Growth, Yield and Its Attributes of Durum Wheat as Affected by Sowing Dates and Seeding Rates under Libyan Conditions

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ABSTRACT

A field experiment was carried out during 2020/ 2021 winter season in a private farm at Al-Maamorah district, El-Ghafara, Tripoli, Libya to evaluate four planting dates (1st and mid November and 1st and mid December) and four seeding rates (80, 100, 120 and 140 kg ha^{-1}) on growth, grain yield, yield attributes and grain protein content of Sidi Almsry durum wheat variety. Randomized complete block design in split plot arrangement in three replications was used, where the four sowing dates were randomly allocated in the main plots and the four seeding rates were randomly distributed within each main plot. Obtained results indicated that planting the studied variety at mid November produced the tallest plants, highest LAI, number of tillers and spikes m^{-2}, number of grains spike^{-1}, grain yield, H.I. and heaviest 1000-grain weight. However, 140 kg seeds ha^{-1} produced the tallest plants, highest LAI, number of tillers and spikes m^{-2}, lodging percentage and grain protein content. Meanwhile, planting Sidi Almsry variety at mid November with 100 kg seeds ha^{-1} produced maximum grain yield, H.I and 1000-grain weight, while 140 kg seeds ha^{-1} at mid November produced the tallest plants and highest LAI, number of tillers and spikes m^{-2}. The highest grain protein content resulted from sowing at mid December with 140 kg seeds ha^{-1}.

Keywords: Wheat, sowing dates, seeding rates, grain yield, yield components, protein content.

INTRODUCTION

Durum wheat (*Titicum turgidum* ssp. durum Desf. em. Musn) is more adapted and suitable in semi-arid regions in the world than bread wheat (*Triticum aestivum* L.). Durum wheat acreage is larger than bread wheat in those regions. It is used for making good kinds of pasta because it produces the best type of simolina and healthy food characterized with low-glycenic index (Kadkol and Sissons, 2016). Durum wheat is the most important cereal crop in Libya, but high temperature, soil salinity and drought stress had harmful effects on its growth and grain yield. To increase wheat grain yield and decrease the gap between popular consumption and production, it is a must to select high yielding capacity genotypes and application of recommended agricultural practices according to the environmental conditions.

Sowing wheat at an appropriate time is important for realizing higher and economic grain yield, for its effect on growth and grain filling duration. Hussain *et al.* (2015) reported that seasonal changes in environmental factors, i.e. temperature and precipitation, have potential impacts on plant growth stages, crop productivity and grain quality. Higher temperature (over optimum) accelerates developmental processes in wheat crop and consequently grain yield may be decreased according to increasing photorespiration rate in C_3 plants (Polley, 2002), but these harmful effects varied according to plant species, genotype and plant growth stage (Wahid *et al.*, 2007).

In contrast, too early sowing produced weak plants with small roots, and temperature is higher than the optimum in that period that led to irregular germination and decomposition of endosperm of grains due to bacterial and fungal infection (Abdel Nour and Fateh 2011). They added that optimum sowing date produced maximum plant height, number of spikes m^{-2}, number of grains spike^{-1}, 1000-grain weight and biological and grain yields compared to early and late sowings. Plant density is another major factor that determine the crop ability to capture resources. The optimum density vary from one area to another according to environmental conditions, sowing date, variety and soil characters. Too high plant population could give poor growth and development of wheat crop that will have adverse effects on growth, yield and its attributes as a result of lodging, water and nutrients deficiency before maturity and may provide favorable conditions for disease and insect incidence (Shah *et al.*, 2016). Conversely, lower than optimum seeding rate led to decrease in growth, yield and its components and make wheat crop unable to compensate. According to the importance of both sowing dates and seeding rates, the present study aimed to determine the optimum sowing date and seeding rate to obtain good growth, grain yield and its attributes of Sidi Almsry durum wheat variety.

