supply because it has been said to be tolerant of water stress (Herman Silva *et al.,* 2021) Additionally, it provides the opportunity to export the expensive chia seeds, generating foreign currency for reimporting things like an annual herbaceous plant belonging to the Lamiaceae family, the chia (*Salvia hispanica* L.). It is a Mesoamerican native species with short days. Due to their nutritional qualities, chia seeds are referred to as a "superfood" (Vârban *et al.,* 2022). Chia plants have the potential to reach heights of one metre under ideal circumstances. The leaves are inserted opposite each other and are elongated, measuring 4–8 cm long by 4–8 cm wide. Flowers range in colour from white to purple and are hermaphrodites. They are 3–4 mm in size and have the typical labiate morphology. On the inflorescence axis, flowers are arranged in verticillasters (Hrnčič *et al.,* 2020 and Motyka *et al.,* 2022). The plant creates an oval, dry, indehiscent fruit that is between one and two millimetres long and can range in colour from white-gay to black; the whiteness of the seeds is a recessive trait (Motyka *et al.,* 2022). Four nutlets are produced per flower, and act as seed units (Geneve *et al.,* 2019). The day length and temperature have the biggest effects on the growth and development of this species, which is native to the tropical climate of southern Mexico and Guatemala (Motyka *et al.,* 2022). Chia crops require evenly spaced rainfall during early growth and dry conditions during seed maturation and harvest for successful cultivation (Iannucci and Amato, 2021). Despite not being frost-tolerant, this plant has been cultivated far outside of its natural habitat (Grimes *et al.,* 2018; Iannucci and Amato, 2021). De Oliveira *et al.,* (2019) report that there is still a dearth of technical information regarding the cultivation of this species. This species grows in mountainous regions in its natural habitat. Although it can grow in soil with a pH between 6.5 and 8.5, acidic soils are ideal for cultivation (Motyka *et al.,* 2022). According to Grimes *et al.,* (2018), this crop grows best at temperatures between 16 and 26 °C. Chia seeds have a high oil content (28 to 32%) and are an appealing source of polyunsaturated fatty acids (PUFA), particularly omega-3 fatty acids (linolenic acid, 68%) and omega-6 fatty acids (linoleic acid, 19%), which are necessary for human health but cannot be synthesised by the body (Fernandes *et al.,* 2021). This valuable plant species is a promising crop, so it may be possible to cultivate it outside of its native geographic range in order to meet the expanding market demands. Chia that is grown nearby might offer a consistent supply of raw materials, making it a desirable choice for both local farmers and the food industry. However, the agronomic suitability and feasibility of this crop must be established before advising this species for cultivation in the region. The purpose of this study was to look into how Chia (*Salvia hispanica* L.) growth and yield were impacted by sowing date and environmental factors.

MATERIALS AND METHODS

Field trials were conducted in 2021-2022 season (20th September to 6th March), at the experimental farm of the National Research Center, Nubaria, Behira governorate, Egypt located 122 km Northwest of Cairo (30°29'52.20" N 30°19'14.09" E, 35 m a.s.l.).

The climatic conditions, (wind speed, relative humidity, maximum and minimum temperatures, precipitation rate) of the experimental site were obtained from Wadi El Natrun weather station (Table 1).

Soil anlysis of study area

Three soil samples (0-20 cm depth) were collected from study area, the samples were brought to laboratory, air dried and sieved through a 2mm sieve to get rid of debris and coarse gravels. Then the samples were subjected to physical and chemical analysis (Table 2).

Experimental design

The experiment was conducted using split-plot design, with three replications. The plot treatment was 3 sowing dates (SD1= September 20th, SD2= October 5th, and SD3= October 20th 2021). Planting interval between first, second and third sowing dates (15 days). Plot size was 14 m long and 10 m wide, with row spacing of 70 cm and plant spacing 10 cm. Seeds were sown by hand at hills with light covered for enhancing germination at 1 cm depth with rate 5 kg seeds ha^{-1}. Once the first pair of leaves had completely unfolded, seedlings were thinned to one plant every 10 cm. Plants were fertilized by 125, 100, and 40 kg ha^{-1} N, P, and K, respectively (Souza and Chaves, 2017). Weed control was performed manually. The harvest was performed at physiological maturity on 24, 20 Jan. for SD 1, on 14 Feb. for SD2, on 6 Mar. 2022 for SD3, respectively (Table 3). Physiological maturity was defined to occur when over 75% of the plants were completely senescent (Mack *et al.,* 2018).

