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REGULAR ARTICLE

ORGANIC FERTILIZATION AND NATURAL SUBSTANCES TREATMENTS AFFECTS CHEMICAL CONSTITUENTS OF GUAR PLANTS

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ABSTRACT

This experiment was conducted at the Floriculture Nursery, Faculty of Agriculture, Minia University during the two successive seasons to study the effect of compost at rates (0, 25, 2.50 and 3.75 ton/fed.) and natural substances i.e. vitamins (ascorbic acid at 50 and 100 ppm, α-tocopherol at 10, 20 ppm and thiamine, at 25 and 50 ppm) and active yeast at 2.5 and 5 g/l. and their interaction on some chemical constituents of guar plants. The results indicated that, Addition of compost caused an increase in guaran %, Photosynthetic pigments, Total carbohydrates (%) N, P and K (%) and Protein (%). The maximum level in all previous traits was for the plants growing in the soil fertilized with the highest level of compost (3.75 t/fed.). Using the treatments of vit. C at 50 ppm followed by 5 g/l. active yeast, then vit. E at 10 ppm gave the highest values of all previous traits. The interaction between the two main factors (A×B) was significant for guaran %, photosynthetic pigments, total carbohydrates %, N and P %., The highest values were obtained from the interaction treatments of 3.75 ton/fed., compost in combination with active yeast at 5 g/l. and vit. C at 50 ppm. On the other hand, the interaction between compost, active yeast and vitamins treatments was not significant for protein content (%). We conclude that supply guar plants with compost at 3.75 ton/fed., and spraying plants with either active yeast at 5 g/l. or ascorbic acid (vit. C) at 50 ppm to improve the values of some chemical constituents under investigation condition.

Keywords: Guar, Compost, Vitamin C, Active yeast, Chemical constituents

INTRODUCTION

Guar, *Cyamopsis tetragonoloba*, L. Taub. (cluster bean vegetable), an annual summer adapted well to arid and semi-arid climatic zones 65 [1]. It is also known as saline and drought resistant plant; it belongs to Family Fabaceae [2]. Guar is known and grown in Egypt as forage crop. Primarily, its green manure and seed production have considered as animal nutritive substances as its protein content 16 %. Recently, the interest has expanded to use a source of glactomannan gum. The endosperm containts guaran gum (20-30 %), a polymer of glactose (36 %) and manose (64 %), known as glactomannan [3]. The gum is used in food industry [4], it can also be used for treating diabetes mellitus, hyperglycemia, glycosuria and hyperlipopropteinemia and the seeds are used as a laxative [5]. Recently, the interest has extended to be use as a source of galactomannan gum.

Organic manures are important for medicinal plants to produce the best product in both quantity and quality and it is also very safe for human health and environment [6]. Composts are ecofriendly organic supplements which are not harmful for even soil microbiota [7]. Recently, great attention has been focused on the possibility of using natural substances, i.e. vitamins (E or B_1 or C) and yeast in order to improve plant growth, flowering, fruit setting and yield.

Alpha-tocopherols (vitamin E), are secondary metabolites which protects plants from various abiotic stresses [8, 9]. Thiamine (vitamin B_1) is an essential for the synthesis of succinyl-Co-A and glycerin and for the reaction of them to form aminolevulinic acid [10], the main intermediate for formation of protoprophyrin in the precursor of chlorophyll [11] and a factor in the decarboxylation of pyruvate. In addition, various physiological processes depend more or less on the availability of vitamin B [12]. Moreover, [13] obtained pronounced increments in lemongrass yield, vegetative growth, as well as, essential oil percentage due to applying thiamine.

Ascorbic acid (vitamin C) an important antioxidant in plants which helps the plants to overcome stressful conditions [14]. In addition, yeast extract is a source of many natural plant growth substances (cytokinins), large

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amount of vitamin B and most of nutritional elements (P, K, S, Na, Ca and Mg), as well as, organic compound (high protein, carbohydrates, nucleic acids and lipids) [15].

Therefore, the present study was carried out to investigate the effect of organic manure (compost) and some natural substances (vitamin E, B_1 and C, as well as, active yeast) treatments on some chemical constituents of *Cyamopsis tetragonoloba*, L. plant.

MATERIALS AND METHODS

The present work was concluded at the Floriculture Nursery, Faculty of Agriculture, Minia University during the two successive seasons of 2010 and 2011 to study the effect of compost in combination with active yeast and some vitamins on growth, yield and guaran content of guar gum (*Cyamopsis tetragonoloba*, Taub.). Table (1) shows the physical and chemical properties of the used soil in both seasons.

The layout of this experiment during both seasons was split plot design with three replicates. The main-plots included four compost treatments (0, 1.25, 2.50 and 3.75 ton/feddan.), while the sub-plots were devoted to nine treatments; control, α-tocopherol (vit. E.) at 10 and 20 ppm, thiamine (vit. B_1) at 25 and 50 ppm, ascorbic acid (vit. C) at 50 and 100 ppm and active yeast (AY) at 2.5 and 5 g/l. Compost were added during soil preparation for cultivation in both seasons. The physical and chemical properties of the used compost are shown in table (2).

