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RESPONSE OF FABA BEAN (*Vicia faba* L.) PLANTS TO SEED – SOAKING APPLICATION WITH NATURAL YEAST AND CARROT EXTRACTS.

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ABSTRACT

Growth of faba bean cv. Giza 461 was significantly affected with natural yeast and carrot extracts applied as seed – soaking treatments in concentrations of 50,100 and 200 ml/l of each during 1999/2000 and 2000/2001 seasons. In this concern, significant increase was existed in many growth aspects as number of branches and formed leaves / plant, dry weights of both stems and leaves/plant and total leaf area as well. Yet, significant reduction in the assimilation rate (leaf area in cm^2 required for producing one gram of dry mater) was existed with all applied treatments. However, the two extracts exhibited contradictory effects concerning the plant height, since yeast extract significantly increased this parameter, whereas carrot extract decreased it.

Besids, different applied concentrations of both yeast and carrot extracts obviously increased photosynthetic pigments, NPK, total carbohydrates and crude protein contents in leaves at 90 days after sowing.

In addaition, the obtained vigorous growth of faba bean plants with yeast and carrot treatments was accompanied with obvious alterations in many anatomical features of stems and leaves. Here, different applied treatments increased thickness of stem wall and its comprising tissues as epidermis, cortex and parenchymatous pith as well as thickness of midvein, lamina, upper and lower epidermis, palisade and spongy tissues in leaves. Moreover, diminsions of vascular bundles, thickness of both phloem and xylem tissues and number of xylem vessels/bundle were also increased in stems and leaves with all applied treatments. This may ensure the essentiality of increasing the cross sectional area of phloem and xylem tissues accompanied with creating more photosynthates and absorbing more mineral nutrients for improving growth and productivity of treated plants.

Furthermore, with the onset of flowering the two applied extracts significantly increased number of formed flowers and setted pods/plant, whereas showed contradictory effect upon shedding percentage of both flowers and immature pods/plant. That is consequently reversed upon increment of pod

weight /plants and final seed yield as well. Hence, it could recommended the applying such low and safe natural extracts as seed – soaking treatments for increasing the final seed yield of this economic plant.

INTRODUCTION

In Egypt, light crop density in different faba bean cultivars is commonly evident. This unfavorable characteristic returns either to the obvious and high percentage of flower shedding before setting or directly after their set.

Many trials have been carried out for increasing flower set, minimizing pre- harvest abscission of immature fruits of faba bean or other plants by the use of different factors including plant growth regulators and mineral nutrients as well (Embleton *et al*., 1973; Wilson, 1983; Rabie *et al*. 1991; Guardiola *et al*., 1993; Atawia and El-Desouky,1997; Bastawisy and Sorial, 1998; Abd El-Dayem and El-Deeb, 2000 and El-Desouky *et al*., 2001).

But recently, considering the public health, there are several cautions about the use of synthetic plant growth regulators and the axcess of mineral nutrients especially on fresh marketable vegetables and fruits. Therefore, according to the study plane and in agreement with the research programme in the Botany Department, Faculty of Agriculture at Moshtohor, Zagazig University, Benha Branch, yeast and carrot extracts were used as soaking treatments for faba bean seeds to improve growth and reduce flowers and immature pod shedding of this economic plant.

In this respect, Mitchell *et al*., (1970) and Ries *et al*., (1977) applied natural extracts of plant pollens and the powder of alfa alfa (Medicago sativa) leaves, respectively, to enhance growth and yield of many plants.

Here, yeast treatments were suggested to participate a beneficial role during vegetative and reproductive growths through improving flower formation and their set of some plants due to its high auxin and cytokinin contents and enhancement carbohydrates accumulation (Roberts, 1976 and Barnett *et al*., 1990). Also, it was reported about its stimulatory effects on cell division and enlargement, protein and nucleic acid synthesis and chlorophyll formation (Karaig and Haber, 1980; Spencer *et al*., 1983; Castelfranco and Beale, 1983; Fathy and Faried, 1996; El-Desouky *et al*., 1998 and Wanas *et al* 1998). In addition to its contents of caryoprotective agents, i.e sugars, proteins and amino acids and also several vitamins (Shady, 1978 and Mahmoud, 2001). Moreover, improving growth and fruiting of horticultural plants by yeast application was reported by Bowe *et al*. (1989), Fathy and Farid (1996), Atawia and El-Desouky (1997) and El-Mogy *et al*., (1998).

As for the carrot extract, the rich natural source of carotenoids, it was suggested to be used for enhancement of some hormones (GA_3 and ABA) biosynthesis beside its high content of sugars, antioxidant vitamins (A and C) and carotenoids (Bartels and Watson, 1978).

Therefore, it was thought advisable to use yeast and carrot extracts as soaking treatments for faba bean seeds to improve growth, flower setting and reduce shedding of immature pods as a low coast and safe tool for increasing the final seed yield of this economic plant.

MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Farm of the Faculty of Agriculture at Moshtohor, Zagazig University, Benha Branch during two successive growing season (1999/2000 and 2000/2001) to investigate the effects of applying the natural yeast and carrot extracts as seed-soaking treatments on some growth aspects, chemical components anatomical features, flowering, shedding, yield and its components of faba bean (*Vicia fabe* L.) cultuvar Giza 461. Seeds of faba bean were secured from the Agricultural Research Center, Ministry of Agriculture, Giza.