The three sowing dates resulted in vegetation periods ranging between 120 and 138 day, and growing degree days (GDD) between 972.65 and 1315.38°C d. The daily GDD (GDD*i*) were calculated after (Edey, 1977) as:

$$\mathbf{GDD_i} = \frac{Xi_{,\max} + Xi_{,\min}}{2} - X_{base} \quad \text{if } GDD_i < 0, \text{then } GDD_i = 0$$

Where $X_{i,\max}$ and $X_{i,\min}$ are the daily maximum and minimum temperatures on day*i* and X_{base} is the base temperature which was set to 10°C for chia (Baginsky *et al.,* 2016) as for many tropical crops. The GDD of the vegetation period were the sum of the single GDD_i from sowing to harvest.

Investigation and data collection

During growing period plant height (cm), number of branches per plant and fresh weight FW (g), were recorded.

Lipid content

100 g of seeds was extracted with petroleum ether (40-60°C): diethyl ether (1:1v/v) for 24 h. using Soxhlet apparatus. The lipids were obtained by distilling off the solvent. The last traces of the solvent were removed by heating the liquid sample in a vacuum oven at 50°C to constant weight according to Christie, (1982).

Crude protein

Total nitrogen content was determined using Microkjeldahl method according to A.O.A.C. (2005). Then crude protein content was calculated by multiple the total nitrogen content by the factor of 6.25.

Crude fibers

Two grams of each plant defatted powder were accurately weighed, boiled with 200 ml of 1.25 % sulfuric acid under reflux for 30 minutes, then filtered. The residue of the filtrate was washed with distilled water, then transferred back into the flask, where 200 ml of boiling 1.25 % sodium hydroxide solution were added to the residue and boiled again for 30 minutes under reflux, then rapidly filtered and washed with distilled water. The residue was dried at 100°C to constant weight. The differences between the weight of the residue after drying at 100°C and that of ash represented the weight of crude fibers (A.O.A.C. 2005).

Statistical analysis

Data was statistically analysed by analysis of variance (ANOVA) using SPSS program for data set of the two independent experiments and combined analysis was carried out after checking homogeneity of the variance by Bartlett's test. Duncan multiple range test was used according to **Steel and Torrie, (1960)** in order to compare the means at the $P \leq 0.05$ probability level. Results were presented as average mean of the two independent season ± SE.

RESULTS AND DISCUSSION

5–6 days after sowing, the chia seeds began to gradually germinate; the majority of seedlings emerged one week later. Two weeks after sowing, the true leaves emerged, and at that point, the thinning was done. Three weeks after the seed was sown, the missing seedlings were transplanted. Table 3 revealed that plants at SD1 started to flower at 56 DAS, when 726.59 GDD °Cd had accumulated. From flower induction to harvest maturity at SD1 in 2022, the average temperature was 15.91°C. After sowing, harvest maturity was attained 127 days later, or 1268.2 growing degree-days. The beginning of flowering occurred in SD2 and SD3 at 59 and 60 DAS, which equated to 612.02 (SD2) and 438.35 (SD3) GDD, respectively. The day length of days until flower induction was 10.22 (SD2) and 10.12 (SD3), and the average temperature was 22.10 (SD2) and 19.14 (SD3). The mean temperature at SD2 was 13.78 °C from flower induction to harvest maturity.After sowing, maturity was attained 134 (SD2) and 138 (SD3) days later, or 1093.58 and 974.95 GDD, respectively.

