Egypt. J. of Appl. Sci., 38 (9-10) 2023 *1-18*

EFFECTS OF VARIETIES, SOWING DATES, AND PLANTING DISTANCES ON *VICIA FABA* L., YIELD AND GREEN SEEDS CONTAINS OF THE TYROSINE.

Hala H. Abou El-Nour

Veg. Res. Dep. Hort. Res. Ins. Agric. Res. Center, Giza. Egypt.

E-Mail: wittylight@Gmail.com

ABSTRACT

Two faba bean varieties *i. e.,* Nubaria-1, and Spanish were sown in different cultivated dates 15th of October, November, and December during winter seasons of 2020/2021 and 2021/2022 at different planting distances (30, 25, and 15cm) in sandy loam soil at the experimental farm of El-kassasein Station, Ismailia governorate, Horticulture Research Institute, Agriculture, Research Center, Egypt .The effects of previous factors on the vegetative growth, yield components and green seeds contents of protein, carbohydrates and amino acid (Tyrosine) which is the generator of constructor L-DOPA compound that treated of Parkinsons disease (PD). The results showed that Nubaria-1 obtained augment vegetative growth (plant length, plant fresh and dry weight), yield attributes (number of pods/plant and seeds dry weight percentage), and seeds chemical components percentage (protein, and tyrosine). Meanwhile, Spanish variety was surpassing in number of branches/plant, 100-seed weight, number of seeds/pod, and seeds contents of carbohydrates. Sowing faba bean in 15th November was the optimum date to produce greatest plant growth, green pods, green seeds yield/fed., and pods characteristic as well as seeds chemical contents of carbohydrates, protein, and amino acid (Tyrosine). Planting distances at of 25cm resulted in vigor plant growth then in second order the distance at 30 cm between hills. While, the superiority values of number of pods/plant, 100-seed weight and dry seed weight percentage as well as green seeds chemical contents were established according to space 30cm apart between plants. Conclusively, the interaction between variety Nubaria-1, sowing in 15th November, and planting distance at 30cm increased the chemical components percentage of tyrosine and protein.

Key Words: Faba bean, yield, carbohydrates, and tyrosine.

INTRODUCTION

Faba bean (*Vicia faba* L.) is commonly named as broad bean, belongs to the family of Fabaceae. Accordingly to the production area, faba bean is the fourth major significant legume crop in the world

(**Kebede, 2020**). *Vicia faba* is around 4.5 million tons of annual production, mainly in Asia, Europe, and South America (**Bulduk, 2020**). Egypt is one of the world's largest faba bean producers in 2019 (**FAO, 2021**). The faba bean harvested area in Egypt amounted to 44.5 thousand ha in 2020, with 125 thousand tons for dry and 175 thousand tons for green production (**FAO, 2023**). Although, the local production of faba bean is not sufficient for the Egyptians' needs, so Egypt imports more than 50% of the total import volume in the world as reported by **Elsebaie *et al.*, (2022).** Faba bean cultivate for their fresh vegetables (immature green pods), green seeds, dried kernels, or processed foods (**Alemu and Wato, 2023**). In addition faba bean plants have an effective biological nitrogen fixation since create a symbiotic relationship with Rhizobium bacteria therefor provide a significant amount of nitrogen from the soil air **(Luo *et al.*, 2013 and Etemadi *et al.*, 2019).** Significant differences showing between faba bean plants concerning yield and its components correlated with the interaction between the environment conditions, and genotypes (**Siddiqui *et al*., 2015**). Seeds contain divers' nutritional values including protein, carbohydrates, B group vitamins, minerals, medicinal effects thus; it is used for the treatment of Parkinson's disease also, for the treatment of gallstones and cirrhosis of the liver (**Mohseni and Golshani, 2013**). Faba bean accumulates a large amount of naturally non-protein amino acid which called l-3,4-dihydroxyphenylalanine (L-DOPA) which naturally formed from amino acid tyrosine and accumulates in faba bean seeds (**Etemadi *et al.*, 2018).** Moreover**,** the plant contained the L-DOPA ranged from 0.09 to 1.15 mg/g and acts as an allele-chemical, has an important role in several biological processes, such as stress response and metabolism, in plants. (**Soares *et al.*, 2014** and **Purves *et al.*, 2017**). L-DOPA, a precursor of dopamine currently used as a major ingredient in treating Parkinson’s disease (PD) and hormonal imbalance (**Waller and Sampson, 2018**). L-DOPA is synthesized naturally from the amino acid L-tyrosine in the mammalian body and brain. Parkinson’s disease patients are treated with synthesized L-DOPA which is expensive and often related to a variety of side effects including nausea, vomiting, low blood pressure, drowsiness, and restlessness, therefore cultivation of crops that are rich in natural L-DOPA to overcome side effects and the high cost of production of synthetic L-DOPA has been recommended. The world demand for L-DOPA is estimated to be as high as 250 metric ton year^{-1} with an annual market value of about $100 billion **Patil *et al.*, (2013)** and **Fordjour *et al.*, (2019).**

The objective of this study was to examine the effects of variety, sowing dates, and planting distances on growth, yield & yield components of faba bean, and the content of green seeds from tyrosine that the generator of constructor L-DOPA compound which reflect to the human health.

MATERIALS AND METHODS

A field experiment was conducted during the two winter seasons of 2020/2021 and 2021/2022 at the experimental farm of El-kassasein Station, Ismailia Governorate, Horticulture Research Institute, Agriculture, Research Center, Egypt. Two varieties of faba bean (*Vicia faba* L) *i. e.,* Nubaria-1 and Spanish. Seeds were brought from (Makka Company for Vegetables Seeds, Bab El-Khalk, Cairo). Seeds were planted at three different dates, 15^{th} of (Oct., Nov., and Dec.). The metrological data during growing seasons of 2020/2021 and 2021/2022 are shown in Table 1. The experimental plot area was (4.5 m^2) included 3 rows (each was 3 m length and 50 cm width) the area of each row was 1.5m^2. Seeds sown on two side of the row in two seeded hill at planting distance 30, 25, and 15 cm between hills, the number of plants on each row were 40, 24, and 20 plant respectively. The plants were thin to become one plant in each hill and the number of plants on each row reached 20, 12, 10 plant respectively, then the number of plant in each plot were 60, 36, and 30 plant/plot respectively and the number of plants were 13, 8, and 6/m^2. The experiment was laid out in a split-split plot design in three replicates, thus the two varieties were arranged in the main plot, and the three sowing dates were assigned to sup plot, meanwhile, the plant distance were distributed as sup-sup plot. The irrigation system was drip. Other agricultural practices were done according to the recommended for faba bean plant by the Ministry of Agriculture. The average two seasons, physical and chemical properties of the experimental soil before planting are shown in Table (2).

Table (1): The metrological data during growing seasons of 2020/2021 and 2021/2022.

Month	Temperature C^0				Relative humidity (RH %)	
	Max.	Min.	Max.	Min.		
	2020/2021		2021/2022		2020/2021	2021/2022
October	28.7	19.9	30.1	23.0	68.3	69.6
November	26.1	24.4	28.4	23.0	65.0	63.0
December	20.8	14.3	22.3	15.3	64.7	66.9
January	20.4	12.2	17.9	12.7	63.6	68.6
February	21.5	13.0	20.8	14.7	68.3	65.9
Mars	24.0	15.8	24.7	14.1	66.1	69.0
April	25.7	19.8	26.4	19.6	62.3	65.9

Agricultural Research Center, Central Laboratory for Agricultural Climate, Ministry of Agricultural and Land Reclamation.