The plants were harvested of the fourth week of September in both seasons and the following data were recorded during the two seasons.

Guaran determinations

Concerning guaran determination of oven-dried seeds were determined according to [16].

Pigments determination

The contents of photosynthetic pigments namely; chlorophyll a, b and carotenoids (mg/g f. w.) of fresh leaves were determined according to [17] using the spectrophotometer at wave length of 656, 665 and 452.5 µm, respectively.

Total carbohydrates percentage

Total carbohydrates including poly-saccharides in dry leaves of each experiment unit were colorimetrically determined with the anthrone sulphuric acid method [18]

N, P and K percentages

A sample weight of 0.2 g fine powder of the dry herb was digested using a mixture of hydrogen peroxide (H_2O_2) and concentrated sulphuric acid (H_2SO_4) (4:10). The clear digestion was quantitively 100 ml volumetric flask. In this solution, the following elements were determined:

Nitrogen (%) was determined according to the modified Microkjeldahle method as described by [19]. Phosphorus (%) was determined colorimetrically by the spectrophotometer at wavelength of 650 µm according to the method of [20]. Potassium (%) was determined using flame-photometry method according to [21].

Table 1: The physical and chemical properties of the used soil

Soil character	Values	Soil character		Values
Sand %	28.30	Available P %		15.12
Silt %	30.70	Exchangeable K^+mg/100 g soil		2.11
Clay %	41.0	Exch. Ca^{++}mg/100 g soil		31.74
Soil type	Clay loam	Exch. Na^+mg/100 g soil		2.41
Organic matter %	1.62			
$CaCO_3$ %	2.09		Fe	8.54
pH 1:2.5	7.83	DTPA	Cu	2.06
E. C. m mhose/cm	1.04	Ext. ppm	Zn	2.75
Total N %	0.08		Mn	8.26

The experimental unit (plot) was 2 × 2.4 meters and contained 3 rows, 50 cm apart and seeds were sown in hills, 30 cm apart, on 30th March in both seasons. Seedlings were thinned to one plant/hill, after one month from sowing.

Table 2: The physical and chemical properties of the used compost

Properties	Value	Properties	Value
Dry weight of 1 m^3	450 kg	NaCl %	1.1-1.75
Fresh weight of 1 m^3	650-700 kg	Total P %	0.5-0.75
Moisture (%)	25-30	Total K %	0.8-1.0
pH (1:10)	7.5-8	Fe ppm	150-200
E. C. (m mhose/cm)	2-4	Mn ppm	25.56
Total N %	1-1.4	Cu ppm	75-150
Org. matter %	32-34	Zn ppm	150-225
Org. carbon %	18.5-19.7		
C/N ratio	18.5-14.1		

Each of vitamins and suspension of yeast were applied by hand sprayer 3 times. The first one was added after 5 w from planting date and two weeks thereafter. The plants were sprayed till run off. All agricultural practices were performed as usual, in the region for the production of guar plants.

Protein percentage

Protein percentage was estimated by multiplying nitrogen percent by 6.25. This was based on the assumption that the protein contains 16 % nitrogen, according to the method of [22].

Statistical analysis

The data of the two seasons were subjected to the statistical analysis of variance using [23]. L. SD test at 0.05 was used to compare the means of treatments.

RESULTS AND DISSECTION

Guaran percentage in the seeds

Regarding compost levels, data presented in table (3) revealed that guaran % in the dry seeds of *Cyamopsis tetragonoloba*, L. was significantly increased as a result of fertilizing plants with all used levels of compost treatments over the control in both seasons. The highest guaran % was obtained due to the treatment of compost at high level (3.75 ton/fed.) followed by the treatment of low level (1.25 ton/fed.) with significant differences detected among themselves in both growing seasons.

The enhancement of guaran % obtained in the present work due to using organic manure was also reported by [24] and [25] on guar plants.

Table (3) indicated that all examined eight treatments of vitamins and active yeast significantly increased guaran percentage in the dry seeds of *Cyamopsis tetragonoloba*, L., except for the treatment of vit. C at 100 ppm in comparison with the control in the two growing seasons. The low concentrations of the three used vitamins treatments proved to be more effective than their high concentrations in this respect. However, active yeast at 5 g/l. was more effective than 2.5 g/l. in improving guaran %. The treatments of active yeast (5 g/l.) followed by vit. C (50 ppm) then B1 (25 ppm) resulted the highest guaran % with significant differences detected among themselves in both seasons. The least guaran % resulted from control treatment. The other treatments gave intermediate values. In this respect, [24]on guar plants found that the highest values of guaran % were obtained due to the application of farmyard manure accompanied by Rhizobium and yeast. The interaction between the two main factors (A×B) was significant for guaran % in the second season as illustrated in table (3). The superior interaction treatment over all was compost at high level (3.75 ton/fed.) in combination with active yeast at 5 g/l.