***Yeast extract preparation:**

it was prepared by using a technique allowed yeast cells (pure dry yeast) to be grown and multiplied efficiently during conducive aerobic and nutritional conditions. To produce denovo beneficial bioconstituents, i.e. (carbohydrates, sugars, proteins, amino acid, fatty acids, hormones ,etc.), hence allowed such constituents to release out of yeast cells in readily form. Such technique for yeast preparation based on:

1- Nutritional medium of glucose and casin as a favorite sources of C and N, and other essential elements (P, K, Ca, Mg, Fe, Mn, Zn, Cu, B, Mo as well as Na and Cl.) in suitable balance (Barnett *et al.*, 1990).
2- Air pumping and adjusting incubation temperature.
3- Two cycles of freezing and thawing for disruption of yeast cells and releasing their content.

Procedure modified after Shady (1978), Spencer *et al.* (1983), Atawia and El-Desouky (1997) and Fathy *et al.* (2000). Analysis of prepared yeast stock solution was: total protein (5.3%), total carbohydrates (4.7%), N (1.2%), P (0.13%), K (0.3%), Mg (0.013%), Ca (0.02%), Na (0.01%); micro-elements (ppm), Fe (0.13), Mn (0.07), Zn (0.04), Cu (0.04), B (0.016), Mo (0.0003), IAA (0.5 mg/ml) and GA (0.3 mg/ml). Such analysis was according to Cotton (1954) and atomic absorption method for mineral analysis; Nelson (1944) and A.O.A.C. (1990) for carbohydrates analysis and GLC method (Vogel, 1975) for IAA and GAs.

Yeast extract was used at three concentration, i.e. 50, 100 and 200 ml/l.

Carrot extract preparation:

One kg of fresh carrot roots, cleaned, rinsed and blended well, hence successive extractions were participated by different solvents, petroleum ether 100% (1 liter) and ethanol 50% (1 liter), respectively, each for 12 hours. Starring, filtration and solvent volatilization were done, then volume of extract completed to 1 liter by distilled water. Also, chemical analysis of dried carrot roots was as

follows: total carotenoids 12.80 mg/100 g d.w.), total sugars (278.50 mg/100 g d.w.) and vitamin C (12.46 mg/100 g d.w.) analysis was according to Neeled and Pearson (1963) for carotenoids (precursor for ABA and vitamin A) and A.O.A.C. (1990) for sugars and Vitamin C.

Carrot extract was applied at three concentrations, i.e. 50, 100 and 200 ml/l.

Hence, each experiment included seven treatments, i.e. the control (distilled water) and 50, 100 and 200 ml/l. of each of yeast and carrot extracts. The experiment was arranged in a complete randomized block design with four replicates. The plot area was 10.5m^2 (3.5 x 3m) with 5 rows. Faba bean (cv. Giza 461) seeds were soaked in the solutions of the assigned concentrations of both yeast and carrot extracts as well as in distilled water (as control) for 4 hours, then were sown in hills spaced 15 cm on ridges on the 16th of November in the two seasons. At 21 days after sowing, hills were thinned to one seedling. Calcium superphosphate (15.50% P_2O_5) and potassium sulphate (48% K) were added before the sowing in both seasons at the rates of 100 and 50 kg/fed., respectively. Also, nitrogen fertilizer at rate of 20 kg/fed. was applied before the first irrigation in from of urea (46% N). The other cultural practices for growing faba bean plants were carried out as recommended.

1- Growth characters:

five plants were randomly taken from central row of each plot at two stages of growth, i.e. at 60 and 90 days after sowing in both seasons to estimate plant height (cm), number of branches/ plant, stem dry weight (g)/ plant, number of leaves/plant leaf dry weight (g) /plant and total leaf area (cm^2) /plant using the disc method as described by Deriaux *et al.*, (1973) as well as the assimilation rate using the following equation:

$$\text{Assimilation rate} = \frac{\text{Total leaf area (cm}^2\text{)/plant}}{\text{Total leaf dry weight (g)/plant}}$$ (Wareing and Phillips, 1981)

II-Chemical constituents in the leaves:-.

Samples of faba bean leaves were taken at 90 days after sowing in both seasons to determine photosynthetic pigments (Nornal, 1982) and total carbohydrates (Dubois *et al.*, 1956), total nitrogen, (Horneck and Miller ,1998), phosphorus (Sandell ,1950) and potassium (Horneck and Hanson, 1998). Crude protein was calculated using the following equation:

Crude protein = Total nitrogen x 6.25 (A.O.A.C. 1990)

III- Anatomical study:-

According to the wide differences in the morphological characters due to treatments in the first season, anatomical features of stems and leaves of faba bean plants were examined during the second season.

At 90 days after sowing specimens of stems (1cm long) were taken from the middle part of the 4th apical internode of the main stem , while those of leaves ($1cm^2$) were taken from the middle part of certain leaflet blade of the 4th apical leaf on the main stem. The specimens were then killed and fixed for at least 48 hours in F.A.A. solution, washed in 50% ethyl alcohol, dehydrated in a series of ethyl alcohols (70, 90, 95 and 100%), infiltrated in xylene, then embedded in paraffin wax of a melting point 60-63°C (Sass, 1950). Specimens were sectioned at 20 μ using a rotary microtome, double stained with fast green and safranin ,cleared in xylene and mounted in Canda balsam.