Table (2): Soil physical and chemical analyses (average of two seasons).

Soil physical analyses				Soil chemical analyses																
Text.	Sand (%)	Silt (%)	Loam (%)	pH	E.C. (dSm^{-1})	$CaCo_3$ (%)	Soluble cations (M/L)				Soluble anions (M/L)			Macro elements (ppm)			Micro elements (ppm)			
							Ca^{+2}	Mg^{+2}	Na^{+}	K^{+}	HCO^{-3}	Cl^{-2}	SO_4^{-2}	N	P	K	Fe	Cu	Zn	Mn
Sandy loam	80.3	2.0	17.6	8.4	0.2	5.2	1.0	0.5	0.3	0.2	0.2	0.5	1.3	40	66	40	3.0	0.8	1.0	1.5

1-Vegetative growth characters:

After three months of planting, five samples from the plants of each treatment were collected to determine plant length (cm), number of branches/plant, fresh and dry weigh (g).

2- Pods yield and its components:

At harvesting *i.e.* green stages (120 days after sowing) green pods of each plot were harvested to determine the pods yield and its components (number of pods/plant, number of seeds/pod, weight of 100-green seed (g), dry weight percentage of green seeds and total green pods yield and seeds ($ton.fed.^{-1}$) were estimated (the weight of all pickings).

3- Seeds chemical contents:

Total carbohydrates % in green seeds was determined using phenol sulphuric according to **Dubois *et al.*, (1956**). Total nitrogen % in green seeds was determined by using Micro-Kjeldahl method (**AOAC, 1990**) and the values multiplying by the factor of 6.25 to determined Protein % in green seeds. Amino acid (Tyrosine) was determined according to **AOAC, (2006).**

Statistical Analysis:

All data were subjected to statistical analysis according to the procedures reported by **Snedecor and Cochran (1982)** using Statistix 8 software program and means were compared by L.S.D multiple range tests at the 0.05 level of probability in the two seasons of experimentation.

RESULTS AND DISCUSSION

1- Vegetative growth characters:

Presented data in Table 3 revealed that faba bean variety i.e., Nubaria-1 (V_1) was significantly surpass in all vegetative traits *i. e.*, plant length, plant fresh and dry weight except the number of branches/plant as compared to Spanish variety (V_2). This result might be return to that there were marked variation among faba bean varieties in vegetative performance **(Karadavut *et al.*, 2010)** and number of branches per plant **(Abou-Taleb, 2002).** These results are in accordance with study by

Hassan & Haridy (2019) and **Alabade *et al.,* (2022)** who reported that number of branches of Spanish variety was recorded (6.2/plant). Data also showing that planting dates ($D_{1,2,3}$) have a significant effect on all studied traits, but the vegetative parameters were differ in their response to this factor hence.The obtained results indicated that sowing faba bean in 15th November (D_2) produce the tallest plants, heaviest weight of plant, with more branches and heaviest dry weight for plant, followed by the effects occurred with the sowing in 15th October (D_1) on all canopy parameters. Delaying sowing date (D_3) sharply decreased previous growth characters in comparable to D_1 and D_2 as shown in Table 3. To explain this augment results of D_2 it must delaying to the climatic condition in the second sowing date (Table 1) that provide the suitable appropriate needs to the plants for producing vigorous vegetative growth presented in higher parameters. Same results were obvious by **Khalil *et al.,* (2011)** and **Gomaa *et al.,* (2023)** who reported that November was the suitable planting date. In the same context **EL-Metwally *et al.,* (2013)** found that faba bean sown in October was obtained higher growth parameters than those sown in December under Egypt conditions. The decreasing given in faba bean vegetative characters when sown at late date might be attributed to that the temperature during plant growth and development in late sowing reduce canopy thereby affected the supply of photosynthesis **(Kondra, 1975)**, the differences between day/night predominate temperature during plant growth **(Abou-Taleb 2002)**, sowing at lately date exposure plants to shorter growing period resulted in less dry matter accumulated and poor faba bean growth (**Tawaha and Turk, 2001)**. Present results are in line with those found by **Hegab *et al.,* (2014)** who found that vegetative growth traits of faba bean values were decreased as sowing date delayed beyond the 1st November. These results are in agreement with those obtained by **Yasmin *et al.,* (2020**). Regarding to planting distances ($S_{1,2,3}$) obtained data in Table 3 showed that sowing at 25cm planting distance (S_2) significantly produce greater vegetative growth parameters followed by 30 cm wide distance (S_1), meanwhile the narrow distance (15cm, S_3) causes reducing in all growth traits. This might be due to that sowing at wide distance produce fewer plants account in cultivated unit (m^2) that provided better chance nutrient supplier and light for each plant beside less plant competition **(Abd Alla and Omran, 2002).** Furthermore, faba bean plants often compensate for low plant populations density by producing larger number of lateral branches (**Etemadi *et al.,* 2019**). That probably explained the perfect growth characters and high number of branches/plant presented from plants sown at 30 and 25cm (6,66 and 5.51) respectively. Meanwhile, high plant density can cause lodging, less light penetration in the crop canopy, reduced photosynthetic efficiency **(Lemerle *et al*., 2006)**. The interactions between varieties ($V_{1,2}$) and planting dates ($D_{1,2,3}$) presented data showed that cultivated Nubaria-1 at 15^{th} November (V_1xD_2) was the perfect to produce the greatest vegetative growth parameters except the parameter of number of branches per plant which recorded superior data with Spanish variety when sown in the same date (D_2). In Spanish variety (V_2xD_2) it could observe the same augment effects of planting date on all plant traits as in second order compared to Nubaria-1 (Table 3). The difference between two varieties under this study in plant branches could be due to the fact that there are differs between genotypic between varieties as presented by **(Abdalla *et al*., 2000)**. The interaction between variety ($V_{1,2}$) and planting distances ($S_{1,2,3}$), Nubaria-1 sowing at distance-25cm (V_1xS_2) significantly recorded best growth characteristics Also, the same trend was occurred for Spanish variety (V_2xS_2). Such results might be returned to that appropriate space between plants decreased plant competitions which helps for utilizing all essential nutrients and environmental condition to build up new tissues, therefore increase plant vigor (**Al-Suhaibani *et al*., 2013**), Also, achieving an optimal canopy size resulting from suitable planting distance is important for sufficient interception of radiation, and production of assimilates; however, too large a canopy can also lead to problems such as lodging and high disease pressure (**Loss *et al*., 1998**). The interaction between planting date ($D_{1,2,3}$) and distances ($S_{1,2,3}$) was observed that generally plants grown under second cultivate date 15^{th} November and at 25cm distance (D_2xS_2) showing greatest vegetative growth *i,e.*, plant length, number of branches/plant, fresh and dry weight. It worth to mentioned that cultivate the two varieties in 1^{st} date (15^{th} October) at plant apart 25cm (D_1xS_2) provided effective results on plant growth traits comparing to planting in the later date (D_3xS_2). To explain these results it could be refer to that the availability of suitable weather conditions for plant growth and cultivation at appropriate distances gives it the sufficient amount of lighting and less plant rivalry that enables it to carry out metabolism process in an optimal manner which reflected in the plant development as mentioned by **Pilbeam *et al*., (1990).** The interaction between varieties ($V_{1,2}$), planting date ($D_{1,2,3}$), and distances ($S_{1,2,3}$), the presented data in Table (3) showed that Nuparia-1 sown at 15^{th} of November at 25cm plant apart ($V_1xD_2xS_2$) resulting in active growth in 1^{st} and 2^{nd} seasons expressed as highest plant length (180.58, and 177.67cm), fresh weight (782.33, and 802.00g), and dry weight (106.33, and 106.67g) compared to Spanish variety since achieved smaller parameters except for number of branches/plant since was estimated (9.50, and 8.5/plant) in two season respectively.