MATERIALS AND METHODS

A field experiment was carried out in a private farm at Al-Maamorah district, El-Ghafara, Tripoli, Libya in 2020/ 2021 winter season to evaluate different sowing dates and seeding rates on growth, yield and yield components of Sidi Almsry durum wheat variety. The

trial was carried out in randomized complete block design in split plot arrangement in three replicates. Sub-plot area was 7.2 m^2 (8 rows × 3 m length × 0.3 m width). Preceding crop was maize. Physical and chemical properties of the experimental site soil from 0-30 cm depth were determined according to Page *et al.* (1982). The analysis of soil samples are presented in Table (1).

Four sowing dates, i.e. 1st November (D$_1$), 15th November (D$_2$), 1st December (D$_3$) and 15th December (D$_4$) were allocated in main plots, whereas four seeding rates, i.e. 80 kg ha^{-1} (S$_1$), 100 kg ha^{-1} (S$_2$), 120 kg ha^{-1} (S$_3$) and 140 kg ha^{-1} (S$_4$) were randomly distributed as sub-plots. Nitrogen fertilizer level was 190.4 kg ha^{-1} as urea (46% N) applied in two equal doses (at sowing time and tillering growth stage), phosphorus was applied at the rate of 36.9 kg ha^{-1} P$_2$O$_5$ in the form of single super phosphate (15.5 % P$_2$O$_5$) during soil preparation. Other cultural practices were carried out according to the recommendations for wheat production. Leaf area index (LAI), expressed as the ratio of leaf area (maximum blade width X maximum length × 0.75) to the ground area, was determined at 90 days after sowing (DAS). At harvest, plant height (cm), number of tillers and spikes m^{-2}, spike length (cm), number of grains spike^{-1}, 1000-grain weight (g), grain and biological yields (ton ha^{-1}), harvest index (%), lodging (%) and grain protein content (%) were determined. Obtained data were statistically analyzed as split-plot design according to Steel and Torrie (1984).

RESULTS AND DISCUSSION

Data presented in Table (2) showed that both sowing date and seeding rate beside their interactions had significant effect on the recorded traits of Sidi Almsry wheat variety as the following.

I- Growth characters:

(1) Leaf area index (LAI):

Presented data indicated that sowing Sidi Almsry wheat variety during November, especially mid November, produced the highest LAI (10.09) without significant difference with 1st November, however later sowing led to decrease in (LAI). These results are in agreement with those reported by Dalirie *et al.* (2010). On the contrast, increasing rate of seeding gradually increased LAI, where the highest LAI (9.46) resulted with the highest seeding rate (140 kg ha^{-1}), while low seeding rates (80 and 100 kg ha^{-1}) produced the lowest LAI values. That might be due to long vegetative growth in lower seeding rates (Shah *et al.*, 2016). On the other hand, sowing wheat at mid November with the highest rate of seeding (140 kg ha^{-1}) produced the highest value of LAI (11.02), however early sowing (November first) with 80 kg seeds per hectare produced the least LAI (5.56). That could be due to less number of plants and tillers per unit area as a result of high temperature that accelerates long vegetative growth with less number of tillers.

(2) Plant height:

Data given in the same table revealed that optimum sowing date (mid November) produced the tallest plants (102.60 cm), however, delayed sowing gradually decreased plant height, where the shortest plants (88.34 cm) resulted from mid December sowing date, where low temperature might have suppressed plant growth. Differences between the studied sowing dates effects on plant height was probably related to differences in weather conditions. These results agreed with the findings of Fazal *et al.* (2015) and Mumtaz *et al.* (2015). Regarding seeding rate effect, obtained results showed that increasing seeding rates up to 140 kg ha^{-1} gradually increased plant height to (99.34 cm) and that might be due to high competition between plants for light (Saad, 2010).

Table .1. Some physical and chemical properties of the experimental soil in 2020/ 2021 season.