The prepared sections were microscopically examined, counts and measurements (μ) were taken using a micrometer eye piece. Averages of readings from 4 slides/treatment were calculated.

IV-Flowering and yield characters:

Five plants were randomly chosen in each plot and were marked in the field from the start of flowering to harvest time and the following characters were studied and recorded :

a- No. of opened flowers/ plant: Counting was started at 60 days of plant age with 3 days intervals until 100 days.

b- No. of setted pods/plant: Counting was started at 75 days of plant age with 3 days intervals until 125 days.

c- No. of survived (mature) pods/plant: It was recorded at harvest time.

$$\text{d - \% of flower shedding} = \frac{\text{Total No. of flowers/plant - No. of setted pods/plant}}{\text{Total No. of flowers/plant}}$$

$$\text{e - \% of pod shedding} = \frac{\text{Total No. of setted pods/plant - No. of survived pods/plant}}{\text{Total No. of setted pods/plant}}$$

f- pod yield (g)/ plant, seed weight (g)/ pod, seed yield (g)/plant and seed index [100-seed weight (g)], were recorded at harvest time.

V- Statistical analysis:

Data of vegetative growth, flowering, yield and its components were subjected to statistical analysis according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

I- Growth characters:-

A- At 60 days of plant age:-

Data in Table (1) clearly show that the natural yeast extract with its three assigned concentrations (50, 100 and 200 ml/l) when applied as seed-soaking treatments increased each of plant height, number of both branches and leaves/plant, dry weights of stems and leaves/plant and total leaf area/plant during the two seasons Increases in different growth parameters reached the 5% level of significance with different applied concentrations. Exception was only that insignificant increase in the number of branches/plant existed with the low

concentration of yeast extract. (50 ml/l) during the two seasons. Also, it could be noticed that the effectiveness of yeast extract upon different estimated growth parameters was in parallel to the applied concentration. Since, the highest concentration (200 ml/l) gave the highest values of studied characters, meanwhile the lowest concentration (50 ml/l) exhibited lowest increases, yet 100 ml/l gave values inbetween.

In addition, the assimilation rate i.e. the leaf area in cm^2 required for one gram dry matter production was significantly decreased in parallel with applied yeast extract concentration. That means that, the efficiency of photosynthesis process was positively affected with yeast extract. In other meaning, more photosynthates being created under the application of yeast extract treatments.

On the other hand, carrot extract showed an opposite effect with yeast extract upon plant height. Since, significant reduction in plant height was existed with the three applied carrot extract concentrations (50, 100, and 200 ml/l.) in both seasons. The only exception was that insignificant reduction in plant height existed with 50 ml/l. carrot extract during 1999/2000 season.. Yet, other growth characters, i.e. number of branches and leaves/plant, dry weights of stems and leaves/plant, total leaf area/plant and assimilation rate as well behaved under the carrot extract treatments as the same as with yeast extract treatments. Since, significant increases of all these parameters and significant reduction of only assimilation rate were existed with carrot extract treatments.

B- at 90 days of plant age:-

As shown in Table (1) different estimated growth characters at 90 days of plant age with each of yeast and carrot extracts applied as seed-soaking treatments behaved as the same as at 60 days of plant age. That was true during the two seasons of this study. Also, that means that both applied natural extracts of yeast and carrot enhanced most growth characters of faba bean plant. This enhancement into vigorous growth of treated plants accompanied with the improvement of photosynthesis process and the accumulation of more dry matter in different organs of treated plants. So, this vigorous growth obtained with the applied natural extracts could be expected to reverse upon reproductive growth and final seed yield of faba bean plants.

In this respect, in few other studies, some natural extracts have been applied to some economic plants as new trends for enhancing the plant growth, increasing the final yield and improving its quality as well as diminishing the amount of applied fertilizers. Of these studies are Fathy and Farid (1996), Atawia and El-Desouky (1997), El-Mogy *et al.* (1998), El-Desouky *et al.* (1998), Fathy *et al.* (2000) and Mahmoud *et al.* (2001).

In general, yeast extract has been reported to be a rich source of vitamins, hormones and many other growth factors [Shady (1978), Roberts (1976), Barnett *et al.* (1990), El-Desouky *et al.* (1998), Fathy *et al.* (2000) and Mahmoud (2001)]. Also, carrot extract is a rich natural source of carotenoids suggested to be used for enhancement of ABA biosynthesis beside its high

Table (1):Effects of the natural extracts of yeast and carrot applied as seed-soaking treatment on vegetative growth of faba bean (*Vicia faba L.*, cv. Giza 461) plants at 60and 90 days after sowing during 1999/2000 and 2000/2001 seasons

