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Impact of spraying with yeast extract and L-ascorbic acid on the biomass and bioactive secondary metabolites of faba bean plant (*Vicia faba* L.)

Mahmoud M. A.*, Ahmed A. M., Omar M. I. A., Mohamed M. T.

Department of Agronomy (Biochemistry), Faculty of Agriculture, Al-Azhar University (Assiut Branch), Assiut 71524, Egypt

Abstract

A field experiment was conducted in this study, two dry beans of Faba bean seeds were obtained from Mallawy Agricultural Research Station, Minia, Egypt two varieties (Sakha-1 and Giza-843). During two seasons 2021/2022 and 2022/2023 to examine the impact of applying yeast extract and L-ascorbic acid on the chemical composition of two faba bean varieties (Sakha-1 and Giza-843). Foliar spray of yeast extract (YA: (25 and 50 ml/L) and L-ascorbic acid at rate (L-AA: 50 and 100 mg/L) either alone, or their combination and control. The impact of the preceding treatments on moisture content, total nitrogen, crude protein, crude lipids (CL), carbohydrates, total phenolic compounds, total flavonoids, total alkaloids (TAs), and phytic acid (PA) were assayed. Results showed that applying L-ascorbic acid and yeast extract to the foliage significantly enhances the chemical composition. Results indicated L-ascorbic acid was more effective than yeast extract. Total ash, nitrogen, crude protein (CP), crude lipids (CL), carbohydrates, total phenolic compounds, total flavonoids, total alkaloids (TAs), and phytic acid (PA) in seeds of faba bean were significantly enhanced by mounting L-ascorbic acid from 50 to 100 mg/L and/or yeast extract concentrations up to 25 and 50 ml/L. The qualitative screening of the bioactive secondary metabolites in the extracts of two varieties of broad bean included 12 groups and the recorded results indicate the presence of 10 groups *i.e.* phenolics, flavonoids, alkaloids, tannins, coumarins, glycosides, saponins, proanthocyanins, steriods and phytates and absence emadins and terpenoids. The concentrations of TPCs in all treatments are higher than the unsprayed samples (control). It is also clear that the concentrations of TPCs in the extracts of Sakha-1 cultivar are always higher than their counterparts in Giza-843 cultivar. It is clearly noted that the binary mixtures led to increases in TPCs more than the individual treatments. The treatment YA 50 mg/L + ASA, 100 mg/L is the best treatment as it recorded the highest concentration of TPCs in both cultivars. The concentrations of TFs in the two cultivars are close, and in some cases, the Sakha-1 cultivar has a higher concentration, unlike the concentrations of TPCs, which are higher in Sakha-1 cultivar in all treatments than in Giza-843 cultivar. The present results also indicate that TFs fluctuate within a narrow range, and the treatment YA 50 mg/ + ASA, 50 mg/L was the best treatment in the two cultivars, and the highest concentration of flavonoids was recorded at 88.37 for Sakha-1 cultivar and 88.44 for Giza-843 cultivar. Phytic acid concentrations were always higher in the extracts of Sakha-1 variety than in Giza-643 variety. The results also indicate that the treatment YA 50 mg/L + ASA, 100 mg/L achieved the highest concentration of phytic acid which plays an important role in resistance against bacteria, fungi and insects and is also a standard antioxidant.

Keywords: Ascorbic acid, alkaloids, faba bean, flavonoids, phenolics, secondary metabolites, yeast extract.

*Corresponding author: Mahmoud M. A.,
E-mail address: salahahmed45050@gmail.com

1. Introduction

Legume crops are fascinating marvels of nature, serving as a sustainable treasure trove of high-protein nourishment and are cultivated extensively across the globe. Among the many these legumes, the faba bean also referred to as broad bean, and horse bean, is one of the oldest cultivated crops in the world (Mínguez and Rubiales, 2021). Bioactive compounds are key food components and molecules that present health benefits, disease prevention, or therapeutic possibilities. Furthermore, recent research has indicated that specific bioactive compounds found in foods may offer various health benefits, including anti-inflammatory, antioxidant, anti-tumor, anti-hypertensive, and cholesterol-lowering effects. These compounds include polyphenols, carotenoids, anthocyanins, flavonoids, and phytosterols (Ceramella *et al.,* 2022). Spraying with yeast extract and L-ascorbic acid led to a significant increase in the percentages of nitrogen, protein, and carbohydrates in faba bean seeds, with the highest values observed when using L-ascorbic acid compared to control plants (Al-Rubaiee, 2024). Faba bean is regarded as a significant crop for its ecological, nutritional, and economic benefits (Xiao *et al.,* 2021). Faba bean, much like their fellow legume counterparts, boast an impressive nutritional profile packed with a symphony of protein and carbohydrates. Additionally, it comprises considerable amounts of crude lipids, fiber, vitamins, and minerals (Alonso *et al.,* 2000; El-Tinay, *et al.,* 1993). Faba bean has diverse bioactive compounds such as total phenolic and have demonstrated antioxidant activity with flavonoids (Valente *et al.,* 2018). Faba bean was found to have various anti-nutritional factors contains lectins, trypsin inhibitor, saponins, phytic acids, tannins that adversely affected its biological value (Revilla, 2015). Faba bean is a significant nutrient legume which contains complex carbohydrates, high levels of rich in lysine protein, fiber and secondary metabolites (total phenolic compounds and antioxidants) that have many reported health benefits (Khazaei *et al.,* 2019; Liu *et al.,* 2022). Faba bean is a potential agronomic friendly alternative to cereal-based cropping system which can fix free nitrogen and help the farmers in sustainable agriculture for achieving environmentally friendly development goals. As legumes, they provide an exceptional good source of protein that is not only rich in lysine but also packed with diverse essential nutrients (Dhull *et al.,* 2022). Yeast is a natural exporter of cytokines and is remarkably stimulating for bean plant (Amer, 2004). In addition, Fathy *et al.* (2000), Abou-Aly (2005) and Wanas (2006) reported on the enhanced growth, flowering and fruit production achieved by spraying applications of yeast. Also, Mahmoud (2001) reported on yeast the content of protective agents (total protein, total amino acids, carbohydrates and total vitamins). L-ascorbic acid, which is the focus of the current study, is now thought to be a mediator of cell division and differentiation and is essential in diverse key processes such as antioxidant defense, photo-protection and regulation of photosynthesis and development