Photosynthetic pigments

The contents of the three studied photosynthetic pigments (chlorophyll a, b and carotenoids) were significantly enhanced by compost levels (1.25, 2.50 and 3.75 ton/fed.) in the two growing seasons as shown in Tables (4, 5 and 6). However, the maximum values were obtained by high level of compost (3.75 ton/fed.). In regard to the enhancement influence of organic fertilization, the previous results were in agreement with those of [26] on coriander; [27] on *Phaseolus vulgaris* and [28] on spider plant.

Table 3: Effect of compost, some vitamins and active yeast treatments on guaran % of *Cyamopsis tetragonoloba* seeds during 2010 and 2011 seasons

First season					
Vitamins and active yeast treatments (B)	**Compost levels (ton/fed.) (A)**				
	0.0	**1.25**	**2.50**	**3.75**	**Mean (B)**
Control	11.56 12.67 11.98 12.78 12.04	11.95	12.31	12.68	12.13
Vit. E at 10 ppm	12.67	12.78 12.40	13.10	13.61	13.04
Vit. E at 20 ppm	11.98	12.40	12.75	13.15	12.57
Vit. B_1 at 25 ppm	12.78	12.89	13.21	13.73	13.15
Vit. B_1 at 50 ppm	12.04	12.45	12.79	13.19	12.62
Vit. C at 50 ppm	13.17	13.30	13.73	14.32	13.63
Vit. C at 100 ppm	11.59	12.00	12.36	12.72	12.17
Active yeast (2.5 g/l)	12.25	12.66	12.99	13.40	12.83
Active yeast (5.0 g/l)	13.50	13.82	14.25	14.65	14.06
Mean (A)	12.39	12.69	13.05	13.49	
L. SD at 5 %	A:	0.16	B: 0.19	AB:	N. S.
Second season					
Vitamins and active yeast treatments (B)	Compost levels (ton/fed.) (A)				
	0.0	1.25	2.50	3.75	Mean (B)
Control	11.95	12.45	12.90	13.27	12.64
Vit. E at 10 ppm	13.05	13.29	13.73	14.23	13.58
Vit. E at 20 ppm	12.39	12.91	13.36	13.76	13.10
Vit. B_1 at 25 ppm	13.19	13.40	13.82	14.35	13.69
Vit. B_1 at 50 ppm	12.46	12.97	13.38	13.80	13.15
Vit. C at 50 ppm	13.59	13.81	14.36	14.95	14.18
Vit. C at 100 ppm	11.97	12.50	12.95	13.30	12.68
Active yeast (2.5 g/l)	12.67	13.19	13.60	14.00	13.37
Active yeast (5.0 g/l)	13.93	14.03	14.69	15.31	14.49
Mean (A)	12.80	13.17	13.64	14.11	
L. SD at 5 %	A:	0.11	B: 0.11	AB:	0.22

Vit. E. = α-tocopherol Vit. B_1.= Thiamine Vit. C.= Ascorbic acid

Table 4: Effect of compost, some vitamins and active yeast treatments on chlorophyll a content (mg/g f. w.) of *Cyamopsis tetragonoloba* during 2010 and 2011 seasons

First season					
Vitamins and active yeast treatments (B)	**Compost levels (ton/fed.) (A)**				
	0.0	**1.25**	**2.50**	**3.75**	**Mean (B)**
Control	2.311	2.376	2.423	2.466	2.394
Vit. E at 10 ppm	2.399	2.458	2.507	2.548	2.478
Vit. E at 20 ppm	2.369	2.438	2.478	2.518	2.451
Vit. B_1 at 25 ppm	2.381	2.441	2.491	2.531	2.461
Vit. B_1 at 50 ppm	2.360	2.429	2.470	2.512	2.443
Vit. C at 50 ppm	2.428	2.488	2.549	2.588	2.528
Vit. C at 100 ppm	2.341	2.400	2.451	2.491	2.421
Active yeast (2.5 g/l)	2.356	2.421	2.462	2.506	2.437
Active yeast (5.0 g/l)	2.457	2.519	2.561	2.602	2.535
Mean (A)	2.378	2.441	2.488	2.529	
L. SD at 5 %	A: 0.052	B: 0.011	AB: 0.220		
Second season					
Vitamins and active yeast treatments (B)	Compost levels (ton/fed.) (A)				
	0.0	1.25	2.50	3.75	Mean (B)
Control	2.351	2.411	2.462	2.500	2.431
Vit. E at 10 ppm	2.401	2.461	2.518	2.555	2.484
Vit. E at 20 ppm	2.375	2.439	2.481	2.521	2.454
Vit. B1 at 25 ppm	2.380	2.445	2.490	2.528	2.461
Vit. B1 at 50 ppm	2.365	2.431	2.476	2.516	2.447
Vit. C at 50 ppm	2.448	2.508	2.568	2.571	2.523
Vit. C at 100 ppm	2.352	2.418	2.477	2.520	2.442
Active yeast (2.5 g/l)	2.359	2.421	2.486	2.529	2.449
Active yeast (5.0 g/l)	2.468	2.520	2.573	2.548	2.527
Mean (A)	2.389	2.450	2.503	2.536	
L. SD at 5 %	A: 0.041	B: 0.009	AB: 0.018		