Characters / Treatments		Days after sowing												
		60							90					
		Plant height (cm)	No. of branches / Plant	Stem dry weight (g)/plant	No. of leaves/ plant	Leaf dry weight (g)/ plant	Total leaf area (cm2) /plant	Assimilation rate cm2/g	Plant height (cm)	No. of branches/ plant	Stem dry weight (g)/plant	No. of leaves/ plant	Leaf dry weight (g)/ plant	Total leaf area (cm2)/ Plant	Assimilation rate cm2/g
Control		Season 1999/2000												
		44.75	1.70	3.31	16.70	3.18	494.95	155.64	94.00	2.10	15.92	50.20	9.89	2216.63	215.03
Yeast extract ml/l	50	49.50	2.00	3.62	18.50	3.74	546.82	146.21	104.30	2.30	16.96	53.00	10.83	2234.43	206.32
	100	53.50	2.30	3.89	22.60	4.10	596.34	145.45	107.10	2.50	17.80	57.30	11.34	2297.43	202.60
	200	55.70	2.50	4.54	25.80	4.63	668.68	144.42	101.50	3.00	18.39	66.50	13.11	2447.67	186.70
Carrot extract ml/l	50	42.00	2.10	3.75	20.60	3.82	532.01	139.27	87.10	3.00	17.91	58.40	11.27	2298.31	203.93
	100	40.10	2.40	3.97	22.10	4.17	545.75	130.88	82.80	3.00	18.82	63.70	12.88	2364.60	183.59
	200	36.70	2.70	4.28	24.60	4.22	509.12	120.64	75.50	3.40	18.53	61.00	12.08	2194.20	181.64
LSD 0.05		2.90	0.36	0.11	1.66	0.31	36.07	8.03	5.60	0.31	0.94	2.56	0.68	67.01	5.97
		Season 2000/2001												
Control		43.00	2.10	3.47	18.50	3.50	561.42	160.41	90.75	2.00	14.04	47.30	9.02	2028.86	224.92
Yeast extract ml/l	50	46.00	2.20	3.65	20.60	4.01	608.42	151.74	98.25	2.00	15.47	56.30	10.99	3307.14	209.93
	100	51.00	2.50	4.01	24.50	4.49	674.52	150.22	105.20	2.90	17.11	61.70	11.50	2389.94	207.82
	200	53.80	2.80	4.65	27.20	4.71	691.18	146.75	99.35	3.30	18.95	70.60	13.64	2618.86	200.00
Carrot extract ml/l	50	40.20	2.50	3.80	22.00	3.96	601.09	151.79	84.80	3.00	16.13	55.00	10.53	2204.25	209.33
	100	38.00	2.80	4.71	24.10	4.25	618.37	145.50	79.25	3.25	17.48	65.30	11.96	2311.21	193.24
	200	32.75	2.60	4.25	20.80	4.13	568.93	137.76	68.30	3.90	16.86	67.80	11.03	2165.60	186.21
LSD 0.05		2.16	0.29	0.16	1.28	0.41	29.68	6.67	4.50	0.47	1.06	3.04	0.97	89.13	9.81

content of sugars and antioxidant vitamins (Bartels and Watson, 1978). So, the enhancement of faba bean growth with these natural extracts being logically expected due to their high contents of many growth factors and/or growth hormones (auxins, gibberellins and cytokinins).

II- Photosynthetic pigments, NPK and some bioconstituents in leaves:-

As shown in Table (2) application of yeast and carrot natural extracts as seed-soaking materials at the concentrations 50, 100 and 200 ml/l for each, obviously increased contents of photosynthetic pigments (chlorophylls a & b) and carotenoids in leaves of treated plant at 90 days after sowing more than the untreated ones. Also, it could be noticed that each individual pigment as well as their summation were increased parallel to the applied concentration of each extract in the two assigned seasons.

As for the NPK content, it was nearly behaved as the same as in case of photosynthetic pigments. Since, the highest concentration of each extract also gave the highest value of NPK content.

With regard to the total carbohydrates, increasing of its content in leaves was the dominant result of different applied treatments. Also, it could be noticed that carrot extract to some extend was more effective comparing with yeast one. Concerning the crude protein content, it was increased with treatments of both extracts nearly with the same degree during the two assigned seasons. Here, the increases of photosynthetic pigment content and increment of the dry matter accumulation in leaves indicate the positive and stimulatory effects of these natural extracts upon the efficiency of photosynthesis process and more photosynthates being created as well as enhancement of mineral translocation from roots to leaves.

III-Anatomical features:-

A- Stem structure:-

As shown in Table (3) and Fig. (1) yeast and carrot extracts applied as seed-soaking material with the three assigned concentrations of each, obviously affected many anatomical feartures in stems of treated faba bean plants. In this respect, diameter of whole section reached 112.88, 137.26 & 158.80% and 111.02, 123.42 & 156.87% of the control value (100%) with 50, 100 & 200 ml/l. of yeast and carrot extracts, respectively. Here, it could be noticed that yeast extract was more effective when compared with carrot extract regarding this character. Also, the obtained data clearly indicate that increment of stem diameter was mainly due to increases of hollow pith diameter and stem wall thickness. Since, e.g. the thickness of stem wall was increased from 100 % of the control to reach 117.20 , 122.54 & 154.55% and 116.67, 130.19 & 160.53% with 50,100 & 200 ml/l of the yeast and carrot extract, respectively. Here also, it could be noticed that, to some extend, the carrot extract was more effective than the yeast one. In addition, increment of stem wall thickness was accompanied with increases in most of its anatomical features, i.e. thickness of epidermis, thickness of cortex, thickness of cortical parenchyma cells, thickness of parenchymatous pith, thickness of pith parenchyma cells, dimensions (length and width) of