(Bolkhina *et al*., 2003). As of late, it has been recorded as almost its basic part in arrangement of physiological forms such as plants protection against oxidation, major cofactor of protein, plant cell division, cell development, development and improvement and aging (Zhang, 2013). The present work was planned with the objective of studying the influence of L-ascorbic acid and yeast extract on chemical composition such as primary metabolites and some secondary metabolites of faba bean varieties. The main objectives of this study were: (1) to investigate the impact of L-ascorbic acid and yeast extract on chemical composition such as, primary metabolites and secondary metabolites of faba bean seed. (2) To investigate the changes in chemical composition actuated with spraying application of L-ascorbic corrosive and yeast extricate on seeds of faba bean.

2. Materials and methods

2.1 Samples

In the presently study two dry beans of Broad bean seeds were gotten from Mallawy Agricultural Research Station, Minia, Egypt, two varieties (Sakha-1 and Giza-843).

2.2 Experiments

Thess tests were carried out within the Research facility and Exploratory Cultivate of Staff of Farm of College of Agriculture, Al-Azhar University, Assiut, Egypt amid the two progressive seasons of 2021/2022 and 2022/2023 to ponder the impact of splashing with yeast extricate and L-ascorbic corrosive on chemical composition of Broad bean seeds plants. Exploratory plan was laid in a part plot course of action in totally randomized square plan with three replications, assortment (Sakha-1 and Giza-843) of Broad bean. Faba bean plants considered the most plots, splashes treatment was doled out as sub plots. Faba bean seeds were sown on October 25th of the two seasons. The exploratory plot was 3.6 × 3 m and contained 5 lines, 60 cm separated. The separations between the slopes were 30 cm. All agricultural practices were performed as usual. All agrarian hones were performed as regular. At the conclusion of the test, the taking after information was recorded: was explored as well as chemical composition such as, primary metabolites (moisture, total ash, nitrogen, protein (CP), crude lipids and Carbohydrates) and secondary metabolites (Total phenolic compounds, Total flavonoids total alkaloid (TAs) and phytic acid (PA). Sprinkle was performed utilizing plastic atomizer and plants were splashed twice by yeast extricate and L-ascorbic corrosive, the primary splashing was connected after 45 days of sowing and moment splashing was connected in 15 days after. These coefficients were as follows:

1. Yeast extract (spraying foliar) at (control – 25 and 50 ml/L).
2. L-ascorbic acid (spraying foliar) at (control – 50 and 100 mg/L).
3. L-ascorbic acid + yeast extract

(spraying foliar) at (control – 50 mg/L L-ascorbic acid + 25 ml /L YA – 50 mg/L L-ascorbic acid + 50 ml /L YA).

4. L-ascorbic acid + yeast extract (spraying foliar) at (control - 100 mg /L L-ascorbic acid + 25 ml /L YA – 100 mg/ L L-ascorbic acid + 50 ml /L YA).

2.3 Approximate analysis

Chemical composition of Broad bean seeds was carried out concurring to official strategies of the Association of Official Analytical Chemists (AOAC, 2000). All judgments were performed in triplicates and implies will be detailed. Estimates of moisture and ash contents were decided concurring with the official strategy (AOAC, 2000).

2.4 Estimate of total nitrogen and protein

The Kjeldahl strategy was utilized to decide the nitrogen substance agreeing to (AOAC, 1984). The crude protein was at that point calculated with increasing nitrogen substance with 6.25 as a worker for faba bean seeds.

2.5 Estimate of crude lipids

The crude lipids were decided concurring to AOAC (1984).

2.6 Estimate of total carbohydrates

The total carbohydrates were determined by using the method phenol sulphuric acid according to Dubois *et al*. (1956).