Vit. E. = α-tocopherol Vit. B_1.= Thiamine Vit. C.= Ascorbic acid

Table 5: Effect of compost, some vitamins and active yeast treatments on chlorophyll b content (mg/g f. w.) of *Cyamopsis tetragonoloba* during 2010 and 2011 seasons

First season					
Vitamins and active yeast treatments (B)	**Compost levels (ton/fed.) (A)**				
	0.0	**1.25**	**2.50**	**3.75**	**Mean (B)**
Control	0.771	0.794	0.807	0.822	0.799
Vit. E at 10 ppm	0.801	0.820	0.853	0.967	0.860
Vit. E at 20 ppm	0.790	0.815	0.841	0.851	0.824
Vit. B1 at 25 ppm	0.795	0.813	0.846	0.859	0.828
Vit. B1 at 50 ppm	0.787	0.812	0.835	0.841	0.819
Vit. C at 50 ppm	0.809	0.829	0.856	0.980	0.869
Vit. C at 100 ppm	0.781	0.800	0.817	0.830	0.807
Active yeast (2.5 g/l)	0.785	0.807	0.821	0.836	0.812
Active yeast (5.0 g/l)	0.819	0.839	0.866	0.985	0.877
Mean (A)	0.793	0.814	0.838	0.886	
L. SD at 5 %	A: 0.018	B: 0.007	AB: 0.014		
Second season					
Vitamins and active yeast treatments (B)	Compost levels (ton/fed.) (A)				
	0.0	1.25	2.50	3.75	Mean (B)
Control	0.783	0.805	0.820	0.831	0.810
Vit. E at 10 ppm	0.808	0.828	0.860	0.973	0.867
Vit. E at 20 ppm	0.791	0.813	0.833	0.855	0.823
Vit. B1 at 25 ppm	0.799	0.816	0.838	0.860	0.828
Vit. B1 at 50 ppm	0.791	0.811	0.833	0.850	0.821
Vit. C at 50 ppm	0.809	0.836	0.871	0.988	0.878
Vit. C at 100 ppm	0.784	0.808	0.825	0.840	0.814
Active yeast (2.5 g/l)	0.788	0.809	0.829	0.843	0.817
Active yeast (5.0 g/l)	0.821	0.843	0.868	0.991	0.881
Mean (A)	0.797	0.819	0.842	0.892	
L. SD at 5 %	A: 0.015	B: 0.003	AB: 0.006		

Vit. E. = α-tocopherol Vit. B1.= Thiamine Vit. C.= Ascorbic acid

Table 6: Effect of compost, some vitamins and active yeast treatments on carotenoids content (mg/g f. w.) of *Cyamopsis tetragonoloba* during 2010 and 2011 seasons

First season					
Vitamins and active yeast treatments (B)	**Compost levels (ton/fed.) (A)**				
	0.0	**1.25**	**2.50**	**3.75**	**Mean (B)**
Control	0.793	0.811	0.819	0.834	0.814
Vit. E at 10 ppm	0.822	0.850	0.867	0.888	0.857
		0.851			
Vit. E at 20 ppm	0.809	0.839	0.851	0.876	0.844
Vit. B1 at 25 ppm	0.815	0.843	0.861	0.881	0.850
Vit. B1 at 50 ppm	0.805	0.831	0.841	0.866	0.836
Vit. C at 50 ppm	0.829	0.859	0.880	0.899	0.867
Vit. C at 100 ppm	0.796	0.818	0.828	0.846	0.822
Active yeast (2.5 g/l)	0.799	0.826	0.836	0.858	0.830
Active yeast (5.0 g/l)	0.838	0.866	0.910	0.930	0.886
Mean (A)	0.812	0.838	0.855	0.875	
L. SD at 5 %	A:	0.019	B: 0.006	AB:	0.012
Second season					
Vitamins and active yeast treatments (B)	Compost levels (ton/fed.) (A)				
	0.0	1.25	2.50	3.75	Mean (B)
Control	0.795	0.818	0.836	0.846	0.824
Vit. E at 10 ppm	0.829	0.860	0.875	0.896	0.865
Vit. E at 20 ppm	0.811	0.832	0.852	0.876	0.843
Vit. B1 at 25 ppm	0.817	0.839	0.859	0.886	0.850
Vit. B1 at 50 ppm	0.810	0.832	0.846	0.869	0.839
Vit. C at 50 ppm	0.831	0.863	0.899	0.906	0.875
Vit. C at 100 ppm	0.796	0.825	0.838	0.853	0.828
Active yeast (2.5 g/l)	0.801	0.831	0.846	0.862	0.835
Active yeast (5.0 g/l)	0.842	0.869	0.912	0.939	0.891
Mean (A)	0.814	0.841	0.863	0.881	
L. SD at 5 %	A:	0.018	B: 0.011	AB:	0.022