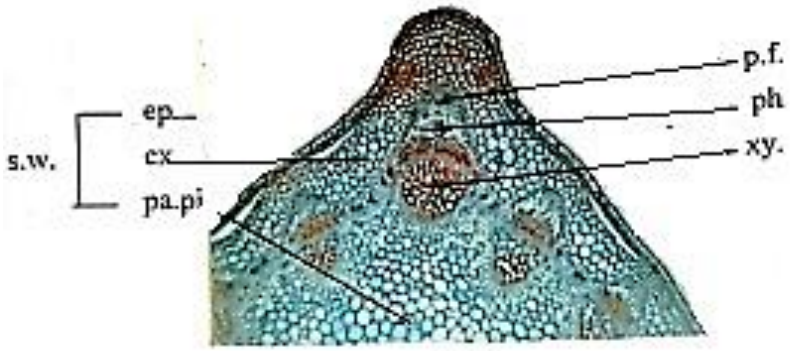
Table (2): Effects of the natural extracts of yeast and carrot applied as seed- soaking treatments on photosynthetic pigments, NPK and some bioconstituents in leaves of faba been (*Vicia faba L.* cv. Giza461) at 90days of plant age during 1999/ 2000 and 2000/ 2001 seasons.

Treatments		Season 1999 / 2000								
		mg / g d.w.				%				
		Chl.a	chl.b	Chl. (a+b)	Carot	N	P	K	Total carbohydrate	Crude protein
Control		6.60	2.40	9.00	7.30	2.62	0.30	3.39	36.30	16.40
Yeast extract ml/l	50	7.25	2.80	10.05	8.10	2.85	0.43	3.96	40.40	17.81
	100	7.40	3.05	10.45	8.25	3.28	0.46	4.62	41.40	20.50
	200	7.75	3.45	11.20	8.65	3.39	0.69	5.24	44.60	21.19
Carrot extract ml/l	50	7.50	2.95	10.45	8.20	2.82	0.42	3.82	40.70	17.63
	100	7.85	3.45	11.30	8.65	2.96	0.57	4.39	44.20	18.50
	200	8.55	3.95	12.50	98.40	3.28	0.62	4.72	45.90	20.50
		Season 2000 / 2001								
Control		5.90	2.20	8.10	6.50	2.55	0.36	3.14	35.50	15.94
Yeast extract ml/l	50	6.95	2.90	9.85	7.70	2.70	0.41	3.27	40.3	16.88
	100	7.60	3.35	10.95	8.20	3.17	0.52	3.96	40,50	19.81
	200	7.80	3.60	11.40	8.50	3.23	0.65	4.88	45.20	20.19
Carrot extract ml/l	50	7.15	3.10	10.25	8.05	2.66	0.43	3.56	39.40	16.63
	100	7.95	3.85	11.70	8.95	2.72	0.52	4.09	42.60	17.00
	200	8.10	3.90	12.00	9.15	3.17	0.62	4.62	45.20	19.81

Table (3): Mean counts and measurements (related to the control) of certain anatomical features in transverse sections through the 4th apical internode of the main stem of faba bean as affected by yeast and carrot extracts.

Treatments / Measurements (μ) and counts	Control	Yeast extract ml/l						Carrot extract ml/l					
		50		100		200		50		100		200	
		X	% to control	Y	% to control	Y	% to control	Y	% to control	X	% to control	Y	% to control
Diameter of whole section	4162.80	4698.80	112.88	5714.00	137.26	6613.70	158.88	4621.50	111.02	5137.90	123.42	6530.00	156.87
Diameter of hollow pith	1740.60	1860.00	106.86	2745.80	157.75	2870.10	164.89	1795.50	102.15	1984.50	114.01	2641.60	151.76
Thickness of stem wall	1211.10	1419.40	117.20	1484.10	122.54	1871.80	154.55	1413.00	116.67	1576.70	130.19	1944.20	160.53
Thickness of epidermis	36.90	51.30	139.28	54.00	121.95	53.70	145.53	41.40	112.20	51.30	139.02	55.10	149.32
Thickness of cortex	308.70	378.10	122.48	441.00	142.86	468.10	151.64	401.40	130.03	474.30	153.64	530.10	171.72
X Thickness of cortical parenchyma cells	48.60	57.60	118.52	67.50	138.89	28.80	170.37	56.70	116.67	69.40	142.80	84.60	174.07
Thickness of parenchymatous pith	865.50	990.00	114.38	998.10	115.32	1350.00	155.98	970.20	112.10	151.10	121.44	1359.00	157.28
* Thickness of pith parenchyma cells	66.60	77.90	116.97	85.36	128.08	103.85	155.93	69.30	104.05	87.59	131.52	113.25	170.05
No. of vascular bundles	20.25	22.25	109.88	23.75	112.35	23.75	117.28	22.00	108.64	25.50	125.93	24.25	119.75
Length of cortical bundle	607.60	727.10	119.67	782.50	128.79	800.55	131.76	642.10	105.68	728.50	119.90	853.20	140.42
Width of cortical bundle	553.50	630.00	113.82	540.00	97.56	576.00	104.07	570.60	103.09	630.00	113.82	720.00	130.08
Thickness of phloem tissue	143.00	178.20	116.47	189.00	117.65	252.10	164.77	154.80	101.18	181.80	118.82	238.50	155.88
Thickness of xylem tissue	405.50	495.40	122.23	549.90	135.68	495.85	122.34	437.80	108.02	494.50	122.01	563.40	139.01
No. of xylem vessels/cortical bundle	48.25	52.25	108.29	560.00	116.06	63.00	130.57	55.00	113.99	61.80	126.42	65.00	134.72
Thickness of pericyclic fibers	168.50	234.90	139.41	270.00	160.24	270.00	160.24	178.20	105.76	200.70	119.11	270.00	160.24

• Control values are considered as 100%.