Soil character	2020/ 2021 season		
	Physical properties		
Sand (%)	88.8	Silt (%)	6.6
Clay (%)	4.6	Texture	Sandy
	Chemical properties		
N (%)	0.024	P (ppm)	26.6
K (ppm)	83.7	O.M. (%)	1.67
Ec (dS/m)	0.76	pH	7.7
Ca^{++}	1.96	HCO$_3^-$ (meq/ L)	4.18
Cl$^-$ (meq/ L)	1.2	Na$^+$ (meq/ L)	2.02
Mg^{++} (meq/ L)	3.22		

Table 2. Means of leaf area index, plant height, spike length and lodging percentage as affected by sowing dates, seeding rates and their interactions.

Treatments		Leaf area index (LAI)	Plant height (cm)	Spike length (cm)	Lodging (%)
Sowing dates					
D_1 (1st Nov.)		9.99 a	93.92 b	10.68 a	3.06 d
D_2 (15th Nov.)		10.09 a	102.60 a	10.33 b	5.64 c
D_3 (1st Dec.)		7.52 c	95.25 b	8.71 c	9.07 b
D_4 (15th Dec.)		9.24 b	88.34 c	8.10 d	12.42 a
L.S.D. (P ≤ 0.05)		0.51	2.84	0.26	2.42
Seeding rate (kg ha^{-1})					
S_1 (80 kg ha^{-1})		7.74 c	89.90 d	9.78 a	3.87 d
S_2 (100 kg ha^{-1})		7.96 c	93.90 c	9.50 b	6.30 c
S_3 (120 kg ha^{-1})		8.68 b	96.96 b	9.53 b	8.35 b
S_4 (140 kg ha^{-1})		9.46 a	99.34 a	9.02 c	11.67 a
L.S.D. (P ≤ 0.05)		0.24	1.95	0.18	1.98
Interactions					
D_1	S_1	5.56 h	91.23 e	11.13 a	1.10 e
	S_2	6.09 g	93.59 de	10.89 ab	2.57 e
	S_3	7.33 f	94.17 de	10.54 b	3.43 de
	S_4	8.97 d	96.69 cd	10.17 b	5.14 de
D_2	S_1	9.57 c	92.25 de	10.76 ab	3.67 de
	S_2	9.65 c	99.72 c	10.13 b	4.31 de
	S_3	10.13 b	106.32 b	10.89 ab	5.32 de
	S_4	11.02 a	112.11 a	9.54 c	9.26 cd
D_3	S_1	6.98 f	90.67 ef	9.00 d	4.40 de
	S_2	7.01 f	94.80 d	8.89 de	8.15 cd
	S_3	7.89 e	97.11 cd	8.56 de	10.07 c
	S_4	8.22 e	98.42 c	8.39 e	13.66 bc
D_4	S_1	8.87 d	85.46 f	8.22 e	6.29 d
	S_2	9.09 d	87.50 f	8.09 e	10.17 c
	S_3	9.38 cd	90.23 ef	8.13 e	14.59 b
	S_4	9.65 c	90.17 ef	7.96 e	18.64 a
L.S.D. (P ≤ 0.05)		0.38	3.38	0.54	3.63

Means in the same column followed by the same letter(s) are not significantly different according to L.S.D.0.05 values.

Concerning planting date X seeds rate interactions effect, the tallest wheat plants (112.11 cm) resulted from mid November sowing with 140 kg seeding rate per hectare, however sowing wheat in mid December with any seeding rate produced the shortest plants.

(3) Spike length:

The tallest spikes of Sidi Almsry durum variety (10.68 cm) resulted from early planting (1st November) and there was a gradual decrease in spike length towards late planting (mid December) that gave the shortest spikes (8.10 cm) as shown in Table (2). The same trend was realized with increasing seeding rate from 80 up to 140 kg ha^{-1} which produced the shortest spikes (9.02 cm). Results presented in that table, also revealed that early sowing (1st November) combined with the lowest rate of seeding (80 kg ha^{-1}) showed the tallest spikes (11.13 cm), however the shortest ones

resulted from combination between late sowing (mid December) and any seeding rate. That pointed out the importance of environmental effects on this trait.