Table (3): Response of faba bean vegetative growth with respect to varieties, planting dates and distances during the two growing seasons of 2020/2021 and 2021/2022.

Treatment		Plant length (cm)	Plant weight (g)	Number of branches /plant	Dry weight (g)	Plant length (cm)	Plant weight (g)	Number of branches /plant	Dry weight (g)
		1st season				2nd season			
Varieties	Nubaria-1	132.79	422.88	5.15	72.46	126.91	464.78	4.91	76.68
	Spanish	110.87	316.08	6.04	71.39	108.48	342.15	5.72	72.32
L.S.D at 5%		0.62	6.65	0.12	2.42	1.22	8.88	0.15	0.22
Planting date	15th Oct.	120.04	398.66	5.59	78.89	112.19	426.89	5.30	79.41
	15th Nov.	132.13	411.76	6.02	85.81	129.39	466.44	5.59	89.82
	15th Dec.	113.33	298.01	5.17	51.06	111.50	317.06	5.04	54.27
L.S.D at 5%		0.90	12.60	0.07	3.34	1.39	12.63	0.04	1.00
Planting distance	30 cm	120.40	426.22	6.66	74.94	115.37	142.06	6.26	75.07
	25 cm	132.39	559.72	5.51	81.11	129.26	589.78	5.24	86.67
	15 cm	112.71	122.49	4.61	59.71	108.44	478.56	4.44	61.77
L.S.D at 5%		0.89	6.75	0.09	3.44	1.23	9.02	0.05	0.86
VXD	V_1XD_1	127.59	473.67	5.06	85.16	114.94	504.78	4.77	89.44
	V_1XD_2	147.80	486.73	5.77	88.11	143.56	550.67	5.41	95.05
	V_1XD_3	122.98	308.22	4.58	44.10	122.22	338.89	4.55	45.56
	V_2XD_1	112.49	323.65	6.11	69.68	109.44	349.00	5.78	69.38
	V_2XD_2	116.46	336.80	6.23	86.45	115.22	382.22	5.83	84.60
	V_2XD_3	103.67	287.80	5.80	58.03	100.78	295.22	5.54	62.98
L.S.D at 5%		1.28	17.82	0.10	2.73	1.97	17.86	0.06	1.42
VXS	V_1XS_1	123.32	497.22	5.42	79.04	116.53	155.00	5.19	77.43
	V_1XS_2	150.64	648.11	6.58	85.38	147.08	669.22	6.24	87.73
	V_1XS_3	124.42	123.30	3.45	61.50	117.11	570.11	3.30	64.88
	V_2XS_1	114.15	355.22	5.77	70.85	111.44	129.11	5.58	72.70
	V_2XS_2	117.48	471.33	6.73	76.83	114.22	510.33	6.28	85.61
	V_2XS_3	100.99	121.69	5.11	56.93	99.78	387.00	5.18	58.66
L.S.D at 5%		1.26	9.55	0.13	4.87	1.75	12.76	0.08	1.21
DXS	D_1XS_1	116.31	453.08	5.10	76.61	106.63	127.33	4.69	77.41
	D_1XS_2	131.33	627.00	6.63	86.50	128.63	651.17	6.18	97.75
	D_1XS_3	112.49	115.90	4.45	60.08	101.33	502.17	4.61	63.08
	D_2XS_1	129.22	467.83	5.33	96.58	126.50	149.83	4.84	93.90
	D_2XS_2	150.54	638.67	8.53	100.00	148.50	690.00	7.71	99.33
	D_2XS_3	116.63	128.79	4.80	74.35	113.17	559.50	5.96	76.25
	D_3XS_1	115.31	357.75	4.15	51.65	113.00	149.00	4.48	53.90
	D_3XS_2	115.67	413.50	6.11	56.83	110.67	428.17	5.11	62.93
	D_3XS_3	109.00	122.78	4.09	44.72	110.83	374.00	4.23	46.00
L.S.D at 5%		1.54	11.70	0.16	5.96	2.14	15.63	0.10	1.49
VXDXS	$V_1XD_1XS_1$	118.78	579.00	4.46	45.47	105.92	131.67	4.26	46.50
	$V_1XD_1XS_2$	142.50	725.67	5.16	49.33	136.92	750.00	5.00	54.20
	$V_1XD_1XS_3$	122.00	116.35	4.27	37.50	102.00	632.67	3.46	36.00
	$V_1XD_2XS_1$	133.05	547.67	5.11	99.33	127.67	164.67	5,10	95.32
	$V_1XD_2XS_2$	180.58	782.33	5.26	106.33	177.67	802.00	5.13	106.67
	$V_1XD_2XS_3$	129.77	130.20	5.00	81.33	125.33	685.33	5.09	87.17
	$V_1XD_3XS_1$	118.11	365.00	3.57	92.33	116.00	168.67	5.06	90.50
	$V_1XD_3XS_2$	128.83	436.33	3.70	74.83	126.67	455.67	3.43	102.33
	$V_1XD_3XS_3$	121.50	123.33	3.10	65.67	124.00	392.33	3.00	71.50
	$V_2XD_1XS_1$	113.83	327.17	6.51	57.83	107.33	123.00	4.26	61.30
	$V_2XD_1XS_2$	120.17	528.33	6.83	64.33	120.33	552.33	6.23	71.67
	$V_2XD_1XS_3$	103.48	115.45	6.43	51.93	100.67	371.67	6.16	56.00
	$V_2XD_2XS_1$	125.39	388.00	7.56	93.83	125.33	135.00	6.93	92.48
	$V_2XD_2XS_2$	120.50	495.00	9.50	98.17	119.33	578.00	8.50	96.00
	$V_2XD_2XS_3$	103.50	127.39	7.23	67.37	101.00	433.67	6.83	65.33
	$V_2XD_3XS_1$	113.22	350.50	5.61	60.89	110.00	129.33	5.42	64.33
	$V_2XD_3XS_2$	101.78	390.67	5.93	93.67	94.67	400.67	5.53	89.17
	$V_2XD_3XS_3$	96.00	122.22	5.40	54.50	97.67	355.67	5.13	54.67
L.S.D at 5%		2.19	16.55	0.23	8.43	3.03	22.11	0.14	2.10

V= Varieties D= Planting dates S= Planting distances

V_1= Nubaria-1 variety. V_2= Spanish variety D_1= Planting date (15th October) D_2= Planting date (15th November). D_3= Planting date (15th December) S_1= Planting distance at 30cm. S_2= Planting distance at 25cm. S_3= Planting distance at 15cm

2- Pod yield and its components:

Presented data in Table 4 showed the differ between the two varieties Nubaria-1 and Spanish in their yield and pods components traits, *i. e.,* number of pods/plant, seeds dry weight percentage and average number of seeds per pod. The positive results significantly obtained were related to Nubaria-1 (V_1) in two growing seasons. It worth to mentioned that the superiority of Nubaria-1 in seeds dry weight although its lower number of seeds/pod compared to Spanish might be return to that rate of filling of pods containing three seeds was higher than that of pods containing more seeds, that lead to competition for elements store which were lower consequently reduced seeds dry weight as explained by **(Dekhujzen and Verkerke, 1986**). In case of Nubaria-1 this competition was absent so the elements distribution heaviest on less number of seeds therapy reflected in higher seeds dry weight. Meanwhile, the significant superior in seed-index traits (100-seed weight) and number of seed/pod was observed with Spanish variety (Table 4). Current results are in line with those found by **Alabade *et al.,* (2022).** Planting date significantly influenced on two varieties in their yield components *i.,e.,* number of pods/plant, number of seeds/pod, 100-seed weight (seed index), seed dry weight percentage, green pods yield, and green seeds yield/fed. From this concern, sowing date at 15th November (D_2) led to increase the previous parameters followed by 15th October (D_1). While, sowing at delay date 15th December (D_3) caused decrease in the different measurements (Table 4). These results are compatible with those found by **Hussien *et al.,* (2006), El-Metwally *et al.,* (2013**) **Sallam *et al.,* (2017), Yasmin *et al,.* (2020)**, and **Gomaa *et al.***, **(2023).** They deduced that planting broad bean through various dates of November produce higher number of pods/plant, seeds/pod, and 100-seed weight. Meanwhile, the corresponding lowest values were recorded from late sowing at 15th December. Moreover, these differences in the previous parameters regarding to sowing date might be due to that differing in an environmental factors *i.e.,* temperature and light that significantly affects the reproductive stages **(Turk and Tawaha, 2002)**. Data about planting distances (Table 4), it was observed that superiority values of number of pods/plant, 100-seed weight and dry seeds weight percentage were established according to space 30 cm apart between plants (S_1), The reduction in pod components and yield values were detected to (S_3) distance. It could be explain these results through that sowing at wide spaces such 30cm in present experiment means lower plant populations (6 plant/m^2) which tend to produce more branches as established in Table (3). That allow each plant to product more leaf area for light interception and more pods per plant as described by **Robinson and Conley(2007**). In this respect **Al-Khafaji (1987)** illustrated that a significant increase was obtained in pod number, 100-seed weight, and seed yield when faba bean plants sown at wide space hill apart as 30, and 40cm. However, sowing at narrow space such 15cm as occurred in this study it means higher plant density (13 plant/m^2) .Therefore, lead to competition between plants for light, water and other nutrients (**Pilbeam *et al.*, 1990**) and poor light permeation between plants that reduced photosynthetic efficiency which causes reduction in plant pod components as reported by **Abd El-Rahman (2014)** and (**Ayman *et al.*, 2021**). The interaction between different varieties ($V_{1,2}$) and planting date ($D_{1,2,3}$) recorded in Table (4) indicated that all pod components of two varieties showed significant effects with sowing in 15th November (D_2) to maximize different the previous parameters followed by sowing in 15th October (D_1). While, sowing date at 15th December (D_3) produced the worst results. On the other side, the recorded data about the interaction between varieties ($V_{1,2}$) and planting distances ($S_{1,2,3}$) revealed in Table (4) that Nubaria-1 or Spanish when sown at 30cm (S_1) clearly rise all parameters values followed by planting at space 25cm (S_2). The interaction between planting date ($D_{1,2,3}$) and distances ($S_{1,2,3}$) showing in Table 4 that it could arrange the maximizing of resulting as follow (D_2xS_1) which recorded the greatest values followed by (D_2xS_2), then (D_1xS_1), but the lowest measurements of both yield and pod components were observed from plant sown in third date 15th December (D_3) at narrow spacing 15cm (D_3xS_3) as showing in Table (4). Concern to the interaction between varieties ($V_{1,2}$), planting date ($D_{1,2,3}$), and distances ($S_{1,2,3}$) data in Table 4 indicated that there were different results according to different interaction effect. However, Nubaria-1 plants sown in 15th November at space 30cm ($V_1xD_2xS_1$) produced highest number of pods/plant and heaviest dry weight percentage of seeds while, the superiority results of number of seeds/pod and 100-green seed weight were accordance to Spanish variety sown in 2nd date and at 1st distance ($V_2xD_2xS_1$). On the Other hand, the sever decrease in measurements of number of green seeds/pod, and 100-seed weight were achieved from the interaction between ($V_1xD_3xS_3$) and for number of pods/plant and dry seeds weight percentage were connected with ($V_2xD_3xS_3$).

Table (4) : Response of faba bean pods yield , and pod attributes with respect to varieties, planting dates and distances during the two growing seasons of 2020/2021 and 2021/2022.