(a)

(b) (c)

Fig.(I) : Transverse sections through the middle part of the 4th apical internode of the main stem of faba bean as affected by natural yeast and carrot extracts applied as seed – soaking treatments (X50)

a- Control .

b- Yeast extract at 200 ml /l .

c- Carrot extract at 100 ml /l .

Abbr ep. = epidermis, cx.= cortex, pa. pi. = parenchymatous pith, p.f.= pericyclic fibers, ph.= phloem tissue , xy. =xylem tissue and s.w.= stem wall .

vascular bundles and number of vascular bundles comparing with those of the control. spongy tissues. Exception was only the reduction in lamina thickness and its tissue components that existed with 200 ml/l of carrot extract.

Moreover, thickness of both phloem and xylem tissues was also increased by the treatments of yeast and carrot extracts, especially phloem tissue with 200 ml/l of each extract. Furthermore, the number of xylem vessels/cortical bundle was also positively responded to the treatments of yeast and carrot extracts.

Of interest is to note that these positive responses of different anatomical aspects to the natural extract treatments were completely reversed upon vegetative and reproductive growth of treated plants. So, present study revealed those increases of xylem tissue, i.e. the route of mineral nutrients and water translocation from roots to leaves and the phloem tissue i.e., the pathway of different assimilates from leaves to seeds and other plant sinks. Thereby, improvement of translocation events directly could be considered a direct reason for increment the final seed yield.

B-Leaf structure :

Data in Table (4) and Fig. (2) indicate the effect of yeast and carrot extracts applied as seed-soaking treatments upon different anatomical features of faba bean leaves. In this respect, most of the studied features of leaf anatomy was increased with the assigned treatments of yeast and carrot extracts. Among these anatomical features were the most improtant ones, i.e. thickness of midvein, length and width of vascular bundle, thickness of phloem and xylem tissues and number of xylem vessels in the vascular bundle as well. Also, it could be noticed that carrot extract treatments were more effective when compared with yeast extract ones, regarding the above mentioned characters.

On the other hand, treatments of both yeast and carrot extracts obviously increased thickness of lamina. Also, increment of lamina thickness was accompanied with increases in the thickness of its comprising tissues, i.e. upper and lower epidermis, palisade and

In general, these positive alterations in stem and leaf anatomy of faba bean plants treated with yeast and carrot extracts as seed-soaking application led to vigorous growth and enhancement of flowering and fruit setting of treated plants. That as will mentioned afterwards reversed upon significant increases in the final seed yield. Besides, yield increases with natural extract treatments through doing alterations in the anatomical features of treated plants was also reported by Wanas *et al.* (1998) and Wanas (2001).

IV-Reproductive growth and yield characteristics:-

A- Flower formation and shedding:-

Data in Table (5) clearly show that each of yeast and carrot extracts significantly increased number of flowers/plant during the two assigned seasons. Also, carrot extract treatments were more pronounced in this respect. On the other

Table (4): Mean counts and measurements (related to the control) of certain anatomical features in transverse sections through the leaflet blade of the 4th apical leaf on the main stem of faba bean as affected by yeast and carrot extracts.

Treatments / Measurements(μ) and counts	Control	Yeast extract ml/L						Carrot extract ml/L					
		50		100		200		50		100		200	
		X	% to control	X	% to control	X	% to control	X	% to control	X	% to control	X	% to control
Thickness of midvein	1065.60	1009.45	382.24	1126.70	105.73	1254.60	117.74	1126.80	105.74	1178.90	109.88	1309.70	122.91
Length of main vascular bundle	287.60	306.30	329.62	426.60	150.96	430.80	166.60	358.20	122.96	299.60	141.60	534.70	185.67
Width of main vascular bundle	229.50	734.00	301.96	256.60	111.72	270.90	118.04	264.80	115.38	270.00	117.65	258.20	156.88
Thickness of phloem tissue	98.00	135.90	131.00	156.60	174.80	173.80	193.11	122.30	137.00	146.70	163.00	207.00	230.00
Thickness of xylem tissue	192.60	238.60	169.63	256.60	133.13	297.00	154.21	227.00	117.86	252.90	131.31	317.70	164.95
No. of vessels/main vascular bundle	21.75	24.00	110.29	32.00	148.65	34.00	169.45	27.00	118.68	28.00	122.88	37.00	162.64
Thickness of lamina	391.5	433.90	110.83	470.80	120.26	491.20	125.47	442.30	113.21	421.30	107.61	374.50	95.66
Thickness of upper epidermis	45.00	54.90	122.00	55.80	124.00	54.00	120.00	47.70	106.00	50.40	112.00	45.50	110.00
Thickness of lower epidermis	41.40	47.70	115.22	42.30	102.17	51.00	123.43	43.20	104.35	45.00	108.70	40.50	97.83
Thickness of palisade tissue	*100.00	115.30	114.36	130.50	129.46	123.40	122.43	124.20	123.21	116.30	113.29	95.40	94.64
Thickness of spongy tissue	204.30	216.90	185.72	242.20	118.55	268.70	129.17	228.10	111.65	211.60	103.57	189.18	92.56

* control values are considered as 100%.