Vit. E. = α-tocopherol Vit. B_1.= Thiamine Vit. C.= Ascorbic acid

Table 7: Effect of compost, some vitamins and active yeast treatments on total carbohydrates (%) of *Cyamopsis tetragonoloba* during 2010 and 2011 seasons

First season					
Vitamins and active yeast treatments (B)	**Compost levels (ton/fed.) (A)**				
	0.0	**1.25**	**2.50**	**3.75**	**Mean (B)**
Control	22.2	25.3	27.1	29.5	26.0
Vit. E at 10 ppm	23.5	28.2	29.5	31.8	28.3
		2.80			
Vit. E at 20 ppm	23.3	28.0	29.1	31.3	27.9
Vit. B1 at 25 ppm	23.4	28.1	29.3	31.4	28.0
Vit. B1 at 50 ppm	23.2	27.9	29.1	31.2	27.9
Vit. C at 50 ppm	23.8	28.5	29.9	32.1	28.6
Vit. C at 100 ppm	23.1	26.4	28.3	30.1	27.0
Active yeast (2.5 g/l)	23.7	27.1	29.1	31.1	27.8
Active yeast (5.0 g/l)	23.6	28.3	29.6	31.9	28.4
Mean (A)	23.3	25.3	29.0	31.2	
L. SD at 5 %	A:	0.18	B: 0.4	AB:	0.8
Second season					
Vitamins and active yeast treatments (B)	Compost levels (ton/fed.) (A)				
	0.0	1.25	2.50	3.75	Mean (B)
Control	23.5	26.7	27.9	29.4	26.9
Vit. E at 10 ppm	23.6	28.6	29.4	31.8	28.4
Vit. E at 20 ppm	23.4	28.1	29.2	31.6	28.1
Vit. B1 at 25 ppm	23.4	28.2	29.2	31.5	28.0
Vit. B1 at 50 ppm	23.3	28.0	29.1	31.5	28.0
Vit. C at 50 ppm	23.7	29.5	31.1	31.3	28.9
Vit. C at 100 ppm	23.2	26.5	28.3	30.3	27.2
Active yeast (2.5 g/l)	23.9	27.2	29.2	31.2	27.9
Active yeast (5.0 g/l)	23.6	28.7	29.6	31.9	28.5
Mean (A)	23.5	27.9	29.4	31.3	
L. SD at 5 %	A:	2.5	B: 0.5	AB:	1.0

Vit. E. = α-tocopherol Vit. B1.= Thiamine Vit. C.= Ascorbic acid

Data presented in Tables (4, 5 and 6) showed that all spraying treatments significantly increased the chlorophyll a, b and carotenoids contents (mg/g. f. w.) over the check treatment. The highest contents of the previous characters resulted from the plants which received active yeast at 5 g/l. followed by vit. C at 50 ppm in both experimental seasons.

The interaction between compost and spraying treatments was significant in both seasons for the three photosynthetic pigments. The highest contents of chlorophyll a, b and carotenoids in the fresh leaves of guar plants was obtained from the interaction treatments of 3.75 ton/fed., compost in combination with active yeast at 5 g/l. and vit. C at 50 ppm. Similar results were obtained by [29] on coriander; [30] on black cumin and anise and [31] on sage who found that the interaction between farmyard manure with yeast significantly increased chlorophyll a, b and carotenoids. Also, [32] on caraway; [33] on fennel and [34] on black cumin recorded that the highest contents of chl. a, b and carotenoids were obtained from the treatment of compost in combination with ascorbic acid.

Total carbohydrates percentage

Data presented in table (7) indicated that supplying guar plants with compost at 1.25, 2.50 and 3.75 ton/fed., resulted in a significant increase in the total carbohydrate percentage in the dry seeds of plant compared to control plants. The increase of carbohydrate % was gradually increased with the gradual increase of compost level in the two experimental seasons. The beneficial effect of organic fertilization on carbohydrate was obtained by [35] on *Sideritis monata*; [36] on oregano plants; [37] on *Lawsonia alba*; [38] on *Vicia faba*; [39] on kidney bean and [40] on sugar beet plant.

Concerning the influence of spraying treatments [(vit. C, E and B_1)] and active yeast, each at two concentrations on carbohydrate %, data presented in table (7) showed that all used eight treatments increased the percentage of carbohydrate compared to untreated plants in both seasons. Using the treatments of vit. C at 50 ppm followed by 5 g/l. active yeast, then vit. E at 10 ppm gave the highest values in this concern without significant differences detected among themselves.