Plant height (cm) and number of shoots/plant

Effect of environmental conditios and sowing dates on plant height and number of shoots / plant plant height varies depending on varietal traits and is a result of how the environment, particularly temperature, altitude, photoperiod, relative humidity, and wind, interacts with the cultivar genotype (Ayerza, 2011). The results presented in table (4), showed that, the chia plant height increased with increasing number of days after sowing. Where plants at 90 days recorded the tallest plants (118.22 cm), at SD1, however, at SD3 recorded the shortest plants (63.88 cm) after 90 days from sowing Results are consistent with studies by Grimes *et al.,* (2018) who measured plant heights of the study conducted at Ihinger Hof (IHO) Upper Neckarland, and Eckartsweier (EWE) Upper Rhine Valley cultivated in Germany between 115.6 cm and 102.3 cm. The plant height in Nubaria were quite high, they were still in line with the plant height between 60 to 180 cm reported for Capitani *et al.,* (2013). For SD3 the plant recorded (63.88 cm). According to Moosavi *et al.,* (2012), a delay in sowing date significantly reduced plant height, additionally, the chia plant is sensitive to a variety of environmental factors, including planting time, soil characteristics, and day length (Baginsky *et al.,* 2016). In our study, the plant exposed to low temperatures in December and January was less than the minimum requirement, as shown in Fig. 1. Chia plant heights decrease with shorter days and lower temperatures, according to Ayerza and Coats, (2009), the ideal temperature range for chia is between 16°C and 26°C, with the minimum and maximum growth temperatures being 11°C and 36°C, respectively. However, the effect of the different sowing dates on the number of main shoots or plants was no appreciable (P 0.05). with the age of the plant increased, the number of shoots per plant. The most shoots were observed during the experimental periods at 90 days in SD1 (8.556), and the fewest were observed during the same periods, SD3 (7.111) (Table 4). Grimes *et al.,* (2018) work on characterising and evaluating *Salvia hispanica* L. using three varieties for their cultivation in Southwestern Germany produced similar findings. Golden Chia produced significantly fewer branches than Genotype G8 (7.77) and Genotype SALV66

(8.27), which were in the range (7.9–9.3) of what Souza and Chavez, (2017) observed under greenhouse conditions in Brazil (2018), according to research from the university's experimental station in Eckartsweier (EWE) in southwest Germany. While Yeboah *et al.*, (2014) found that under field conditions (latitude 6° N, mean temperature 24-28 °C), a plant could have between 21.2 and 26.8 branches, Since row spacing and seeding density have a direct impact on the number of branches per plant, the variation between studies revealed that chia has a high degree of plasticity with regard to branch number. As a result, the chosen density must be matched to the unique environmental conditions at each growing site.Sosa-Baldivia and Ruig Ibarra, (2018).

Plant fresh weight

Effect of environmental conditions and sowing dates on plant fresh weight. Across sowing date, there was significantly increased in fresh weight (g) by increasing days to 90 days. As days pass the chia plant slows down before stopping at a specific moment. Later in life death occurs this happened after 120 days. There was a significant change between SD1 SD2 and SD3. The SD1 was higher than SD2 and SD3 for the same periods (78.031, 54.135 and 21.791 g/plant, respectively). Fresh weight, and crop productivity, are impacted by a number of variables, including sowing time, the chia plant (*Salvia hispanica,* L.) responded to different sowing times during two crop cycles, according to a study by Da Silva *et al.,* (2020), which found that the sowing time significantly affected plant population density, raceme number, and shoot dry matter yield. According to research by Cahill and Ehdaie, (2005), earlier sowing times result in better production performance. The results were lower than those found in studies by Salman *et al.,* (2019) and Fouad *et al.,* (2018), which reported fresh weights of 951.64 g–141.5 g and 169.8 g–169.8 g/plant, respectively. The lower fresh weight could be attributed to high plant density in our study than Salman and Fouad which they studied the chia plant at 30 cm plant density and also under different rates of fertilization. The same comment was made in a study reporting that high plant density was associated with higher biomass but lower plant relative growth rates, stem diameter, branching, and leaf proportion. From planting to harvest, Nubaria always had a 120-day cycle, as a result, SD1 had a higher shoot dry matter yield. Dry matter and a measure of crop productivity, are impacted by a number of variables, including sowing time. Baginsky *et al.,* (2016) demonstrated that the effect of sowing date was significant (P 0.01) across all experimental sites in the Valle de Azapa study, Chile, and that there was a tendency for biomass production to decline with later sowing. The highest dry matter yield was noted in plants sown in November in the study by Karim *et al.,* (2015), which was conducted in Mymensingh, Bangladesh, for a comparison of results, differences in latitude, photoperiod, soil properties, and fertilisation must be taken into consideration. Due to exposure to low temperatures during early developmental phases, shoot dry matter yield in SD2 and SD3 was lower than that seen in the first crop cycle.