2.7 Qualitative examination of secondary metabolites concentrations in faba bean

The qualitative analyses of Sakha-1 and Giza-843 were carried out according to the following the methodology outlined by Harborne (1973) and others as follows: For discovery of steroids a method described by Gibbs (1974) was applied. Discovery of terpenoids was by Ayoola *et al.* (2008). Discovery of tannins was by Treare and Evans (1985). Discovery of saponins was done by Kumar *et al.* (2009). Discovery of anthocyanin's in the extricate was performed by strategy of Paris and Moyse (1969). Discovery of glycosides was done according to Khandewal (2008). Emodins were detected in the samples examined by Rizk (1982). For detection of alkaloids a method of Gibbs (1974) was used. Discovery of phenolics was assayed by Gibbs (1974). Discovery of flavonoids was estimated by Khandewal (2008).

2.8 Extraction and estimate of total phenolic compounds

The concentrations of total phenolic compounds within methanolic extricates was decided with the strategy portrayed with Mahrous *et al.* (2023) with a few adjustments. One ml of test was blended with one ml of Folin Ciocateu's phenol reagent. Total flavonoids substance was estimate as catechin equivalent (6.25–200 µg/mL) and was expressed as gram of catechin equivalent /100 gram agreeing to the strategy portrayed according to Zhishen *et al.* (1999).

2.9 Estimate of total alkaloids

The estimate of total alkaloids substance was done by an antacid precipitation gravimetric strategy depicted according to Harborne (1973). The total alkaloid content was calculated and expressed as a ratio of the weight of the analyzed sample.

2.10 Extraction and estimate of phytic acid

The phytic acid was extracted from two faba bean tests by the strategy depicted according to Ellis *et al*. (1977). The phytic acid of push and prepared tests were decided concurring to the strategy depicted according to Wheeler and Ferrel (1971).

2.11 Statistical analysis

The experimental design was laid out in a split plot. The obtained information was subjected to analysis using the fluctuation method, and treatment means were compared using the LSD test according to Gomez and Gomez (1984).

3. Results and Discussion

3.1 Qualitative screening of bioactive secondary metabolites in faba bean cultivars

The qualitative screening from the bioactive secondary metabolites in extracts from two varieties of *Vicia faba* included 12 groups and the recorded results indicate the presence of 10 groups *i.e*. phenolics, flavonoids, alkaloids, tannins, coumarins, glycosides, saponins, proanthocyanins, steriods and phytates and absence two groups these are emadins and terpenoids (Table 1). Faba beans are an exporter from numerous bioactive secondary metabolites. They are numerous Egyptian varieties of *Vicia faba*, Mekky *et al.* (2020) addressed compared chemical diagnosis from the Egyptian varieties of *Vicia faba* to be specific Nubaria-3, Giza-843 and Sakha-3. The watched metabolites are total phenolic compounds (phenolic acids and flavonoids), saponins, total alkaloids, nucleosides, total carbohydrate, organic acids, amino acids and a jasmonate. These discoveries explained the primary reported in the metabolic diagnosis from the varieties as well as their antioxidant exercises (Mekky *et al.*, 2020).

3.2 Chemical constituents

3.2.1 Impact of spraying by yeast extract and L-ascorbic acid on primary metabolites

Results of the chemical primary metabolites in faba bean seeds counting 6 electorate from moisture, ash, total nitrogen, crude protein, crude lipids and carbohydrates are given in Tables (2, 3 and 4). These dataers presented in Tables (1, 2 and 3) showed that foliar spraying application from either yeast or L-ascorbic acid at any concentration significantly increased the total ash, nitrogen, crude protein, carbohydrates percentages as well as crude lipids, in faba bean seeds compared by their control with

the harvest stage. In Table (2) data presented also showed that the foliar spraying application by yeast and L-ascorbic acid non-significant in moisture percentage in the yielded faba bean seeds. Mahmoud *et al*. (2016) reported that spraying application by yeast non-significant in moisture percentage in the yielded lupines seeds. Generally, it is clear the Giza-843 variety surpass Sakha-1 variety in the two seasons on respectively in moisture, total ash and carbohydrates and it is clear that Sakha-1 variety surpass Giza -843 variety in the two seasons respectively in total nitrogen, protein and lipids.

Table (1): Qualitative screening of bioactive secondary metabolites in faba bean cultivars.

Group	Sakha-1	Giza-843	Group	Sakha-1	Giza-843
Phytosteriods	+	+	Emadins	-	-
Terpenoids	-	-	Alkaloids	++	++
Tannins	+++	+++	Glycosides	+	+
Saponins	++	++	Phenolics	++++	+++
Proanthocyanins	++	++	Flavonoids	+++	++
Coumarins	+	+	Phytates	+++	+++

(+) present, (-) absent.

Table (2): Impact of spraying with yeast extract and L-ascorbic acid on the moisture and total ash of the yielded faba bean seeds.