Regarding ascorbic acid these results agree with those of [41] on *Vicia faba*. However, [39]on kidney bean; [42] on *Vicia faba* and [40] on sugar beet, concluded that active yeast increased total carbohydrates in plants. Moreover, [43] on *Syngonium podophyllum* found that total carbohydrates content was significantly increased when plants were treated with thiamine, ascorbic acid and kinetin.

Regarding interaction between the two main factors (A×B) it significantly increased carbohydrate % in both two seasons as shown in table (7). The highest values were obtained by the interaction treatments of compost (3.75 ton/fed.) in combination with vit. C (50 ppm), active yeast (5 g/l.) or vit. E (10 ppm) during the first season. Moreover, the interaction between high level of compost (3.75 ton/fed.) in combination with any tested spraying treatment, except for vit. C at 100 ppm gave the best interaction treatments.

Table 8: Effect of compost, some vitamins and active yeast treatments on N (%) of *Cyamopsis tetragonoloba* during 2010 and 2011 seasons

First season					
Vitamins and active yeast treatments (B)	**Compost levels (ton/fed.) (A)**				
	0.0	**1.25**	**2.50**	**3.75**	**Mean (B)**
Control	1.76 2.13	2.16	2.45	2.68	2.263
Vit. E at 10 ppm	2.13	2.57 2.45 2.50 2.40 2.63	2.91	3.13	2.685
Vit. E at 20 ppm	2.01	2.45	2.78	3.00	2.560
Vit. B1 at 25 ppm	2.06	2.50	2.84	3.06	2.615
Vit. B1 at 50 ppm	1.97	2.40	2.72	2.97	2.515
Vit. C at 50 ppm	2.19	2.63	2.98	3.19	2.748
Vit. C at 100 ppm	1.88	2.29	2.59	2.83	2.398
Active yeast (2.5 g/l)	1.93	2.35	2.66	2.90	2.460
Active yeast (5.0 g/l)	2.24	2.68	2.03	3.24	2.798
Mean (A)	2.019	2.448	2.773	3.000	
L. SD at 5 %	A:	0.026	B: 0.060	AB:	0.120
Second season					
Vitamins and active yeast treatments (B)	Compost levels (ton/fed.) (A)				
	0.0	1.25	2.50	3.75	Mean (B)
Control	1.84	2.25	2.55	2.79	2.358
Vit. E at 10 ppm	2.14	2.59	2.94	3.17	2.710
Vit. E at 20 ppm	2.05	2.50	2.83	3.03	2.603
Vit. B1 at 25 ppm	2.10	2.56	2.89	3.08	2.658
Vit. B1 at 50 ppm	2.02	2.46	2.79	2.99	2.565
Vit. C at 50 ppm	2.20	2.65	3.00	3.23	2.770
Vit. C at 100 ppm	1.95	2.37	2.68	2.92	2.480
Active yeast (2.5 g/l)	1.99	2.42	2.74	2.98	2.533
Active yeast (5.0 g/l)	2.24	2.70	3.05	3.29	2.820
Mean (A)	2.059	2.500	2.830	3.053	
L. SD at 5 %	A:	0.042	B: 0.055	AB:	0.110

Vit. E. = α-tocopherol Vit. B1.= Thiamine Vit. C.= Ascorbic acid

Table 9: Effect of compost, some vitamins and active yeast treatments on P (%) of *Cyamopsis tetragonoloba* during 2010 and 2011 seasons

First season					
Vitamins and active yeast treatments (B)	**Compost levels (ton/fed.) (A)**				
	0.0	**1.25**	**2.50**	**3.75**	**Mean (B)**
Control	0.32	0.33	0.34	0.35	0.335
	0.36				
	0.35				
Vit. E at 10 ppm	0.36	0.38	0.39	0.39	0.380
		0.37			
Vit. E at 20 ppm	0.35	0.37	0.37	0.37	0.365
Vit. B1 at 25 ppm	0.36	0.38	0.38	0.39	0.378
Vit. B1 at 50 ppm	0.34	0.36	0.36	0.37	0.358
Vit. C at 50 ppm	0.37	0.39	0.39	0.39	0.385
Vit. C at 100 ppm	0.33	0.34	0.35	0.36	0.345
Active yeast (2.5 g/l)	0.33	0.35	0.36	0.37	0.353
Active yeast (5.0 g/l)	0.37	0.39	0.40	0.40	0.390
Mean (A)	0.348	0.366	0.371	0.377	
L. SD at 5 %	A:	0.015	B:	0.010	AB: 0.020
Second season					
Vitamins and active yeast treatments (B)	Compost levels (ton/fed.) (A)				
	0.0	1.25	2.50	3.75	Mean (B)
Control	0.30	0.31	0.32	0.33	0.315
Vit. E at 10 ppm	0.35	0.38	0.39	0.39	0.378
Vit. E at 20 ppm	0.34	0.37	0.38	0.38	0.368
Vit. B1 at 25 ppm	0.35	0.37	0.38	0.39	0.373
Vit. B1 at 50 ppm	0.34	0.36	0.37	0.37	0.360
Vit. C at 50 ppm	0.36	0.39	0.39	0.40	0.385
Vit. C at 100 ppm	0.32	0.33	0.34	0.35	0.335
Active yeast (2.5 g/l)	0.34	0.35	0.36	0.37	0.355
Active yeast (5.0 g/l)	0.37	0.39	0.40	0.41	0.393
Mean (A)	0.341	0.361	0.370	0.377	
L. SD at 5 %	A:	0.018	B:	0.016	AB: 0.032