Weight of seeds per plant (g), 1000 seed (g) and yield (Kg/fed.) of chia (*Salvia hispanica* L.)

Effect of sowing dates on weight of seed per plant (g), weight of 1000 seeds (g), and yield (kg/fed) were all significantly (P 0.05) influenced by sowing time. According to statistical analysis, sowing time SD1 produced the highest 1000 seed and seed yield per fed. (3.645 g/plant and 437.360 k/fed), which was followed by SD2 (2.857 g/plant and 342.857 k/fed), where SD3 recorded the lowest value (1.768 g/plant and 212.153 Kg/fed.) respectively. For 1000-seed weights, sowing time had no significant difference for SD1 and SD2, however, SD3 showed the lowest value (Table 3). Our research is consistent with the results from Baginsky *et al.,* (2016) and Sosa *et al.,* (2016). According to Grimes *et al.,* (2018), planting in November resulted in higher seed yield plant-1 (4.773 g) and husk yield plant-1 (2.840 g) values than planting in December (3.090, 2.350, and 0.9467 g, respectively) and January (2.167, 0.6150g, and 0.5383g, respectively). This variation may be the result of planting times changing over time. The number of seeds per plant at the university's experimental station in Eckartsweier (EWE), Germany, was 2073 (Sahi Alba 914), 3519 (W13.1), and 2738 (G8). For the two sites, there were no discernible differences in the number of seeds produced per plant.

The goal of the Kulkarni *et al.,* 2020) study was to identify the physicochemical characteristics of chia seeds. The findings revealed that 1,000 chia seeds weighed 1.384 g. According to Wojahn *et al.,* (2018), there is a significant difference in thousand seed weight depending on sowing times and spacing, with the first sowing time with the smaller spacing recording the best results, averaging 1.165 to

1.125 grammes. According to field trials conducted in Argentina, the weight of 1,000 seeds ranged from 1.21 grammes to 1.31 grammes (Rovati *et al.,* 2012). According to Win *et al.,* (2018), there was no significant difference (P 0.05) between planting densities and sowing times for 1000-seed weights (1.10–1.17 g). Plants produce 1000 seeds per (g), and both genetic and environmental factors affect this weight. Therefore, the 1000-seed weights could not be significantly affected by using a single genotype (Australian) at all sowing times and planting densities. The weight of the chia seeds we purchased per 1000 seeds was 1.39g, indicating that the Sichuan Basin, China, seeds we harvested in the early winter were much smaller. In our experiment, the cold temperature and lack of sunlight during the middle to late stages of seed growth were significant limiting factors.

Oil percentage

There were significant differences across all three-sowing dates. Chia plants that cultivated at September 2021 (SD1), showed the highest fixed oil percentage (28.06%), where the plants cultivated at 5 Oct. 2022, recorded the lowest percentage (23.3%). Chia seeds have an oil content that ranges from 20.30 to 38.60%, according to numerous reports (Ixtaina *et al.,* 2011; da Silva Marineli *et al.,* 2014; Amato *et al.,* 2015). At various stages of seed development and maturation, the yield of oil extracted with cyclohexane ranged from 23.3 to 28.4% (Gravé *et al.,* 2019). The earlier research mentioned above was consistent with our findings, which showed that the oil yield was 30.789–23.732%. The results were less than those found in studies by Timilsena *et al.,* (2017), Moraes *et al.,* (2014), and Campos *et al.,* (2014), which found oil yields between 20.3% and 35.3%. Due to genetic and environmental factors, the lower seed oil content may be the cause of the lower oil yield. The range of the oil content is 30.789 to 23.732%. The variations in rainfall, temperatures, soil, attitudes, and agronomic practises in each of the locations may be to blame for this variation in oil content (Ayerza, 2011).