Treatments (B)	First season			Second season		
	variety (A)			variety (A)		
	Moisture (%) in variety (A)					
	Sakha-1	Giza-843	Mean	Sakha-1	Giza-843	Mean
Control	7.390	7.580	7.485	7.381	7.572	7.477
YA 25 mg /L	7.401	7.582	7.492	7.382	7.579	7.481
YA 50 mg /L	7.393	7.590	7.492	7.381	7.580	7.481
ASA, 50 mg /L	7.395	7.584	7.490	7.390	7.582	7.486
ASA, 100 mg /L	7.402	7.583	7.493	7.385	7.573	7.479
YA 25 mg /L+ ASA, 50 mg /L	7.397	7.583	7.490	7.384	7.579	7.482
YA 25 mg /L+ ASA, 100 mg /L	7.399	7.585	7.492	7.391	7.578	7.485
YA 50 mg /L+ ASA, 50 mg /L	7.398	7.587	7.493	7.387	7.580	7.484
YA 50 mg /L+ ASA, 100 mg /L	7.405	7.585	7.495	7.387	7.582	7.485
Mean	7.398	7.584		7.385	7.578	
LSD 0.05	A 1.723	B 0.855	AB 0.251	A 0.013	B 0.014	AB 0.020
	Total ash (%) in variety (A)					
Control	3.28	3.76	3.52	3.31	3.77	3.54
YA 25 mg /L	3.54	3.83	3.69	3.49	3.85	3.67
YA 50 mg /L	3.57	3.85	3.71	3.58	3.92	3.75
ASA, 50 mg /L	3.59	3.87	3.73	3.52	3.91	3.72
ASA, 100 mg /L	3.60	3.92	3.76	3.60	3.94	3.77
YA 25 mg /L+ ASA, 50 mg /L	3.62	3.88	3.75	3.56	3.88	3.72
YA 25 mg /L+ ASA, 100 mg /L	3.65	3.92	3.79	3.67	3.96	3.82
YA 50 mg /L+ ASA, 50 mg /L	3.67	3.95	3.81	3.69	3.99	3.84
YA 50 mg /L+ ASA, 100 mg /L	3.69	4.00	3.85	3.75	4.12	3.94
Mean	3.58	3.89		3.57	3.93	
LSD 0.05	A 1.445	B 0.825	AB 1.167	A 0.141	B 0.162	AB 0.229

Table (3): Impact of spraying yeast extract and L-ascorbic acid on the total nitrogen and crude protein of the yielded faba bean seeds.

Treatments (B)	First season			Second season		
	variety (A)			variety (A)		
	Total nitrogen (%) in variety (A)					
	Sakha-1	Giza-843	Mean	Sakha-1	Giza-843	Mean
Control	5.05	4.82	4.94	5.08	4.83	4.96
YA 25 mg /L	5.42	5.30	5.36	5.40	5.27	5.34
YA 50 mg /L	5.86	5.73	5.795	5.79	5.75	5.77
ASA, 50 mg /L	5.58	5.68	5.63	5.59	5.52	5.56
ASA, 100 mg /L	5.91	5.98	5.95	5.88	5.81	5.85
YA 25 mg /L+ ASA, 50 mg /L	6.03	6.00	6.02	6.01	6.01	6.01
YA 25 mg /L+ ASA, 100 mg /L	6.24	6.09	6.17	6.12	6.05	6.09
YA 50 mg /L+ ASA, 50 mg /L	6.65	6.42	6.56	6.67	6.30	6.49
YA 50 mg /L+ ASA, 100 mg /L	6.93	6.71	6.82	6.95	6.69	6.82
Mean	5.96	5.86		5.94	5.80	
LSD 0.05	A 0.287	B 0.174	AB 0.246	A 0.237	B 0.235	AB 0.332
	Crude protein (%) in Cultivar (A)					
Control	31.56	30.13	30.85	31.75	30.19	30.97
YA 25 mg /L	33.88	33.13	33.51	33.75	32.94	33.35
YA 50 mg /L	36.63	35.81	36.22	36.19	35.94	36.07
ASA, 50 mg /L	34.88	35.50	35.19	34.94	34.50	34.72
ASA, 100 mg /L	36.94	37.38	37.16	36.75	36.31	36.53
YA 25 mg /L+ ASA, 50 mg /L	37.69	37.50	37.595	37.56	37.56	37.56
YA 25 mg /L+ ASA, 100 mg /L	39.00	38.06	38.53	38.25	37.81	38.03
YA 50 mg /L+ ASA, 50 mg /L	41.56	40.13	40.85	41.69	39.38	40.54
YA 50 mg /L+ ASA, 100 mg /L	43.31	41.94	42.63	43.44	41.81	42.63
Mean	37.27	36.62		37.15	36.27	
LSD 0.05	A 1.542	B 1.281	AB 1.811	A 1.516	B 1.013	AB 1.432

Data displayed in Tables (2, 3 and 4) appear noteworthy increments in the total ash, total nitrogen, crude protein, crude lipids and carbohydrates of the products faba bean seeds were altogether affected seed as a result of both applied vitamins (yeast extract and L-ascorbic acid) showed that foliar spraying application of both yeast and L-ascorbic acid and their combination had noteworthy impact on ash, nitrogen, protein, lipids and carbohydrates of the yielded faba bean seeds compared with control (Tables 2, 3 and 4). From the data in Tables (2, 3 and 4) it appears that spraying the foliar faba bean plants with yeast extract was more positive from L-ascorbic acid any concentration as well as their combination on ash, nitrogen, protein, lipids and carbohydrates in faba bean seeds compared with control and this increment was continuously positive that gave the most noteworthy expanding percentage. This result is similar by Mahmoud *et al*. (2016), Khalifa *et al*. (2020) on lupine seeds and Taha *et al*. (2023) on seeds of *Vicia faba* plants**.** The impact by yeast spraying foliar application on nitrogen, protein and carbohydrates was previously studied in other faba bean plant species (Mady 2009). Spraying foliar application with yeast was an improvement in the percentage of total protein and lipids in soybean plants (Abdo *et al*., 2012).