(4) Lodging (%):

Obtained results (Table 2) demonstrated that late sowing date (mid December) produced the significantly highest lodging percent (12.42%), while early sowing showed the lowest lodging percent (3.06%). That could be correlated with environmental factors, especially sunlight that increased the supportive tissues (Xylem) at early sowing date (1st November). On the other hand, increasing seeding rates gradually increased lodged plants percentage up to 140 kg seeds per hectare (11.67 %). High lodging percentage was correlated with higher competition level between wheat plants on sunlight, where dense plant population decreased light penetration and consequently photosynthesis rate (El-Hag, 2011 and Mumtaz et al., 2015). Considering

interaction between the two studied factors effect on lodging percent, results pointed out that the highest percent of lodging (18.64 %) resulted from the latest sowing date (mid December) with highest seeding rate (140 kg ha^{-1}). That might be due to decrease in light intensity within plant canopy and high plant to plant competition.

II- Yield and yield components:

(1) Number of tillers and spikes m^{-2}:

Data presented in Table (3) indicated that sowing wheat under favourable weather conditions in mid November produced the highest number of tillers and spikes m^{-2} (395.85 and 379.29), respectively, as a result of accelerating tillering according to wheat variety. Conversely, earlier sowing (1st November) produced the lowest number of tillers and spikes (289.06 and 284.79), respectively. That could be related to weather conditions effect that tend to prolong vegetative growth stage, thus accelerating more tillers formation and leaf area which resulted in more photosynthates and consequently increased more spikes per unit area. These results were in harmony with Fazal *et al.* (2015) and Mumtaz *et al.* (2015). On the other hand, highest seeding rate, generally produced the highest number of tillers and spikes m^{-2} (365.54 and 340.16), respectively. Results, also, revealed that sowing Sidi Almsry variety at mid November with 140 kg seeds per hectare produced the highest number of both tillers and spikes m^{-2} (442.17 and 401.52), however earlier sowing (1st November) combined with the lowest rate of sowing (80 kg ha^{-1}) produced the lowest tillers and spikes (265.13 and 262.20 m^{-2}), respectively, and that might be due to high temperature effect on vegetative growth accelerating and suppression of tillers production (El-Hag, 2011).

(2) Number of grains spike^{-1}:

Obtained results showed that earlier or later planting dates than mid November significantly decreased number of grains spike^{-1}, where grains number spike^{-1} were 57.65, 62.45, 46.90 and 42.73 for planting in 1st and mid November and 1st and mid December, respectively. That pointed out that higher deviation of sowing dates than the optimum (mid November) caused the plants to suffer from the unfavourable weather conditions and consequently decreased number of grains spike^{-1} (Mumtaz *et al.*, 2015).

With respect to seeding rates effect on that trait, presented results in Table (3) showed that the highest number of grains spike^{-1} (56.32) resulted from the lowest seeding rate (80 kg ha^{-1}), however there were gradually decreases in grains number spike^{-1} with increasing seeding rate. These results are in good accordance with those reported by Ali *et al.* (2004), Soomro *et al.* (2009) and Baloch *et al.* (2010).

Results presented in the same table revealed that planting Sidi Almsry wheat cultivar in mid November with any of the studied seeding rates, generally, produced the highest number of grains spike^{-1}, specially with 80 kg seeds ha^{-1}. Conversely, late sowing at mid December produced the lowest number of grains spike^{-1}. That might be referred to the adverse climatic (temperature and sunlight) and soil minerals (availability and adequacy) effect on that trait out of the optimum conditions in suitable planting date and seeding rate.

(3) 1000-grain weight:

Sowing wheat in the optimum date (15th November) produced the heaviest 1000-grain weight (60.11 g), however the lightest 1000-grain weight (40.67 g) resulted from the latest planting of Sidi Almsry variety. That might be referred to effect of favorable environmental factors on photosynthesis acceleration in optimum date of planting and consequently increased synthates that translocated into (sink) grains (Abdel Nour and Fateh, 2011). On the other side, the heaviest 1000-grain (54.93 g) resulted from sowing Sidi Almsry variety by a rate of 80 kg ha^{-1} and increasing seeding rate gradually decreased 1000-grain weight up to 140 kg ha^{-1}. That could be due to high competition between plants on nutrients and moisture of soil and light, as reported by Soomro *et al.* (2009) and Baloch *et al.* (2010).