Vit. E. = α-tocopherol Vit. B1.= Thiamine Vit. C.= Ascorbic acid

Table 10: Effect of compost, some vitamins and active yeast treatments on K (%) of *Cyamopsis tetragonoloba* during 2010 and 2011 seasons

First season					
Vitamins and active yeast treatments (B)	**Compost levels (ton/fed.) (A)**				
	0.0	**1.25**	**2.50**	**3.75**	**Mean (B)**
Control	1.30	1.33	1.36	1.40	1.348
	1.35				
Vit. E at 10 ppm	1.35	1.40	1.41	1.48	1.400
		1.39			
		1.39			
		1.38			
		1.40			
Vit. E at 20 ppm	1.34	1.39	1.39	1.46	1.395
Vit. B1 at 25 ppm	1.35	1.39	1.40	1.47	1.403
Vit. B1 at 50 ppm	1.34	1.38	1.39	1.45	1.390
Vit. C at 50 ppm	1.36	1.40	1.42	1.48	1.415
Vit. C at 100 ppm	1.33	1.36	1.38	1.43	1.375
Active yeast (2.5 g/l)	1.33	1.37	1.39	1.44	1.383
Active yeast (5.0 g/l)	1.36	1.41	1.43	1.49	1.423
Mean (A)	1.340	1.381	1.397	1.456	
L. SD at 5 %	A:	0.022	B:	0.024	AB: N. S.
Second season					
Vitamins and active yeast treatments (B)	Compost levels (ton/fed.) (A)				
	0.0	1.25	2.50	3.75	Mean (B)
Control	1.28	1.30	1.34	1.36	1.320
Vit. E at 10 ppm	1.36	1.38	1.40	1.41	1.388
Vit. E at 20 ppm	1.34	1.36	1.39	1.41	1.375
Vit. B1 at 25 ppm	1.35	1.37	1.39	1.42	1.383
Vit. B1 at 50 ppm	1.33	1.35	1.38	1.40	1.365
Vit. C at 50 ppm	1.36	1.39	1.41	1.42	1.395
Vit. C at 100 ppm	1.31	1.33	1.37	1.39	1.350
Active yeast (2.5 g/l)	1.32	1.34	1.37	1.40	1.358
Active yeast (5.0 g/l)	1.37	1.39	1.42	1.43	1.403
Mean (A)	1.336	1.357	1.386	1.404	
L. SD at 5 %	A:	0.022	B:	0.017	AB: N. S.

Vit. E. = α-tocopherol Vit. B1.= Thiamine Vit. C.= Ascorbic acid

Nitrogen, phosphorus and potassium %

Data presented in Tables (8, 9 and 10) showed that the increase in N, P and K % in the dry leaves of guar plants was parallel to the increase in compost level. The high level of compost (3.75 ton/fed.) followed by medium level (1.25 ton/fed.) significantly increased N, P and K % in both seasons in comparison with those of control treatment.

The promotive effect of organic manure was found by many authors, namely, [25] on guar; [44] on soybean; [45] on *Pisum sativum*; [36] on *Origanium syriacum*; [46] on rosemary; [47] on *Eclipta alba*; and [48] on roselle plants.

Concerning the treatments of vitamins and active yeast, data presented in Tables (8, 9 and 10) clearly revealed that all used treatments considerably increased N, P and K % in the dry levels of guar plants in comparison with control plants during both seasons. Active yeast at high level 5 g/l. followed by ascorbic acid at low concentration (50 ppm) then α-tocopherol at low concentration (10 ppm) gave the highest percentages of N, P and K with non-significant differences among themselves in case of P and K %. The treatment of vit. B_1 (25 ppm) gave the second order in this concern.

Many researchers came to similar results that active yeast augmented NPK % in the leaves of different plants such as coriander [49]; [26]. Lemongrass [50]. *Phaseolus vulgaris* [51] and [52]. *Vicia faba* [38]. The role of vit. C and vit. E in promoting NPK % was also, reported by [53] on sweet pepper and [54] on eggplant. Regarding the effect of vit. C, [55] on black cumin; [56] on tomato and [57] on caraway plants concerning the effect of vit. E. Moreover, [58] on tomato; [43] on syngonium and [59] on snap bean found that spraying plants with vit. B_1 increased N, P and K total uptake by plant.