Marzauk *et al*. (2014) observed that in spraying foliar application of dry yeast result in slight increases in *Vicia faba* seeds content of protein and nitrogen %. Xu *et al*. (2015) observed the spraying foliar application of L-ascorbic corrosive improves the expansion of protein amalgamation, photosynthesis and plant development. Sadak and Dawood (2014) found that in the flax cultivars (Sakha-3 and Giza 8) with spraying foliar application of L-ascorbic acid improved the proteins, lipids and carbohydrates percentage. Azooz *et al.* (2013) found that treatment by ascorbic acid (AA) increase the content of proteins, and total soluble sugars in broad bean. Spraying foliar application by yeast caused significant increases in total protein and oil in soybean seeds (Abdo *et al*., 2012).

Table (4): Impact of spraying yeast extract and L-ascorbic acid on the total nitrogen and crude protein of the yielded faba bean seeds.

Treatments (B)	First season			Second season		
	variety (A)			variety (A)		
	Crude lipids (%) in variety (A)					
	Sakha-1	Giza-843	Mean	Sakha-1	Giza-843	Mean
Control	1.68	1.29	1.49	1.64	1.31	1.48
YA 25 mg /L	1.84	1.42	1.63	1.83	1.40	1.62
YA 50 mg /L	1.92	1.50	1.71	1.88	1.52	1.70
ASA, 50 mg /L	1.90	1.47	1.69	1.85	1.43	1.64
ASA, 100 mg /L	1.95	1.58	1.77	1.89	1.54	1.72
YA 25 mg /L+ ASA, 50 mg /L	1.92	1.49	1.71	1.87	1.51	1.69
YA 25 mg /L+ ASA, 100 mg /L	2.02	1.61	1.82	1.91	1.60	1.76
YA 50 mg /L+ ASA, 50 mg /L	1.98	1.56	1.77	1.94	1.63	1.79
YA 50 mg /L+ ASA, 100 mg /L	2.09	1.67	1.88	1.95	1.67	1.81
Mean	1.92	1.51		1.86	1.51	
LSD 0.05	A 0.093	B 0.150	AB 0.212	A 0.061	B 0.128	AB 0.181
	Carbohydrates (%) in variety (A)					
Control	50.03	50.12	50.08	49.86	50.06	49.96
YA 25 mg /L	52.13	52.02	52.08	51.45	51.86	51.66
YA 50 mg /L	53.59	52.99	53.29	51.63	51.89	51.76
ASA, 50 mg /L	53.53	53.50	53.52	51.72	52.00	51.86
ASA, 100 mg /L	54.23	53.95	54.09	51.80	52.14	51.97
YA 25 mg /L+ ASA, 50 mg /L	53.85	53.72	53.79	51.90	52.15	52.03
YA 25 mg /L+ ASA, 100 mg /L	53.94	53.86	53.90	51.97	52.24	52.11
YA 50 mg /L+ ASA, 50 mg /L	54.00	53.97	53.99	52.06	52.51	52.29
YA 50 mg /L+ ASA, 100 mg /L	54.10	54.13	54.12	52.26	52.79	52.53
Mean	53.27	53.14		51.63	51.96	
LSD 0.05	A 2.537	B 3.526	AB 4.987	A 1.204	B 2.569	AB 3.633

Using L-ascorbic acid as foliar spray concentration nitrogen, total protein, total soluble sugars and lipids of lupine (*Lupines termis* L.) plant (Khalifa *et al*., (2020). Abdo *et al.* (2012) found that foliar spray application by yeast was adequate for decreasing the destructive impact of cadmium and caused significant increases the total protein and total oil percentage in seeds of soybean plants. Abdel-Rahman *et al.* (2015) reported that the ascorbic acids foliar application

increased nitrogen, crude protein and carotenoids of sorghum. Spraying L-ascorbic acid caused significantly increased the protein content of *Vicia faba* seeds (Bughdady and Kenawey, 2021).

3.2.2 Impact of spraying yeast extract and L-ascorbic acid on some secondary metabolites

Results of the total phenolic compounds, total flavonoids, total alkaloid and phytic acid (PA) are given in Tables (5 and 6) and Figures (1, 2, 3 and 4). Data displayed in Table (5) showed that the foliar spraying application by either yeast extract or L-ascorbic acid at any concentration significantly increased total phenolic compounds (TPCs) and total flavonoids (TFs) of the yielded faba bean seeds compared with control (Figure 1). This information displayed in Table (6) showed that the foliar spraying application by either L-ascorbic acid at any concentration significantly increased total alkaloid (TAs), and phytic acid (PA) of the yielded faba bean seeds compared with control. Information displayed in Table (6) also showed that foliar spraying application by yeast extract caused a significantly increased in phytic acid (PA) percentage and also showed that foliar spraying application by yeast at 25 and 50ml/L decrease non-significant in total alkaloid percentage in the yielded faba bean seed. Mahmoud *et al*. (2016) found that the foliar spraying application by yeast decrease non-significant percentages total alkaloids (%) of lupines seeds. Khalil and Ismael (2010) found the foliar spraying application by yeast gave treated plants induced significant decrease of alkaloid content.