Results in Table (3), also indicated that planting Sidi Almsry variety on 1st November at 80 kg/ ha seeding rate produced the heaviest 1000-grain weight (62.18 g) followed by sowing by a rate of 100 kg ha^{-1} in 1st or mid November (60.32 and 60.17 g), respectively. On the contrary, late sowing (mid December) with any seeding rate produced the lightest grain weight. These results are in agreement with those reported by Anwar *et al.* (2015), who stated that delaying planting tended to delay heading and flowering stages and shorten the period of grain filling.

(3) Grain yield (ton ha^{-1}):

Sowing Sidi Almsry cultivar at mid November produced the highest grain yield (8.98 ton ha^{-1}), however the lowest grain yield (6.342 ton ha^{-1}) resulted from the latest sowing date at mid December as shown in Table (3). Early sowing tend to prolong the vegetative growth stage resulting in more photosynthate prodution and consequently high yield components, i.e. more tillering and active tillers that bearing spikes, leaf area index, number of grains spike^{-1} and 1000-grain weight (Fazal *et al.*, 2015).

Table 3. Means of grain yield, yield components and protein content as affected by sowing dates, seeding rates and their interactions.

Treatments		No. of tillers m^{-2}	No. of spike m^{-2}	No. of grains spike^{-1}	1000-grain weight (g)	Grain yield ha^{-1} (ton)	Biological yield ha^{-1} (ton)	Harvest index (H.I %)	Protein content (%)
Sowing dates									
D$_1$ (1st Nov.)		289.06 c	284.79 d	57.65 b	57.98 b	7.482 b	17.814 c	42.00 a	10.77 c
D$_2$ (15th Nov.)		395.85 a	379.29 a	62.45 a	60.11 a	8.980 a	22.580 ab	39.77 a	11.72 b
D$_3$ (1st Dec.)		339.83 b	327.44 b	46.90 c	56.82 c	7.881 b	22.963 a	34.32 b	12.64 a
D$_4$ (15th Dec.)		333.04 b	306.47 c	42.73 d	40.67 d	6.342 c	20.814 b	30.47 c	12.62 a
L.S.D. (P ≤ 0.05)		18.42	14.62	2.21	1.32	0.621	1.862	2.85	0.15
Seeding rate (kg ha^{-1})									
S$_1$ (80 kg ha^{-1})		315.06 d	304.52 c	56.32 a	54.93 a	6.977 b	18.645 b	37.42 a	11.27 d
S$_2$ (100 kg ha^{-1})		331.71 c	319.62 b	53.40 b	54.21 b	7.932 a	21.073 a	37.64 a	11.85 c
S$_3$ (120 kg ha^{-1})		345.48 b	333.70 a	50.76 c	54.02 b	8.007 a	22.040 a	36.33 a	12.01 b
S$_4$ (140 kg ha^{-1})		365.54 a	340.16 a	49.25 c	52.42 c	7.783 a	22.136 a	35.16 b	12.62 a
L.S.D. (P ≤ 0.05)		11.64	10.30	1.63	0.50	0.417	2.306	2.14	0.09
Interactions									
D$_1$	S$_1$	265.13 i	262.20 h	60.22 bc	62.18 a	6.409 cd	14.873 c	43.09 a	10.88 f
	S$_2$	284.34 h	280.29 g	58.30 c	60.32 b	7.228 c	17.063 c	42.36 a	10.60 fg
	S$_3$	296.56 h	287.34 g	56.74 cd	59.74 bc	7.970 bc	19.242 bc	41.42 a	10.46 g
	S$_4$	310.24 g	309.33 f	55.35 d	58.22 cd	8.324 b	20.238 bc	41.13 ab	11.13 ef
D$_2$	S$_1$	362.25 d	356.11 d	66.13 a	56.60 de	8.362 b	20.801 b	40.20 ab	10.98 ef
	S$_2$	380.43 c	371.21 c	62.67 b	60.17 b	9.783 a	23.653 ab	41.36 a	11.25 e
	S$_3$	398.57 b	388.34 b	60.92 bc	58.43 c	9.151 ab	22.952 ab	39.87 ab	12.12 d
	S$_4$	442.17 a	401.52 a	60.11 bc	56.72 d	8.622 b	22.900 ab	37.65 b	12.54 c
D$_3$	S$_1$	320.11 fg	301.42 f	50.79 e	58.19 cd	6.837 cd	19.341 bc	35.35 bc	12.06 d
	S$_2$	332.53 ef	324.53 e	48.41 e	57.24 cd	8.187 b	22.729 ab	36.02 bc	12.57 c
	S$_3$	346.60 e	334.44 e	45.23 f	56.79 d	8.593 b	25.318 a	33.94 c	12.83 bc
	S$_4$	360.08 de	349.38 d	43.19 f	55.08 e	7.910 bc	24.718 a	32.00 cd	13.10 b
D$_4$	S$_1$	312.77 g	298.36 fg	48.17 e	39.87 g	6.250 d	20.122 b	31.06 cd	11.17 ef
	S$_2$	329.53 f	302.45 f	44.22 f	41.98 f	6.531 cd	21.170 b	30.85 cd	12.98 bc
	S$_3$	340.21 ef	324.67 e	40.18 g	41.14 fg	6.312 d	20.970 b	30.10 d	12.65 c
	S$_4$	349.67 de	300.43 f	38.36 g	39.69 g	6.276 d	21.004 b	29.88 d	13.69 a
L.S.D. (P ≤ 0.05)		15.20	12.64	2.85	1.57	0.873	3.412	3.64	0.36