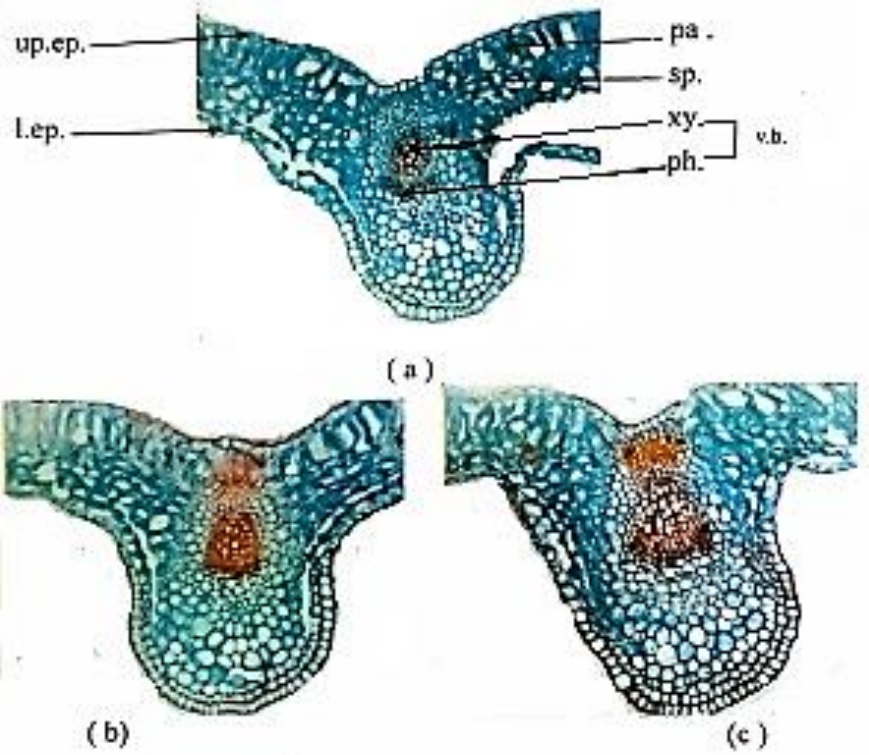


Fig.(2) : Transverse sections through the leaflet blade of the 4th apical leaf on the main stem of faba bean as affected by natural yeast and carrot extracts applied as seed – soaking treatments (X50)

a- Control.

b- Yeast extract at 200 ml /l .

c- Carrot extract at 200 ml /l .

Abb: up.ep. = upper epidermis, Lep.= lower epidermis, pa= palisade tissue, sp.= spongy tissue, xy.=xylem tissue, ph.=phloem tissue and v.b.=vascular bundle.

hand, percentage of shedded flowers was decreased with all applied concentrations of both yeast and carrot extracts. Here, it could be noticed that increase of formed flowers or reduction of aborted ones was in parallel to the applied concentration. That was true for yeast extract and carrot one as well.

B-Pod development:

As shown in Table (5) both extracts significantly increased number of setted pods and decreased number of shedded ones proportionally to the applied concentration of each extract. So, in the two assigned seasons, the number of mature pods, i.e. yielded pods was also increased with all applied treatments.

In addition, significant increases were existed dominantly in weight of pod, pod yield/plant, seed weight/pod and seed yield/plant as well. Moreover, seed index, i.e. the weight of hundred seeds, was also positively responded. Since, its significant increase proportionally existed with the three applied concentrations of each yeast and carrot extract.

In this respect, to our knowledge, there are only few studies have been carried out about the effect of such natural extracts on fresh marketable vegetables and fruits. Of these studies are Alawia and El-Desouky (1997) who reported that yeast extract at 100 and 200 ml/l not only significantly increased the number of setted fruits of Washington navel orange trees but also the mean weight of fruit and improved fruit quality as well. Also, El-Desouky *et al.* (1998) found that yeast extract increased different growth aspects and yield of seed-treated squash plants and enhanced their fruit quality as well. In addition, Fathy *et al.* (2000) reported that yeast and carrot extracts not only increased cold tolerance in tomato plants but also enhanced the final fruit yield as well as improvement the quality of yielded fruits.

In general, the vigorous growth of faba bean plants with yeast and carrot extracts applied as seed-soaking treatments and the significant increases obtained in their seedyield either in the present study or other ones could be mainly attributed to the higher contents of phytohormones and other growth factors in such natural extracts.

Finally, the present study strongly admit the possibility of applying such low coast and safe natural extracts as seed-soaking treatments for faba bean. Since, these natural extracts have economic importance concerning reduction of flowers and pod shedding accompanied by increasing number of branches/plant, number and weight of mature pods/plant, in turn the final seed yield.

Table (5): Effects of the natural extracts of yeast and carrot applied as seed-sooking treatments on flowering and yield characteristics of faba bean (*Vicia Faba* L.cv. Giza 461)plants during 1999/2000 and 2000/2001 seasons.