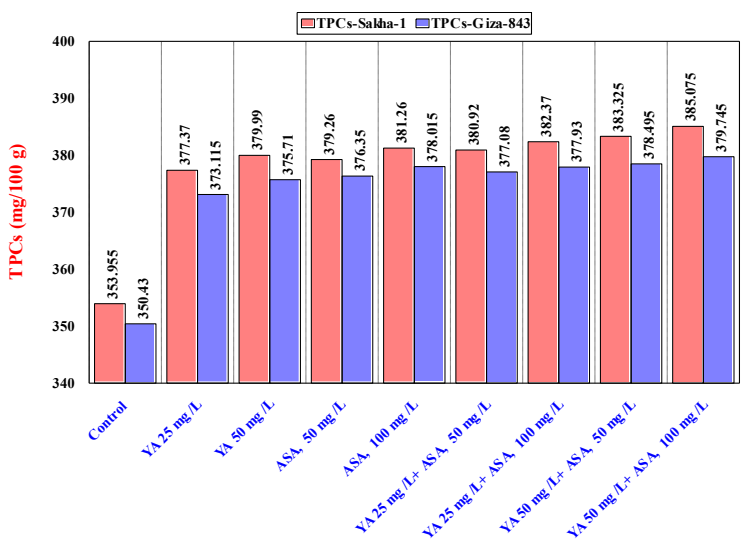

Figure (1): Impact of spraying yeast extract and L-ascorbic acid on total phenolic compounds (TPCs) on two faba bean cultivars during two successive seasons.

Table (5): Impact of spraying by yeast extract and L-ascorbic acid on the Total phenolic compounds and Total flavonoids of faba bean seeds.

Treatments (B)	First season			Second season		
	variety (A)			variety (A)		
	Total phenolic compounds (mg/100g) in variety (A)					
	Sakha-1	Giza-843	Mean	Sakha-1	Giza-843	Mean
Control	353.90	350.09	351.99	354.01	350.77	352.39
YA 25 mg /L	375.53	370.23	372.88	379.21	376.00	377.61
YA 50 mg /L	379.76	372.08	375.92	380.22	379.34	379.78
ASA, 50 mg /L	378.00	372.35	375.18	380.52	380.35	380.44
ASA, 100 mg /L	380.25	374.08	377.33	382.27	381.95	382.11
YA 25 mg /L+ ASA, 50 mg /L	379.30	373.42	376.36	382.54	380.74	381.64
YA 25 mg /L+ ASA, 100 mg /L	380.87	373.96	377.42	383.87	381.90	382.89
YA 50 mg /L+ ASA, 50 mg /L	381.10	375.04	378.07	385.55	381.95	383.75
YA 50 mg /L+ ASA, 100 mg /L	383.50	375.70	379.60	386.65	383.79	385.22
Mean	376.91	370.77		379.43	377.42	
LSD 0.05	A 2.302	B 9.696	AB 13.712	A 11.708	B 11.807	AB 16.698
	Total flavonoids (mg/100g) in variety (A)					
Control	81.06	81.84	81.45	80.75	81.51	81.13
YA 25 mg /L	83.50	84.33	83.92	84.05	84.22	84.14
YA 50 mg /L	85.02	85.75	85.39	85.25	85.29	85.27
ASA, 50 mg /L	84.75	85.79	85.27	85.21	85.90	85.56
ASA, 100 mg /L	85.97	87.08	86.53	86.14	87.15	86.65
YA 25 mg /L+ ASA, 50 mg /L	86.00	86.35	86.18	86.36	85.67	86.02
YA 25 mg /L+ ASA, 100 mg /L	86.24	86.95	86.59	87.47	86.02	86.75
YA 50 mg /L+ ASA, 50 mg /L	86.87	86.90	86.89	87.87	88.12	87.99
YA 50 mg /L+ ASA, 100 mg /L	88.21	88.12	88.17	88.52	88.75	88.64
Mean	85.29	85.90		85.74	85.85	
LSD 0.05	A 1.833	B 2.608	AB 3.688	A 1.266	B 2.163	AB 3.059

Table (6): Impact of spraying by yeast extract and L-ascorbic acid on the Total alkaloids and phytic acid of faba bean seeds.