Crude protein contents

The seeds from SD1 showed that the highest crude protein contents of 19.97%, while seeds from SD2 and SD3 had 19.12 and 18.76%. These findings concur with those made by Da Silva *et al*., (2017), who discovered that the protein content of chia grown in two regions of Brazil was 19% and 20% crude protein was found in Brazilian seeds, according to a different study (Ganzaroli *et al*., 2017).

Crude fibre

For crude fibre, there was no statistically significant difference between SD1 and SD2, 34.181% and 33.66%. The lowest value, 30.93%, was displayed by SD3, though. Similar findings were made in the study by Da Silva *et al*., (2017) that examined chia seeds from two different Brazilian regions. It was discovered that these seeds contained 35% dietary fibre, including 6% soluble fibre. According to this results, even within a single nation, composition can vary depending on the region of growth. Between 34 and 40 percent of dietary fibre, including 5 to 10 percent soluble fibre, is found in whole chia seeds. Chia seeds contain more than three times as much fibre as flax seeds, which is an increase of 1.2 times. Other studies (Reyes-Caudillo, 2008; Da Silva Marineli *et al*., 2014) revealed that the total dietary fibre content in chia seeds ranges between 32.4 and 37.50 g/100 g, with the majority of this fibre being insoluble (>93%) and the remaining portion being soluble (7%). Chia meal has a high potential for human and animal nutrition because it has a high level of dietary fibre (33.9–39.9% of dietary fibre per 100 g), according to Capitani *et al*., (2012).

CONCLUSION

According to the study's findings, new land in Nubaria has a good chance of producing chia seeds. The best results came from the seed sowing that was done in September. Additionally, we propose that the cultivation of chia plants on the reclaimed land be used for future expansion in order to make up for Egypt's national shortfall in the production of strategic crops.

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Table 1: Climatic conditions of the study area (wind speed m/s, relative humidity %, maximum temperature °C, minimum temperature °C and precipitation rate mm/ month) of the area in 2021/22. T2M_ MIN, MAX (Maximum and minimum temperature at 2 meters high), RH2M (Relative humidity at 2 meters high), WS2M (Wind speed at 2 meters high), WS10M (Wind speed at 10 meters high) and precipitation (precipitation rate mm/month).

Nubaria						
2021/22 Month	WS2M (m/s)	WS10M (m/s)	RH2M (%)	TEMP 2M (°C)		Precip. (mm)
				MIN	MAX	
SEP	3.11	4.32	53.62	21.53	36.50	0
OCT	2.70	3.80	56.91	18.47	32.24	0.06
NOV	2.32	3.40	62.99	15.95	28.26	0.69
DEC	2.67	3.97	66.47	10.13	20.24	0.46
JAN	2.61	3.93	63.32	6.83	17.82	0.19
FEB	2.58	3.97	61.85	7.79	20.35	0.11

Table 2: Soil chemical and physical characteristics of experimental soil.

Physical properties			
Sand (%)	Silt (%)	Clay (%)	Texture
97.10	1.74	1.16	Sandy
Chemical properties			
EC (dS/m)	pH	HCO_3^-	
3.98	7.7	3.8	
Cations Meq/L			
K^+	Na^+	Mg^{++}	Ca^{++}
2.82	19.3	5.44	12.2
Anions Meq/L			
$CaCO_3^{--}$ (%)	SO_4^{--}	Cl^-	CO_3^{--}
5.8	18.5	15.5	0

Table 3: Characteristics of the three sowing dates including date of sowing harvest, growing period (d), temperature (°C), growing degree days (°C d) and day length (h).