Characters / Treatments		No. of flowers/ plant	% of flower shedding	No. of setted pods /plant	% of pods shedding	No. of mature pods/ plant	Weight of pod (g)	Pod yield (g)/ plant	Weight of seeds (g)/pod	Seed yield (g)/ plant	Seed index (g)
		Season 1999/2000									
Control		81.20	74.26	20.90	29.67	14.70	2.76	40.57	2.19	32.19	73.00
Yeast extract ml/l	50	86.10	71.20	24.80	27.02	18.10	3.20	57.92	2.66	48.15	88.67
	100	93.40	70.12	27.90	26.88	20.40	3.42	69.77	2.73	55.69	91.00
	200	108.70	71.30	31.20	25.64	23.20	3.04	70.53	2.43	56.38	81.00
Carrot extract ml/l	50	96.70	70.42	28.60	26.92	20.90	3.31	69.18	2.58	53.92	86.00
	100	99.40	68.11	31.70	26.18	23.41	3.06	71.60	2.42	56.63	80.67
	200	114.30	67.89	36.70	26.16	27.10	2.96	80.22	2.32	62.87	77.33
L S D 0.05		4.56	2.81	3.19	2.03	2.67	0.16	0.11	0.11	4.11	1.88
Control		Season 2000/2001									
		91.00	76.04	21.80	28.44	15.60	2.52	39.31	1.99	31.04	66.00
Yeast extract ml/l	50	99.40	73.24	26.60	25.56	19.80	2.98	59.00	2.33	46.13	77.67
	100	109.30	72.00	30.60	24.51	23.10	3.08	71.15	2.36	54.52	79.00
	200	121.80	70.93	35.40	24.29	26.80	2.80	75.04	2.16	57.89	72.00
Carrot extract ml/l	50	108.30	72.11	30.20	25.50	22.50	3.09	69.53	2.45	55.13	81.67
	100	117.80	70.97	34.20	23.68	26.10	2.87	74.91	2.27	59.25	75.67
	200	129.10	68.55	40.60	24.88	30.10	2.74	82.47	2.17	65.32	72.33
LSD 0.05		6.72	2.31	4.41	1.47	3.12	0.14	0.13	0.13	6.34	1.47

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استجابة نباتات الفول لمعاملة البذور بالمستخلصات الطبيعية للخميرة والجزر

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تأثر نمو نباتات الفول صنف جيزة ٤٦١ بدرجة معنوية مع مستخلصات الخميرة والجزر المستخدمة كمعاملات نقع للبذور بتركيزات ٥٠ ، ١٠٠ ، ٢٠٠ ملى / لتر من كل منهما خلال موسمى ١٩٩٩/٢٠٠٠ ، ٢٠٠٠ / ٢٠٠١ ، حيث حدثت زيادة معنوية فى العديد من صفات النمو مثل عدد الأفرع وعدد الأوراق المتكونة / نبات ، الأوزان الجافة لكل من الساق والأوراق / نبات وكذلك مساحة الأوراق الكلية. فى حين حدث نقص معنوى فى معدل التمثيل (مساحة الأوراق بالسنتيمترات المربعة اللازمة لإنتاج جرام واحد مادة جافة) مع كل المعاملات المستخدمة. ومن ناحية أخرى فإن كلا المستخلصين أظهر تأثيرات متعارضة بخصوص ارتفاع النبات ، حيث أدى مستخلص الخميرة إلى زيادته بينما سبب مستخلص الجزر نقص فى هذه الصفة.

علاوة على ذلك فإن مختلف التركيزات المستخدمة من كل من الخميرة والجزر قد سببت زيادة واضحة فى محتوى الأوراق من صبغات التمثيل الضوئى ، والنيتروجين والفوسفور والبوتاسيوم ، الكربوهيدرات الكلية وكذلك البروتين الخام وذلك عند ٩٠ يوم بعد الزراعة.

بالإضافة إلى ذلك ، فإن هذا النمو القوى للنباتات الفول نتيجة المعاملة بمستخلصات الخميرة والجزر كمواد نقع للبذور كان مصحوبا بتغيرات واضحة فى العديد من الصفات التشريحية للساق والأوراق. فقد أدت جميع المعاملات المستخدمة إلى زيادة سمك جدار الساق والأنسجة المكونة له مثل البشرة والقشرة والنخاع البرانشيمى هذا بالإضافة إلى زيادة سمك العرق الوسطى والنصل وكذلك البشرة العليا والبشرة السفلى والنسيجين العمادى والإسفنجى فى الأوراق. وعلاوة على ذلك فقد زادت أبعاد الحزم الوعائية وسمك نسيجى اللحاء والخشب وكذلك عدد أوعية الخشب بالحزمة الوعائية مع كل معاملات المستخلصات المستخدمة ، وهذا قد يؤكد أهمية المساحة المقطعية لنسيجى اللحاء والخشب والمصحوبة بتخليق كمية أكبر من نواتج التمثيل وامتصاص أكثر للعناصر المعدنية لأجل تحسين النمو والإنتاجية للنباتات المعاملة.

فضلاً عن ذلك ، فمع حلول مرحلة الإزهار سببت جميع المعاملات المستخدمة من مستخلصات الخميرة والجزر زيادة معنوية عدد الأزهار المتكونة وعدد الثمار العاقدة / نبات فى حين أظهرت تأثيراً معاكساً لذلك على النسبة المئوية لتساقط الأزهار والثمار غير الناضجة ، وبالتالى انعكس ذلك على زيادة محصول القرون وكذلك محصول البذور النهائى للنبات.

وبناءً على ذلك يمكن التوصية باستخدام مثل هذه المستخلصات الطبيعية قليلة التكاليف والآمنة من الناحية الصحية كمعاملات نقع للبذور بهدف زيادة محصول البذور النهائى فى هذا النبات الاقتصادى.