Means in the same column followed by the same letter(s) are not significantly different according to L.S.D.0.05 values.

El-Nakhlawy *et al*. (2015) reported that late sowing of wheat crop suppressed the grain yield and its components. On the other hand, maximum grain yield resulted from seeding rates (100- 140 kg ha^{-1}) without significant difference. However, the lowest rate of seeding (80 kg ha^{-1}) produced the lowest grain yield (6.977 ton ha^{-1}) and that could result from decreasing yield components (number of tillers and spikes m^{-2}, number of grains spike^{-1} and 1000-grain weight).

Concerning interaction between planting dates and seeding rates effect on grain yield, results presented in Table (3) revealed that planting Sidi Almsry variety using 100 or 120 kg grains ha^{-1} at mid November produced the highest grain yield (9.783 and 9.151 ton ha^{-1}), respectively. On the contrast, the lowest grain yield resulted from the latest sowing date (mid December) with any of the studied seeding rates. That might be referred to the shorter vegetative growth period and exposing plants to high air temperature during grain filling.

(4) Biological yield (ton ha^{-1}):

This trait was similarly affected by planting dates and seeding rates as grain yield. However, effect of interaction between the two factors differed, where higher seeding rate (120 and 140 kg ha^{-1}) at late planting date (1$^{\underline{st}}$ December) produced the highest biological yield (25.318 and 24.718 ton ha^{-1}), respectively. That could be due to higher number of plants per unit area and their tendency to increase vegetative growth because of high competition between plants for growth resources.

(5) Harvest index (H.I %):

Results presented in Table (3) indicated that harvest index values (H.I) were highest with early and optimum sowing dates (42.00 and 39.77 %), respectively, because of decreasing biological yield (17.814 ton ha^{-1}) and increasing grain yield (8.980 ton ha^{-1}), respectively. Also, low (H.I) at the latest sowing dates (30.47 %) resulted from decreasing both grain and biological yields. On the other hand, the highest seeding rate (140 kg ha^{-1}) produced higher tillers number m^{-2} (365.54) and biological yield (22.136 ton ha^{-1}) than grain yield (7.783 ton ha^{-1}).