Sowing date (SD)	Nubaria										
	Sowing Date	Flower Induction				Harvest Maturity			Day length, (h)		
		DAS	Date	Day length	GDD °C d	Date of harvest	Growing period	GDD °C d	Max	Min	Mean
SD1	20 Spt.	56	14 Nov.21	10.40	726.59	24 Jan. 22	127	1268.2	12.1	11.3	11.3
SD2	5 Oct.	59	30 Nov.21	10.22	612.02	14 Fbr. 22	134	1093.58	10.2	10.2	10.2
SD3	20 Oct.	60	19 Dec.22	10.12	438.35	6 Mar.22	138	974.95	11.2	10.7	10.7

DAS Days after sowing. GDD Accumulated growing degree days with a base temperature of 10°C.Average day length until flower induction.

Table 4: Effect of different sowing dates on plant height (cm), and plant shoots number of Chia (*Slavia hispanica* L.).

Treatments	Plant height (cm)				No. of shoots/plant			
Sowing Date (SD)	30Day	60Day	90Day	Mean	30Day	60Day	90Day	Mean
SD1	19.333[a]	86.667[a]	118.222[a]	74.44	1[a]	5.889[a]	8.556[ab]	5.15
SD2	17.222[b]	82.111[b]	92.667[b]	64.00	1[a]	5.889[a]	8.440 [ab]	5.11
SD3	16.778[b]	44.000[c]	63.889[c]	41.33	1[a]	5.667[a]	7.111[c]	4.59
Mean	17.78	70.93	90.96	59.89	1	5.81	8.04	4.90

Table 5: Effect of different sowing dates on plant fresh weight (g) of chia (*Slavia hispanica* L.).

Treatments	Fresh Weight (g)			
Sowing Date (SD)	30 Day	60 Day	90 Day	Mean
SD1	6.940^{a}	28.093^{b}	78.031^{d}	37.69
SD2	6.386^{a}	27.460^{b}	54.135^{g}	29.33
SD3	6.680^{a}	16.950^{c}	21.791^{t}	15.14
Mean	6.67	24.17	51.32	27.38

Table 6: Effect of different sowing dates on seed weight plant (g), 1000 seed (g) and seed yield (Kg/fed). of chia (*Slavia hispanica,* L.).

Treatments Sowing Date (SD)	Seed weight per plant (g)	1000 seed (g)	Seed yield (Kg /fed.)
SD1	3.645^{a}	1.537^{a}	437.360^{a}
SD2	2.857^{b}	1.534^{a}	342.857^{b}
SD3	1.768^{c}	1.526^{a}	212.153^{c}
Mean	2.76	1.53	330.79

Table 7: Effect of different sowing dates on oil content %, protein content % and crude fiber % of chia seed (*Slavia hispanica,* L.).

Treatments	Seeds		
Sowing Date (SD)	Oil content %	Protein content %	Crude fibre %
SD1	28.063^{a}	19.977^{a}	34.181^{a}
SD2	25.803^{b}	19.123^{b}	33.661^{a}
SD3	23.732^{c}	18.763^{bc}	30.935^{b}
Mean	25.87	19.29	32.93

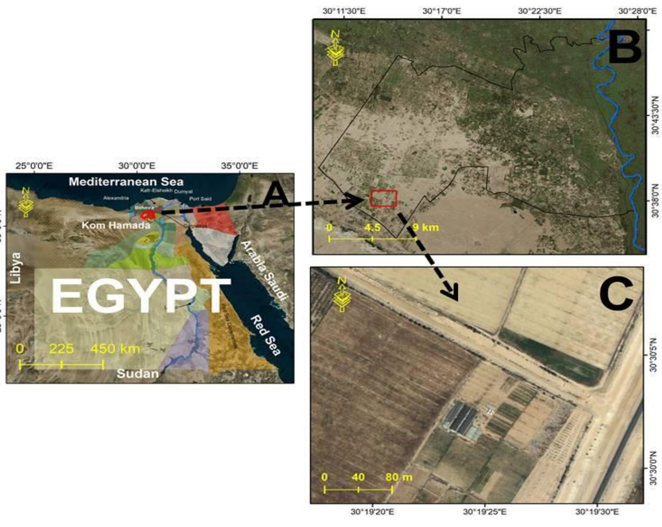

Figure 1: Location of Agricultural Research Station, NRC, Egypt (A), western Delta (B), and NRC farm (C).