Treatments (B)	First season			Second season		
	variety (A)			variety (A)		
	Total alkaloids (mg/100g) in variety (A)					
	Sakha-1	Giza-843	Mean	Sakha-1	Giza-843	Mean
Control	90.12	89.75	89.94	89.95	88.28	88.12
YA 25 mg /L	89.97	89.60	89.69	89.49	87.81	88.65
YA 50 mg /L	90.03	89.65	89.84	89.70	87.93	88.82
ASA, 50 mg /L	92.87	92.70	92.79	92.85	91.52	92.19
ASA, 100 mg /L	92.98	93.02	93.00	93.10	92.70	92.90
YA 25 mg /L+ ASA, 50 mg /L	92.28	92.50	92.39	93.00	91.75	92.38
YA 25 mg /L+ ASA, 100 mg /L	93.20	93.42	93.31	93.52	92.90	93.31
YA 50 mg /L+ ASA, 50 mg /L	93.50	92.34	92.76	93.85	92.43	93.14
YA 50 mg /L+ ASA, 100 mg /L	94.00	93.54	93.77	94.25	93.08	93.67
Mean	92.11	91.84		92.19	90.93	
LSD 0.05	A 2.862	B 2.454	AB 3.470	A 1.351	B 2.300	AB 3.253
	Phytic acid (mg/100g) in variety (A)					
Control	872.52	831.52	852.02	869.87	832.00	850.94
YA 25 mg /L	875.02	834.67	854.85	873.27	835.92	854.56
YA 50 mg /L	875.76	834.84	855.30	873.98	836.07	855.03
ASA, 50 mg /L	875.43	835.25	855.34	874.03	836.00	855.02
ASA, 100 mg /L	875.92	835.33	855.63	874.50	836.67	855.59
YA 25 mg /L+ ASA, 50 mg /L	876.00	835.96	855.98	873.75	836.58	855.26
YA 25 mg /L+ ASA, 100 mg /L	876.65	836.02	856.34	874.86	836.76	855.81
YA 50 mg /L+ ASA, 50 mg /L	876.83	835.40	856.03	874.47	836.80	855.66
YA 50 mg /L+ ASA, 100 mg /L	877.11	836.29	856.70	874.98	836.90	855.94
Mean	875.69	835.03		873.75	835.97	
LSD 0.05	A 6.073	B 8.955	AB 12.664	A 8.272	B 6.314	AB 8.930

From the results in Figure (1) it is clear that the concentrations of TPCs in all treatments are higher than the unsprayed samples (control). It is also clear that the concentrations of TPCs in the extracts of Sakha-1 cultivar are always higher than their counterparts in Giza-843 cultivar. It is clearly noted that the binary mixtures led to increases in TPCs more than the individual treatments. The treatment YA 50 mg/L + ASA, 100 mg/L is the best treatment as it recorded the highest concentration of TPCs in both cultivars. It has become clear that the spray treatments that lead to increases in TPCs from plants are preferred because these compounds play important roles in the resistance mechanism as they are defensive compounds. It is preferable to use sprays with such treatments because they are high-potential antioxidants. The results of the estimation of total flavonoids show that the concentrations of TFs in the two cultivars are close, and in some cases, the Sakha-1 cultivar has a higher concentration, unlike the concentrations of TPCs, which are higher in Sakha-1 cultivar in all treatments than in Giza-843 cultivar (Figure 2).

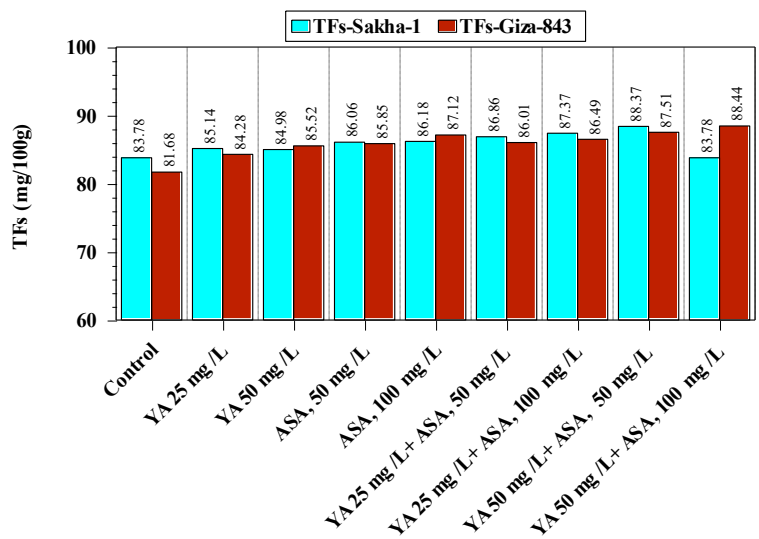

Figure (2): Impact of spraying yeast extract and L-ascorbic acid on total flavonoids (TFs) on two faba bean cultivars during two successive seasons.

The present result also indicate that TFs fluctuate within a narrow range, and the treatment YA 50 mg/L + ASA 50 mg/L was the best treatment in the two cultivars, and the highest concentration of flavonoids was recorded at 88.37 for Sakha-1 cultivar and 88.44 for Giza-843 cultivar (Figure 2). The seeds of field bean contain a group of evolutionary related plant defence proteins, composed of phytohaemagglutinin (PHA), arcelin (Arc), and α-amylase inhibitor (α-AI),

phenolics (Franco *et al*., 2002). Foliar spraying application with L-ascorbic acid of lupine seeds significantly increased some secondary metabolites example total phenolic compounds and total alkaloids (Khalifa *et al*., 2020).