Treatment		No of pods /plant	No of green seeds /pod	100-green Seed weight (g)	Green seeds dry weight (%)	Yield of green pods ton/fed.	Yield of green seeds ton/fed	No of pods /plant	No of green seeds /pod	100-green Seed weight (g)	Green seeds dry weight (%)	Yield of green pods ton/fed.	Yield of green seeds ton/fed.
		1st season						2nd season					
Varieties	Nubaria-1	13.82	3.00	215.19	38.54	6.62	3.25	13.94	2.89	219.00	39.82	7.02	3.06
	Spanish	11.88	4.07	267.67	23.98	11.36	4.42	11.82	3.87	255.37	25.09	10.70	4.01
L.S.D at 5%		0.06	0.08	1.27	0.09	0.62	0.05	0.06	0.02	8.87	0.30	0.01	0.03
Planting date	15th Oct..	12.41	3.37	237.71	30.29	8.99	3.19	12.47	3.48	232.58	32.21	9.01	3.16
	15th Nov.	13.99	3.58	251.74	34.35	10.06	5.18	13.90	3.53	249.53	34.50	9.73	4.31
	15th Dec.	12.21	3.26	230.58	25.14	7.94	3.15	12.17	3.33	229.45	30.66	7.83	3.13
L.S.D at 5%		0.04	0.01	0.98	0.80	0.25	0.04	0.02	0.39	11.09	0.41	0.09	0.02
Planting distances	30 cm	13.43	3.20	264.42	34.05	9.77	3.94	13.44	3.69	248.28	35.76	9.58	3.76
	25 cm	12.67	3.16	232.16	32.56	9.02	3.88	12.67	3.31	237.39	35.01	8.78	3.69
	15 cm	12.49	3.06	227.72	27.16	8.19	3.70	12.53	3.14	225.89	26.60	8.21	3.15
L.S.D at 5%		0.03	NS	0.79	0.42	0.26	0.05	0.02	0.03	10.20	0.54	0.06	0.01
VXD	V_1XD_1	13.15	3.02	213.36	38.24	5.26	2.66	13.26	2.90	216.05	35.48	5.97	2.71
	V_1XD_2	15.31	3.04	219.25	43.30	9.34	4.48	15.44	3.00	222.78	41.32	9.66	3.90
	V_1XD_3	13.10	2.94	204.97	34.07	5.25	2.61	13.13	2.70	210.17	31.67	5.41	2.58
	V_2XD_1	11.66	4.10	262.06	24.27	10.77	3.72	11.66	3.96	256.11	25.68	10.25	3.68
	V_2XD_2	12.66	4.13	285.44	25.46	12.72	5.89	12.69	4.08	280.89	29.94	12.05	4.72
	V_2XD_3	11.31	4.03	255.52	21.22	10.64	3.68	11.40	3.56	229.11	19.65	9.81	3.60
L.S.D at 5%		0.04	0.01	1.39	1.13	0.35	0.05	0.03	0.05	15.69	0.59	0.13	0.04
VXS	V_1XS_1	14.24	3.25	223.97	41.46	6.95	3.41	14.31	3.05	223.44	44.00	7.45	3.36
	V_1XS_2	13.92	3.06	202.79	39.00	6.74	3.32	13.97	3.01	222.11	42.92	7.12	3.07
	V_1XS_3	13.40	2.70	218.81	35.16	6.16	3.02	13.55	2.60	211.44	33.55	6.48	2.76
	V_2XS_1	12.62	4.47	305.47	26.65	12.79	4.74	12.57	4.33	273.67	30.52	11.71	4.31
	V_2XS_2	11.58	4.09	261.50	26.13	11.89	4.57	11.51	4.02	263.11	28.47	11.08	4.16
	V_2XS_3	11.43	3.66	236.05	19.17	9.44	3.99	11.38	3.25	229.33	18.28	9.31	3.54
L.S.D at 5%		0.05	0.01	1.12	0.60	0.37	0.06	0.02	0.05	14.43	0.77	0.08	0.02
DXS	D_1XS_1	13.35	3.56	245.45	33.13	9.60	5.04	13.25	3.46	238.07	35.50	9.79	3.66
	D_1XS_2	13.26	3.47	240.88	31.89	9.28	3.43	12.58	3.40	233.38	34.77	9.30	3.43
	D_1XS_3	12.18	3.41	236.57	29.40	9.13	3.36	12.29	3.26	230.22	30.91	8.64	3.27
	D_2XS_1	14.46	4.06	276.09	38.28	12.20	5.37	14.43	4.05	277.25	41.45	11.52	4.68
	D_2XS_2	13.75	3.90	270.71	35.63	12.11	5.13	13.66	3.76	269.55	36.51	11.46	4.59
	D_2XS_3	12.47	3.28	256.19	33.13	8.08	3.32	13.45	3.47	245.67	35.66	7.94	3.31
	D_3XS_1	12.10	3.50	227.71	27.78	7.19	3.15	12.22	3.20	220.05	26.47	7.91	3.07
	D_3XS_2	12.05	3.35	204.08	25.58	6.78	2.95	12.10	3.06	209.55	26.26	6.90	3.06
	D_3XS_3	11.68	3.12	200.71	20.41	5.86	2.82	11.82	2.22	204.94	25.58	6.22	2.74
L.S.D at 5%		0.06	0.01	1.37	0.73	0.45	0.08	0.03	0.06	17.67	0.94	0.10	0.02
VXDXS	$V_1XD_1XS_1$	14.23	3.15	209.76	40.81	6.34	2.89	14.26	3.12	215.82	44.12	6.92	2.83
	$V_1XD_1XS_2$	13.17	3.11	204.06	39.81	5.90	2.79	13.19	2.81	214.14	40.03	6.04	2.82
	$V_1XD_1XS_3$	13.12	2.91	200.67	37.67	5.42	2.71	13.16	2.61	210.10	37.70	5.97	2.80
	$V_1XD_2XS_1$	15.68	3.34	246.46	44.99	9.69	4.61	15.73	3.35	245.11	46.50	10.01	4.71
	$V_1XD_2XS_2$	15.37	3.22	241.41	44.71	9.26	4.55	15.33	3.23	242.42	44.83	9.63	4.31
	$V_1XD_2XS_3$	14.88	3.18	226.26	41.71	9.08	4.28	15.07	3.16	222.22	44.58	9.36	2.82
	$V_1XD_3XS_1$	13.02	2.75	203.70	32.92	5.07	2.64	13.06	2.74	209.09	33.70	5.42	2.54
	$V_1XD_3XS_2$	12.92	2.70	203.70	32.74	4.46	2.47	12.98	2.56	207.09	36.14	5.04	2.49
	$V_1XD_3XS_3$	12.31	2.62	200,01	31.27	4.34	2.31	12.53	2.46	203.00	30.83	4.78	2.41
	$V_2XD_1XS_1$	11.83	4.15	287.20	26.28	12.67	4.17	12.01	4.10	258.67	28.39	13.04	4.47
	$V_2XD_1XS_2$	11.81	4.09	265.65	25.09	12.63	4.15	11.61	4.00	252.00	26.17	11.69	4.13
	$V_2XD_1XS_3$	11.44	3.96	246.46	20.82	11.92	4.07	11.50	3.83	224.33	20.50	11.23	4.02
	$V_2XD_2XS_1$	13.55	4.77	339.68	32.50	14.96	6.47	13.34	4.75	330.00	38.33	13.61	5.05
	$V_2XD_2XS_2$	12.62	4.68	334.68	31.64	14.72	5.720	12.35	4.50	311.33	31.84	13.29	4.65
	$V_2XD_2XS_3$	12.50	4.18	310.77	28.58	13.66	5.48	12.25	4.11	288.33	31.00	13.09	4.47
	$V_2XD_3XS_1$	11.08	3.95	234.68	18.45	11.71	3.58	11.15	3.76	219.67	18.13	10.85	4.02
	$V_2XD_3XS_2$	11.06	3.46	209.09	18.23	10.75	3.40	11.12	3.40	209.00	16.80	10.40	3.74
	$V_2XD_3XS_3$	11.03	3.44	203.37	14.25	9.23	2.86	11.05	3.27	205.00	14.66	9.11	3.32
L.S.D at 5%		0.08	0.01	1.94	1.04	0.64	0.11	0.05	0.08	12.01	1.33	0.15	2.66

V= Varieties D= Planting dates S= Planting distances

V_1= Nubaria-1 variety. V_2= Spanish variety D_1= Planting date (15th October) D_2= Planting date (15th November). D_3= Planting date (15th December) S_1= Planting distance at 30cm. S_2= Planting distance at 25cm. S_3= Planting distance at 15cm

3- Seeds chemical components:

Table (5) showed that the differences in chemical parameters of varieties contained in their seeds where the highly amount of protein, amino acid (Tyrosine) except carbohydrates were detected to Nubaria-1. However, the average of two seasons recorded (27.40, 1.68, and 51.94%), but for Spanish were registered (24.41, 1.37, and 55.90%) respectively. These results are in line with those recorded by **Samaei *et al.*, (2020), USDA (2021)**, **Saldanha do Carmo *et al.*, (2022**), and **Yassen *et al.*, (2022**). It was documented by **Martineau-Côté *et al.*, (2022)** that the difference between varieties one of the main reasons which impact on faba bean seeds chemical components of protein, carbohydrates, and amino acids. In comparison to different planting dates ($D_{1,2,3}$), it is obvious that sowing faba bean in 15th November significant resulting the best data for all studied parameters (Table 5). This result might be due to that plants developed in this date (D_2) gave strong vegetative growth that reflect in produce a sufficient amount of chemical content in their seeds because of these environment conditions lead to increase in plant canopy, photosynthesis and dry matter accumulation as reported by **Hegab *et al.*, (2014**). In contrast seeds chemical contents produced from plants sown in the third sowing date (D_3) recorded lowest chemical content resulting from unsuitable environmental condition as mentioned by **Tawaha and Turk (2001)**. These results agree with those obtained by **EL-Metwally *et al.*, (2013), and Gomaa *et al.*, (2023).** Presented data in Table (5) revealed that plants which sown at wide planting distances (S_1) have a positively significant impact on chemical parameters in their seeds. These results are confirm by **El-Shafey *et al.*, (2022)** who reported that faba bean plants that sowing at 30cm had the highest seeds content of total carbohydrates and protein. While, growing plants on narrow planting distances (S_3) led to a reduction content of chemical parameters on their seeds. These negative results probably obtain regarding the competitions occurred between plants on principle nutritional needs and environment components as reported by **Ayman *et al.*, (2021**) that lead to reduction in seeds chemical contents. The interaction between varieties ($V_{1,2}$) and planting dates ($D_{1,2,3}$) affected on seeds chemical contents, as shown in Table (5). Nubaria-1 or Spanish observed highest seeds chemical values in seeds of those plants sown in second date (D_2) but both varieties produced seeds with low content of chemical parameters when plants grown in third date (D_3). Presented data in Table (5) cleared that sown of both varieties at distant 30cm significantly gave the highest amount of carbohydrates, protein and amino acid in their seeds (58.57, 34.40, and 1.95%) and (60.76, 30.98, and 1.98%) for (V_1xS_1) and (51.80, 26.14, and 1.47%) and (53.08, 27.12, and 1.52%) for (V_2xS_1) in the two growing seasons respectively.