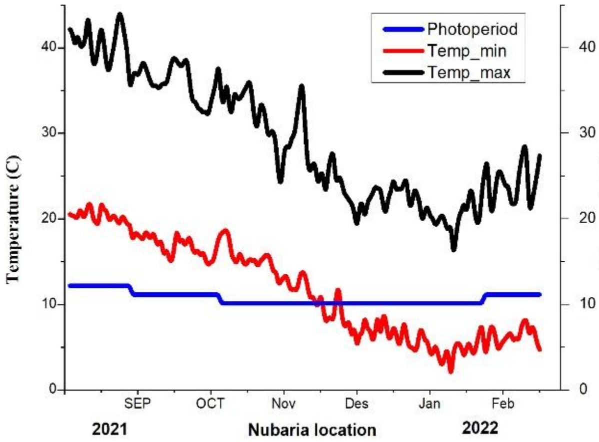

Figure 2: Maximum and minimum temperature (°C) and photoperiod (h) between sowing and harvest at the experimental station.

تأثير الظروف البيئية وميعاد الزراعة على النمو والمحصول لنبات الشيا في منطقة النوبارية – مصر

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الملخص العربي:

يعد المناخ والتربة والتضاريس وكذلك جودة مياة الري من العوامل البيئية الهامة المؤثره على نمو المحاصيل الزراعية. وقد اقيمت تجربة حقلية بمزرعة المركزالقومي للبحوث –النوبارية –البحيرة- جمهورية مصر العربية خلال موسم الزراعة 2021- 2022 بهدف دراسة تأثير الظروف البيئية ومواعيد الزراعة على النمو والمحصول ونسبة الزيت في البذور في نبات الشيا. أظهرت النتائج ان افصى طول للنبات (118.22سم) تم تسجيله في ميعاد الزراعة الأول 20 سبتمبر 2021م تلاها الميعاد الثاني 5 أكتوبر ثم الميعاد الثالث 20 في أكتوبر 2022م على التوالي.وقد اظهرت النتائج ان صفة الوزن الطازج وكذلك محصول البذور و نسبة الزيت للشيا قد اعطت اعلى قيم في ميعاد الزراعة الأول ثم الثاني فالثالث .كما اظهرت النتائج الى وجود فروق معنوية واضحة بين مواعيد الزراعة الثلاثة في صفة كمية المحصول حيث سجل الميعاد الأول اعلى إنتاجية 437.36 كجم/فدان يليه الميعاد الثاني ثم الثالث. تم استخلاص الزيت الثابت من بذور الشيا واعطى ميعاد الزراعة الأول 20 سبتمبر 2021م اعلى نسبة للزيت 28.06 % يليه الميعاد الثاني والثالث. وقد خلصت الدراسة الى ان نبات الشيا من النباتات الواعدة في مصر نظرا لتعدد فوائدها الغذائية والعلاجية وارتفاع نسبة الزيت بالبذور الأمر الذي يجعلها من النباتات الواعدة في المستقبل. وان نتائج هذه الدراسة أكدت ان زراعة نبات الشيا في 20 سبتمبر قد أعطى أغلى القيم لمعظم الصفات المدروسة مقارنة بالميعاد 20 أكتوبر تحت ظروف أراضي التجربة في النوبارية – محافظة البحيره – مصر.

الكلمات الاسترشادية: الشيا، محتوى الزيت، مراحل النمو، الوحدات الحرارية المتجمعة.