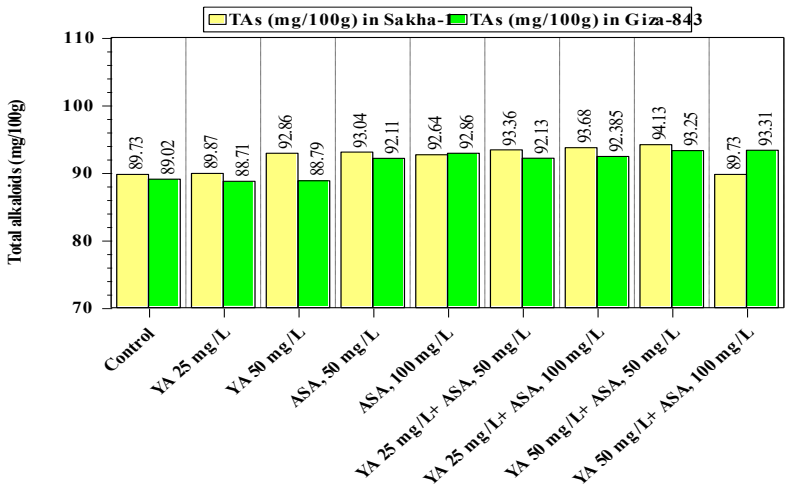

Figure (3): Impact of spraying by yeast extract and L-ascorbic acid on total alkaloids (TAs) on two faba bean cultivars during two successive seasons.

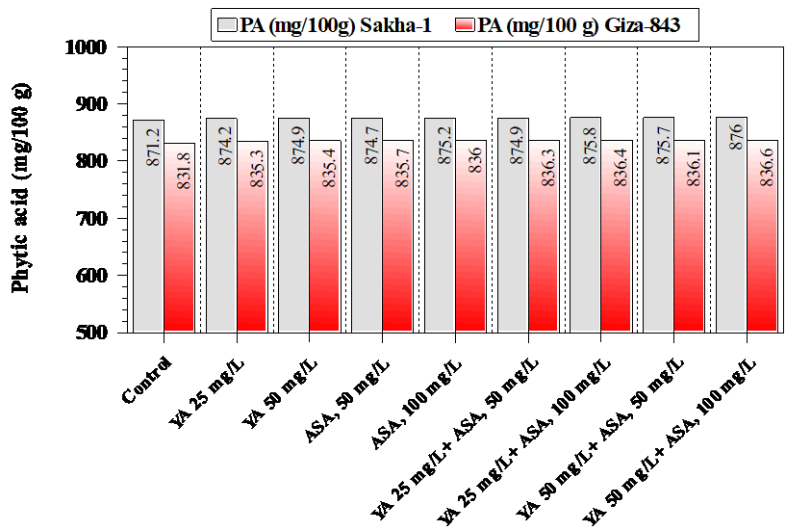

Figure (4): Impact of spraying by yeast extract and L-ascorbic acid on phytic acid (PA) on two faba bean cultivars during two successive seasons.

Generally, it is clear that Sakha-1 variety surpasses Giza -843 variety in the two seasons on respectively in TPCs, total alkaloids (TAs), and Phytic acid. And it is

clear that Giza -843 variety surpass Sakha-1 variety in the two seasons on respectively in total flavonoids (TFs). Generally, yeast extract treatments were superior to L-ascorbic acid in increasing chemical constituents in *Vicia faba* seeds. The more active treatment in this concern was 50 mg/L of yeast or 100 mg/L of L-ascorbic acid separately and their combination the most effective treatment in this concern was yeast extract (YA) at rate 50 mg/L+ 100 mg/L (ASA) of L-ascorbic acid combination. In our study, the foliar spraying application of either YA or ASA affects the wealth of a few metabolites and changes the metabolic systems due to their bio regulatory impact. Such mutations affect the physiology, morphology and enzymatic activity of plants and thus effect the treatment and collection of mason metabolites in seeds. Foliar spraying application with yeast at 9 ml /L caused a significant increase in TPCs (%) in the *Lupines termis* seeds (Mahmoud *et al*., 2016). Results given in the Figure (4) indicated that the concentrations of phytic acid were always higher in the extracts of Sakha-1 variety than in Giza-643 variety and that the concentrations of phytic acid were not less than 831 mg/100 g in Giza-843 variety and did not reach 880 mg/100 g in all treatments. The results also indicate that the treatment YA 50 mg/L + ASA 100 mg/L achieved the highest concentration of phytic acid which plays an important role in resistance against bacteria, fungi and insects and is also a standard antioxidant. Phytic acid demonstrates anticarcinogenic abilities due to its antioxidant capacity, immune system enhancement, and gene alteration, preventing different tumors (breast, colon, liver, skin, etc.) (Poonia *et al.*, 2022).

4. Conclusion

Generally, it is clear that Giza -843 variety surpass Sakha-1 variety in the two seasons on respectively in moisture, total ash and carbohydrates and it is clear that Sakha-1 variety surpass Giza -843 variety in the two seasons on respectively in nitrogen, protein and lipids. Generally, it is clear that Sakha-1 variety surpass Giza -843 variety in the two seasons on respectively in nitrogen, protein, lipids, total phenolic compounds (TPCs), total alkaloids (TAs), and Phytic acid and it is clear that Giza -843 variety surpassed Sakha-1 variety in the two seasons on respectively in moisture, total ash, carbohydrates and total flavonoids (TFs). Results of the treatment of plants by yeast extract caused decrease non-significant in total alkaloid percentage in the yielded faba bean seed as compared with control.

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