The interaction between the two main factors (A×B) was significant for N and P % in both seasons as shown in data presented in Tables (8, 9 and 10). The highest N and P % was obtained due to compost (3.75 ton/fed.) in combination with active yeast (5 g/l.) followed by vitamin C and E, each at low concentration.

Similar results were obtained by [60] on dill; [61] and [62] on faba bean and [63] on pea, concerning the effect of interaction treatment between organic manures and active. However, [64] on caraway and [65] on black cumin concluded that the highest contents of NPK were obtained in combination treatment of compost with ascorbic acid.

Protein (%)

Data presented in table (11) showed that the increase in protein % was due to the increase in compost level. All treatments of compost significantly increased protein % in the dry seeds of guar in both seasons in comparison with those of control. Moreover the best treatment which produced the highest values of protein content % was compost at 3.75 ton/fed. The promotive effect of organic manure was found by [24] and [25] on guar; [66] on pigeon pea; [67] on soybean and [48] on roselle plant.

Table 11: Effect of compost, some vitamins and active yeast treatments on protein (%) of *Cyamopsis tetragonoloba* seeds during 2010 and 2011 seasons

First season					
Vitamins and active yeast treatments (B)	**Compost levels (ton/fed.) (A)**				
	0.0	**1.25**	**2.50**	**3.75**	**Mean (B)**
Control	15.1	15.6	15.9	16.1	15.68
Vit. E at 10 ppm	16.1	16.6	16.9	17.1	16.68
Vit. E at 20 ppm	15.4	16.0	16.2	16.7	16.08
Vit. B1 at 25 ppm	15.6	16.2	16.3	16.9	16.25
Vit. B1 at 50 ppm	15.3	15.9	15.9	16.5	15.90
Vit. C at 50 ppm	15.9	16.5	16.6	16.7	16.43
Vit. C at 100 ppm	15.2	15.7	15.9	16.3	15.78
Active yeast (2.5 g/l)	15.2	15.8	15.9	16.4	15.83
Active yeast (5.0 g/l)	16.4	16.9	17.4	17.6	17.08
Mean (A)	15.58	16.13	16.33	16.70	
L. SD at 5 %	A:	0.35	B: 0.09	AB:	N. S.
Second season					
Vitamins and active yeast treatments (B)	Compost levels (ton/fed.) (A)				
	0.0	1.25	2.50	3.75	Mean (B)
Control	15.2	15.5	15.8	16.2	15.68
Vit. E at 10 ppm	16.3	16.8	16.9	17.5	16.88
Vit. E at 20 ppm	15.4	16.2	16.3	16.7	16.15
Vit. B1 at 25 ppm	15.6	16.2	16.4	16.8	16.25
Vit. B1 at 50 ppm	15.4	16.0	16.2	16.6	16.05
Vit. C at 50 ppm	15.9	16.5	16.6	17.2	16.55
Vit. C at 100 ppm	15.2	15.8	15.9	16.4	15.83
Active yeast (2.5 g/l)	15.1	16.0	16.1	16.4	15.90
Active yeast (5.0 g/l)	16.7	17.3	17.5	17.9	17.35
Mean (A)	15.64	16.26	16.41	16.86	
L. SD at 5 %	A:	0.40	B: 0.12	AB:	N. S.

Vit. E. = α-tocopherol Vit. B1.= Thiamine Vit. C.= Ascorbic acid

Data presented in table (11) indicated that each of the eight treatments were positively and significantly effective on promoting protein % in the dry seeds of guar in the two seasons, over those of control. The best results were obtained due to the use of active yeast (5 g/l.) followed by vit. E at 10 ppm then vit. C at 50 ppm with significant differences between such three treatments in their capability in increasing the seeds percentage of protein. Similar results were obtained by [51] and [39] on *Phaseolus vulgaris*; [42] on *Vicia faba* and [40] on sugar beet, concerning the effect of active yeast. However, [68] on snap beans reported that vit. E had simulative effect on protein content. Also, [41] on *Vicia faba*; [69] on *Saccharum* spp and [70] on *Pisum sativum* concluded that application of vit. C increased total protein in the seeds.

The interaction between compost, active yeast and vitamins treatments was not significant for protein % during both seasons as shown in table (11).

CONCLUSION

From the obtained results in this work, it could be recommended to supply *Cyamopsis tetragonoloba* Taub. plants with compost at 3.75 ton/fed., and spraying plants with either active yeast at 5 g/l. or ascorbic acid (vit. C) at 50 ppm to improve guaran production., as well as, enhancing the values of some chemical constituents of guar plant under investigation condition.

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