Table (5): Response of faba bean seeds chemical contents with respect to varieties, planting dates and distances during the two growing seasons of 2020/2021 and 2021/2022.

Treatment		Carbohydrates (%)	Protein (%)	Tyrosine (%)	Carbohydrates (%)	Protein (%)	Tyrosine (%)
		1st season			2nd season		
Varieties	Nubaria-1	51.28	26.60	1.63	52.61	28.21	1.74
	Spanish	54.71	24.31	1.34	57.09	24.51	1.40
L.S.D at 5%		0.49	0.23	0.10	0.32	0.24	0.03
Planting date	15th Oct.	52.70	25.57	1.34	54.49	25.88	1.49
	15th Nov.	54.78	28.10	1.99	56.92	28.52	1.95
	15th Dec.	52.07	22.69	1.12	51.06	24.68	1.37
L.S.D at 5%		0.54	0.70	0.11	0.66	0.47	0.07
Planting distances	30 cm	55.19	30.27	1.71	57.02	29.05	1.77
	25 cm	52.65	24.57	1.47	55.03	25.42	1.53
	15 cm	51.15	21.52	1.27	52.42	24.60	1.41
L.S.D at 5%		0.53	0.60	0.09	0.57	0.34	0.07
VXD	V_1XD_1	55.18	26.67	1.55	55.71	29.71	1.92
	V_1XD_2	57.23	30.52	1.95	60.02	29.80	1.97
	V_1XD_3	51.73	22.61	1.40	55.39	25.11	1.68
	V_2XD_1	50.33	24.46	1.13	53.83	26.65	1.58
	V_2XD_2	52.41	25.69	2.03	53.58	27.33	1.16
	V_2XD_3	49.11	22.78	0.84	50.42	19.55	1.10
L.S.D at 5%		0.76	1.00	0.15	0.94	0.66	0.11
VXS	V_1XS_1	58.57	34.40	1.95	60.76	30.98	1.98
	V_1XS_2	53.65	24.15	1.61	57.28	27.12	1.73
	V_1XS_3	51.92	21.25	1.34	53.28	26.52	1.56
	V_2XS_1	51.80	26.14	1.47	53.08	27.12	1.52
	V_2XS_2	51.66	24.98	1.34	52.79	23.73	1.33
	V_2XS_3	50.39	21.80	1.20	51.76	22.67	1.20
L.S.D at 5%		0.75	0.85	0.12	0.80	0.49	0.10
DXS	D_1XS_1	54.28	26.51	1.70	54.17	27.18	1.84
	D_1XS_2	53.76	26.08	1.62	56.86	26.27	1.61
	D_1XS_3	53.51	24.63	0.94	54.98	25.93	1.56
	D_2XS_1	57.51	33.80	2.25	59.46	32.45	2.14
	D_2XS_2	54.43	30.93	2.01	57.14	28.44	1.86
	D_2XS_3	52.40	24.00	1.25	54.74	25.16	1.47
	D_3XS_1	51.91	22.56	1.24	53.62	25.13	1.30
	D_3XS_2	50.02	21.14	1.18	52.98	24.01	1.27
	D_3XS_3	49.15	19.44	1.16	49.48	22.60	1.08
L.S.D at 5%		0.92	1.04	0.15	0.99	0.60	0.12
VXDXS	$V_1XD_1XS_1$	52.20	27.90	1.59	53.63	29.71	1.86
	$V_1XD_1XS_2$	52.03	25.00	1.52	53.25	27.03	1.81
	$V_1XD_1XS_3$	52.00	24.06	1.51	53.08	25.70	1.75
	$V_1XD_2XS_1$	52.97	38.66	2.28	54.42	33.74	2.14
	$V_1XD_2XS_2$	52.67	35.87	2.06	54.33	31.37	1.97
	$V_1XD_2XS_3$	52.37	28.66	1.98	53.63	31.00	1.96
	$V_1XD_3XS_1$	51.00	20.50	1.41	51.66	27.83	1.60
	$V_1XD_3XS_2$	50.00	20.09	1.25	51.89	24.66	1.48
	$V_1XD_3XS_3$	46.00	18.66	1.10	47.71	22.83	1.14
	$V_2XD_1XS_1$	56.53	25.13	1.26	58.30	25.70	1.25
	$V_2XD_1XS_2$	56.20	24.63	1.23	57.60	25.20	1.20
	$V_2XD_1XS_3$	52.30	23.50	0.93	54.00	24.66	1.06
	$V_2XD_2XS_1$	63.00	28.93	2.23	65.39	31.16	2.15
	$V_2XD_2XS_2$	56.86	26.00	1.97	60.65	29.05	1.87
	$V_2XD_2XS_3$	56.70	25.20	1.90	59.30	26.16	1.74
	$V_2XD_3XS_1$	51.83	23.00	0.92	54.02	21.19	1.27
	$V_2XD_3XS_2$	51.62	22.20	0.84	52.89	19.33	1.02
	$V_2XD_3XS_3$	47.38	20.21	0.78	51.24	18.17	1.00
L.S.D at 5%		1.31	1.48	0.22	1.40	0.85	0.17

V= Varieties D= Planting dates S= Planting distances

V_1= Nubaria-1 variety. V_2= Spanish variety D_1= Planting date (15th October) D_2= Planting date (15th November). D_3= Planting date (15th December) S_1= Planting distance at 30cm. S_2= Planting distance at 25cm. S_3= Planting distance at 15cm

Results in Table (5) indicated that seeds produced from plants sown in 15th November at space of 30cm between hills (D_2xS_1) gave the highest contents of carbohydrate, protein, and amino acid (Tyrosine). While the lowest values were resulted from interaction between (D_3xS_3) recorded (49.15, 19.44, and 1.16%) and (49.48, 22.60, and 1.08%) for carbohydrate, protein, and tyrosine in two growing seasons respectively. Concern to the interaction between varieties ($V_{1,2}$) , planting dates ($D_{1,2,3}$) and distances ($S_{1,2,3}$), the obtained data revealed that the highly chemicals contents were related to the interaction between ($V_1xD_2xS_1$) which recorded (38.66, and 33.74%) for protein and (2.28, and 2.14%) for tyrosine. On the other hand , the maximum carbohydrates seed content was resulted from the interaction between ($V_2xD_2xS_1$) since registered (63.00, and 65.39%) in both season respectively. Meanwhile, seeds of both verities resulted from plants sown in third date (D_3) at space of 15cm (S_3) have lower carbohydrates, protein and amino acid (Tyrosine) content.