Considering effect of planting dates × seeding rates interaction on that trait, results indicated that sowing Sidi Almsry variety in 1$^{\underline{st}}$ and mid November with any seeding rate studied produced the highest (H.I) percentage. Conversely, delayed sowing suppressed (H.I) caused by reduction grain yield and its contributing traits, especially at 120 and 140 kg ha^{-1} rates of seeding.

(6) Protein content (%):

Protein content in Sidi Almsry variety grains was significantly increased with delaying sowing date, where the highest values (12.46 and 12.62 %) resulted from sowing at 1$^{\underline{st}}$ and mid December, respectively. These results were in agreement with those reported by Omar *et al*. (2014) who reported that short grain felling period decreased carbohydrate content, grain size and weight and in turn increased grain protein content. Increasing seeding rate, also, decreased grain protein content, where the highest seeding rate (140 kg ha^{-1}) produced the highest grain protein content (12.62 %) as shown in Table (3). That could be due to high competition between plants on light and soil nutrients that decreased grain size and weight and consequently increased grain protein content.

Regarding interaction between the studied factors on that trait, results pointed out that increasing seeding rates combined with late sowing, generally increased grain protein content and the highest protein content (13.69 %) resulted from the latest sowing (mid December) with highest seeding rate (140 kg ha^{-1}).

It can be concluded that sowing Sidi Almsry durum wheat variety at optimum date (mid November) with 100 kg seeds ha^{-1} produced high grain yield and yield attributes and lowest lodging at Al-Maamorah district, EL-Ghafara, Tripoli, Libya.

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الملخص العربي

تأثر النمو والمحصول ومكوناته للقمح الديورم بمواعيد الزراعة ومعدلات البذار تحت الظروف الليبية

محمود أبو عجيله على رحومة

نفذت تجربة حقلية فى الموسم الشتوى ٢٠٢٠/٢٠٢١ فى مزرعة خاصة فى منطقة المعمورة– الغفارة– طرابلس– ليبيا لدراسة تأثير أربعة مواعيد لزراعة صنف قمح الديورم سيدى المصرى هى أول ومنتصف نوفمبر وأول ومنتصف ديسمبر بالإضافة إلى أربعة معدلات للبذار (٨٠، ١٠٠، ١٢٠، ١٤٠ كجم/ هكتار)– وقد نفذت التجربة بتصميم القطاعات كاملة العشوائية بترتيب القطع المنشقة فى ثلاث مكررات وقد مثلت مواعيد الزراعة عامل القطع الرئيسية بينما وزعت معدلات البذار عشوائياً على القطع الفرعية وقد أوضحت النتائج أن زراعة الصنف سيدى المصرى فى منتصف نوفمبر أدت إلى الحصول على أطول النباتات وأعلى قيم لدليل المساحة الورقية– وعدد الأشطاء والسنابل/ م² وعدد الحبوب/

سنبلة ومحصول الحبوب ودليل الحصاد وأقل وزن للألف حبة– فى حين أدت الزراعة بمعدل ١٤٠ كجم/ هكتار إلى إنتاج أطول النباتات وأعلى دليل للمساحة الورقية وعدد الأشطاء والسنابل/ م² وكذلك أعلى نسبة من الرقاد للنباتات وأعلى محتوى للبروتين فى الحبوب– وقد أدت الزراعة بمعدل بذار ١٠٠ كجم/ هكتار فى منتصف نوفمبر للحصول على أقصى محصول من الحبوب وأعلى دليل للحصاد ووزن للألف حبة– بينما أدت الزراعة بمعدل ١٤٠ كجم/ هكتار فى منتصف نوفمبر إلى الحصول على أطول النباتات وأعلى قيم لدليل المساحة الورقية وعدد الأشطاء والسنابل/ م²– فى حين تحقق أعلى محتوى بروتينى للحبوب من الزراعة المتأخرة (منتصف ديسمبر) بمعدل بذار ١٤٠ كجم/ هكتار.