CONCLUSION

From this study it can concluded that, the optimum sowing date of faba bean to produce vigor plant growth, yield production was 15th November. Meanwhile the reduction in plant vegetative growth, green yield and yield attributes were correlated with cultivated in delay date 15th December. Nubaria-1 seeds contain higher percentage of protein and tyrosine while the Spanish variety was distinguished by its high seeds contents of carbohydrates.

REFERENCES

AOAC, (1990). Association of official analytical chemist's methods of analysis Washington, D. C. 2004.

AOAC, (2006). International Official Agricultural Chemists. 18th, 4: 17-19.

Abdalla, M. M. F.; D. S. Darwish; A. A. Ali and E. A. A. El-Emam (2000). Investigation on faba bean (*Vicia faba.* L). Variability and clustering of faba bean Land Races. Egypt. J. Plant Breeding, 15: 257-272.

Abd Alla, A. A. and M. M. Omran (2002). Response of some faba bean varieties to irrigation intervals and plant spacing in the new sandy reclaimed lands. Munufiya J. Agric. Res., 27:525-540

Abd El-Rahman, A.M.R. (2014). Effect of plant population and distribution on yield and yield components of five faba bean genotypes. J. Plant Prod. Mansoura Univ., 5:1965–1972.

Abou-Taleb, S.M. (2002). Morphological variation and dry matter distribution in some faba bean (*Vicia faba* L.) cultivars under different sowing dates. Proc. Recent Technol.. Fac. Agric, Cairo Univ., Bull. Fac. Agric. Cairo Univ., Egypt (IV): 864-874.

Alabade, A.; S. Al-Khashab and A. Kahlel (2022). Response of three broad bean varieties (*Vicia faba* L.) to boron, iron, and zinc nano fertilizers, DOI:10.21931/RB/2022.07.04.37, 7(4):37,1-4.

Alemu, W. and T. Wato (2023). Response of faba bean (*Vicia faba* L.) grain yield to bio-fertilizer rates and inter row spacings at kaffa zone, south western Ethiopia. J. Agric. Sci.-Sri Lanka, 18(2):193-208

Al-Khafaji, A.H. (1987). Effect of planting date and plant density on the beans yield and its components, M.Sc. Thesis, Fac. Agric., Baghdad Univ.

Al-Suhaibani, N.; S. El-Hendawy and U. Schmidhalter (2013). Influence of varied plant density on growth, yield and economic return of drip irrigated faba bean (*Vicia faba* L.). Turk. J. Field Crops,18(2):185-197.

Ayman, H. A. M.; S. A. Badawy; A. A. H. Abdel Latef; A. A. El Hosary; U. A. Abd El Razek and R. S. Taha (2021). Integrated effects of potassium humate and planting density on growth, physiological traits and yield of (*Vicia faba* L) grown in newly reclaimed soil. Agronomy 11, 461:1-12

Bulduk, İ. (2020). Optimization of extraction techniques and RPHPLC analysis of anti-parkinson drug levodopa from flowers of *Vicia faba* L. Acta Chromatogr 32:281–288

Dekhujzen, H. M. and D. R. Verkerke (1986). Effect of temperature on development and dry matter accumulation of (*Vicia faba* L) seeds. Ann. Bot., 58:869-885

Dubois, M.; K. A. Gilles; J. R. Hamilton and F. Smith (1956). colorimetric method for Determination of sugar and Related Substances. Anal. Chem., 28 (3):350-356.

EL-Metwally, I. M.; T. A. El-Shahawy and M. A. Ahmed (2013). Effect of sowing dates and some broomrape control treatments on faba bean growth and yield. J. Appl. Sci., 9(1):197–204

Elsebaie, E.; M. Elmahdy; A. R. El-Gezawy; E.S. Badr; M. R. Asker; El-A. M. Gawish and R.Y. Essa (2022). Effects of faba bean hull nanoparticles on physical properties, protein and lipid oxidation, colour degradation, and microbiological stability of burgers under refrigerated storage. Antioxidants, 11(5)938:1-14

El-Shafey A. I.; A. A. Zen El-Dein and I. A. I. Mohammed (2022). Impact of sowing distanseces and fertilization regimes on growth and productivity of wheat and faba bean under intercropping system. Zagazig J. Agric. Res.; 49(2):157-180

Etemadi, F.; M. Hashemi; W. Autio; F. Mangan and O. Zandvakili (2018). Accumulation and distribution trend of L-Dopa in different parts of eight varieties of faba bean plant through its growth period. J. Crop. Sci, 6:426–434

Etemadi, F.; M. Hashemi; A. V. Barker; O. R. Zandvakili and X. Liu (2019). Agronomy, nutritional value, and medicinal application of Faba bean (*Vicia faba* L.) Hort., Plant J., 5(4):170–182.

FAO, (2021). FAOSTAT Database. Food and Agriculture Organization of the United Nations. Available at: www.fao.org/faostat/ [accessed April 15, 2021].

FAO, (2023). FAOSTAT Database. Food and Agriculture Organization of the United Nations. Available at: www.fao.org/faostat.

Fordjour, E.; F. K. Adipah; S. H. Zhou; G. C. Du and J. W. Zhou (2019). Metabolic engineering of Escherichia coli BL21 (DE3) for de novo production of L-DOPA from D-glucose. Microb. Cell Factories, 18, 74.

Gomaa, M. A.; G. A. El-Sorady; A. Frage; I. M. ElShabory and K. E. Essam (2023). Biofortification of productivity and quality of faba bean using sowing dates and calcium boron foliar application. J. Adv. Agric. Res., 28 (3):672-682

Hassan, M. A. M. and A. G. Haridy (2019). Vegetative characteristics and nutritional components of a new line (Dwarf) as compared with three commercial genotypes of Faba bean. J. Food and Dairy Sci., Mansoura Univ., 10(8):289-296

Hegab, A. S. A.; M. T. B. Fayed; M. M. A. Hamada and M. A. A. Abdrabbo (2014). Productivity and irrigation requirements of faba-bean in north delta of Egypt in relation to planting dates. Ann. Agric. Sci., 59(2):185–193

Hussien, A. H.; M. A. El –Deep and Kh. Al–Yamani (2006). Response of some new faba bean genotypes to different sowing dates and plant densities in the newly reclaimed lands in Upper Egypt. National Coordin. Meeting Cairo, Egypt, 11 – 12

Karadavut, U.; C. Palta; Z. Kavurmaci and Y. Bolek (2010). Some grain yield parameters of multi-environmental trials in faba bean (*Vicia faba*). genotypes. Int. J. Agric. Biol., 12:217–220

Kebede, E. (2020). Grain legumes production and productivity in Ethiopian smallholder agricultural system, contribution to livelihoods and the way forward. Coge. Food. Agric., 6:1-20

Khalil, N. A.; W. A. Al-Murshidy; M. O. Khaity and R. A. Badawy (2011). Performance of two faba bean varieties under different environments Egypt. J. Plant Breed., 15(1):1–12

Kondra, Z.P. (1975). Effect of row spacing, seeding rate and date of seeding on faba beans. Can. J. Plant Sci., 55(1):211–214.

Lemerle, D., B. Verbeek and S. Diffey (2006). Influence of field pea (*Pisum sativum* L.) density on grain yield and competitiveness with annual rye grass (*Lolim rigidum*) in South-Eastern Australia. Aust. J. Exp. Agri., 46: 1465-1472.

Loss, S.; K. H. M. Siddique; A. Crombie and L. D. Martin (1998). Responses of faba bean (*Vicia faba* L.) to sowing rate in southwestern Australia II. Canopy development, radiation absorption and dry matter partitioning. Aust. J. Agric. Res., 49:999–1008

Luo, Y; W. Xie; X. Jin; B. Tao; Q. Chen and W. Zhu (2013). Impact of sprouting pretreatment on phytic acid and polyphenol level of faba bean (*Vicia faba* L.) flour. Int. Food Res. J., 20: 1133–1137.

Martineau-Côté, D.; A. Achouri; S. Karboune and L. L'Hocine (2022). Faba Bean: An Untapped source of quality plant proteins and bioactives. Nutrients, 14(8):1-27

Mohseni, M. and B. Golshani (2013). Simultaneous determination of levodopa and carbidopa from fava bean, green peas and green beans by high perfomance liquid gas chromatography. J. Cli. Diag. Res. 7(6):1004-1007.

Patil, S. A.; A. O. Apine; N. S. Surwase and J. P. Jadhav (2013). Biological sources of L-DOPA: An alternative approach. Advances in Parkinson's Disease, 2(3):81-87

Pilbeam, C. J., G. Duc and P. D. Hebblethwaite (1990). Effects of plant population density on spring-sown field beans (*Vicia faba*) with different growth habits. J. Agric. Sci., 114:19–33.

Purves, R.W.; H. Zhang; H. Khazaei and A.Vandenberg (2017). Rapid analysis of medically relevant compounds in faba bean seeds using FAIMS and mass spectrometry. Int. J. Ion Mobil. Spectrom, 20(3-4):1-11

Robinson, A. P. and S. P. Conley (2007). Plant populations and seeding rates for soybeans. Available online: https://www.extension. edue.edu/extmedia/ay/ay-217-w.pdf, Purdue Univ., West Lafayette, IN.

Saldanha do Carmo, C. ; P. Silventoinen-Veijalainen ; H. Zobel ; U. Holopainen-Mantila ; S. Sahlstrøm and S. H. Knutsen (2022). The effect of dehulling of yellow peas and faba beans on the distribution of carbohydrates upon dry fractionation. LWT 163, 113509

Sallam, A.; M. Ghanbari and R. Martsch (2017). Genetic analysis of winter hardiness and effect of sowing date on yield traits in winter faba bean article, Sci. Hortic. 224.

Samaei, S. P.; M. Ghorbani; A. S. Mahoonak and M. Aalami (2020). Antioxidant Activity of faba bean (*Vicia faba* L) proteins hydrolysates produced by alcalase and trypsin. Res. Innov. Food Sci. Technol., 9:1–10.

Siddiqui, M.H.; M.Y. Al-Khaishany; M.A. Al-Qutami; M.H. Al-Whaibi; A. Grover; H.M. Ali; M.S. Al-Wahibi and N.A. Bukhari (2015). Response of Different Genotypes of Faba Bean Plant to Drought Stress. Int. J. Mol. Sci., 16:10214–10227.

Snedecor, C.W. and W.G. Cochran, (1982). Statistical Methods. 7th Ed.The lowa state Univ. Press.Ames. lowa, USA., pp: 325-330.

Soares, A. R.; R. Marchiosi; C. Siqueira-Soares Rde; R. Barbosa de Lima; W. Dantas dos Santos and O. Ferrarese-Filho (2014). The role of L-DOPA in plants. Plant Signal Behav., 9: e28275

Tawaha, A. M.; and M. A. Turk (2001). Crop-weed competition studies in faba bean (*Vicia faba* L.) under rainfed conditions. Acta. Agron. Hung., 49 (3):299–303.

Turk, M.A. and A.R.M. Tawaha (2002). Effect of dates of sowing and seed size on yield and yield components of local faba bean under semi-arid condition. Legume Res., 25(4):301-302

USDA, (US Dept of Agriculture, 2021). Food Data Central (Nutrient Data-base).https://fdc.nal.usda.gov/(accessed on January 26)

Waller, D.G. and A.P. Sampson (2018). 24-Extrapyramidal movement disorders and spasticity. In Medical Pharmacology and Therapeutics, 5th ed.; Waller, D.G., Sampson, A.P., Eds.; Elsevier: Amsterdam, The Netherlands.

Yasmin, W.; S. K. Paul and M. D. P. Anwar (2020). Growth, yield and quality of faba bean (*Vicia faba* L.) in response to sowing date and phosphorus fertilization. Arch. Agri. Environ. Sci., 5(1):11-17

Yassen, A.A.M.; M.G.A.B. Taha ; M.M. Ibrahim and Y.A.M. Khalifa (2022). Identification of faba bean (*Vicia faba* L.) protein by electrophoresis. Arch. Agri. Sci. J., 5(3):261–274

تأثيرات الأصناف، مواعيد الزراعة، ومسافات الزراعة على محصول الفول الرومي ومحتوى البذور الخضراء من التيروسين

هالة حسن ابوالنور

اقسام بحوث الخضر – معهد بحوث البساتين – مركز البحوث الزراعية – الجيزة – مصر

صنفين من الفول نوبارية 1 و الأسبانى زرعت فى ميعاد زراعة 15 من أكتوبر، نوفمبر، وديسمبر أثناء الموسم الشتوى لعامى 2020 / 2021 و 2022/2021م على مسافات زراعية مختلفة (30، 25، و15سم) فى تربة رملية طميية بالمزرعة البحثية بمحطة القصاصين، محافظة الإسماعيلية، معهد بحوث البساتين، مركز البحوث الزراعية، مصر. لتحديد تأثيرات العوامل السابقة على النمو الخضرى، مكونات المحصول ومحتوى البذور الخضراء من البروتين، الكربوهيدرات، والحمض الأميني التيروسين المولد لمركب الدوبا المعالج لمرض الشلل الرعاش. أوضحت النتائج أن الصنف النوبارية 1 أعطى أعظم صفات للنمو الخضرى (طول النبات، الوزن الطازج والجاف للنبات)، وكذلك مكونات المحصول (عدد القرون/للنبات والنسبة المئوية للوزن الجاف للبذور)، والنسبة المئوية للمحتوى الكيميائى للبذور من (البروتين، والتيروسين). بينما تفوق الصنف الأسبانى فى عدد الأفرع/للنبات، وزن 100 بذرة، عدد البذور/للقرن، و محتوى البذور من الكربوهيدرات. زراعة الفول الرومي فى 15 نوفمبر كان الميعاد الأمثل لإنتاج أفضل نمو للنبات، محصول القرون الخضراء، البذورالخضراء/للفدان، صفات القرون ايضا المحتوي الكيميائي للبذور من الكربوهيدرات، البروتين، و الحمض الأمينى التيروسين. الزراعة على مسافة 25 سم انتجت نمو خضرى قوى للنبات ثم فى المرتبة الثانية كانت المسافة 30 سم بين الجور. بينما أعلي القيم لعدد القرون/للنبات، وزن 100 بذرة والنسبة المئوية للوزن الجاف للبذور ايضا المحتوى الكيميائى للبذور الخضراء تحقق تبعا لمسافة الزراعة 30 سم بين النباتات. التوصية ان التفاعل بين صنف النوبارية 1 والزراعة فى 15 من نوفمبر علي مسافة زراعة 30سم أدى لزيادة النسبة المئوية للمحتوى الكيميائى من التيروسين والبروتين.