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THE EFFECT OF AMINO ACIDS GLYCINE IN SOME GROWTH AND YIELD INDICATORS OF *VIGNA SINESIS* PLANT

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Abstract

A field study of the 2016-2017 growth season was carried out in the Botanical Garden of Department of Biology, College of Education for Pure Science, Ibn Al-Haitham, University of Baghdad to study the effect of the glycine amino acid (0, 5, 10, 15) mg. L^{-1} in the growth and yield of *Vigna sinesis* plant. The results show that the glycine acid act on increasing plant height, the number of leaf, chlorophyll a, chlorophyll b, the number of pods and weight of one pod.

Key words : Vigna sinensis, amino acids glycine, plant height, pods.

Introduction

The *Vigna sinesis* is important crops belongs to the Papillionaceae family and it is considered one of the oldest crops that man has grown as a source of food and believes it was used from the Stone Age. There were many speculations about its origin, some of researchers believed that Asia was the original habitat of *Vigna sinesis* and the other researchers believed that *Vigna sinesis* have originated in Asia and that China and Ethiopia are the secondary centres for their emergence. The mature seed and green pods is used in human nutrition and it has high nutritional quality (Townsend and Guest, 1974).

The *Vigna sinesis* is also grown in some countries for the purpose of using animal feed, cover crop or green manure. Seeds of *Vigna sinesis* contain a proportion of the protein ranges from 19-26% and varieties contain a high percentage of thiamine but the *Vigna sinesis* as like the rest of the other legumes crops, decreases the proportion of amino acids containing sulphur, which are methionine and cysteine. The proportion of these amino acids ranges from 0.35-0.90% in most varieties (Ali *et al.*, 1990).

Glycine is the simplest amino acid in organisms and it is organic compound molecular weight formula NH_2CH_2COOH 75.07 gm.mol^{-1}. Its chemical name is 2-amino ethanoic acid as well as it is the smallest amino acid of the 20 amino acids in the protein and has important physiological roles in plant as it activates photosynthesis (Sharaf *et al.*, 2009). It contributes to the synthesis of Glutathione, which is an antioxidant resulting from environmental stress conditions (Soni *et al.*, 1982). It also helps increase plant tolerance to stress of the contaminants (Sun *et al.*, 2010), activate the formation of chlorophyll (Hendry and Stobart, 1977), chelating for nutritive elements (Lester *et al.*, 2005) in addition to has a role in improving the pollination process and the holding of fruits (Bhunia and Mondal, 2012). The current study is aimed to find out the effect of foliar application by glycine acid with different concentrations in the growth and the yield of *Vigna sinesis*.

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Materials and Methods

A field experiment was conducted in the botanical garden of the Department of Biology, College of Education for Pure Science (Ibn Al-Haitham), University of Baghdad for the 2016-2017 growth season. The soil was preparing for ploughing and levelling of the soil and then planting the seeds of *Vigna sinesis* (local variety) in the form of gore on the date of 15/3/2016 in accordance with Randomized complete Block Design (R.C.B.D) (R.C.B.D) (Al-Sahoeke and Wahib, 1990) and three replicates per treated in addition to treating of control.

The glycine material was prepared for the original solution (Stock) and it was prepared by using concentrations in the experiment, which is 5, 10, 15 and sprayed the plants in the 4-6 leaves stage in the early morning by using a handy sprinkler with a little addition of liquid cleaner until full wet (Brayan, 1999).

Then measured the following characteristics :

1. Plant height (cm): the height of the plants were calculated by using the ruler and measured from the surface of the soil to the end of the main branch of three plants of each treatment.
2. Number of leaves: the number of leaves for the main branch has been calculated for three plants of each treatment.
3. Number of branches: the number of branches per plant and three plants per treatment has been calculated.
4. Chlorophyll concentration A, B and total ($mg.gm^{-1}$): The concentration of chlorophyll a, b and total were estimated according to (Lichtenthaler, 1987; Mac-Kinney, 1941) and by using the following equations:

Chlorophyll a ($mg.gm^{-1}$)= 1.25 × (D663)-2.79 × (D645)× $\frac{V}{W \times 1000}$

Chlorophyll b ($mg.gm^{-1}$)= 1.25×(D663)-2.79 × (D645) × $\frac{V}{W \times 1000}$

Chlorophyll total ($mg.gm^{-1}$)= 20.2 × (D645) + 8.02 × (D663) × $\frac{V}{W \times 1000}$

Where,

D = Optical density

D663 = Optical density to the wave length 663 nm

D645 = Optical density to the wave length 645 nm

V = Total volume of extracted (50 ml)

W = Weight of foliar tissue (1 gm)

5. Absolute Growth Rate (AGR) $gm.day^{-1}$: according to the following equations :

AGR = $\frac{W - W}{T - T}$ (Gardver *et al*., 1985)

Where,

W_1 = Vegetative dry weight at first period or harvesting

W_2 = Vegetative dry weight at second period or harvesting

T_1 = Time of first period or harvesting

T_2 = Time of second period or harvesting

6. Number of pods ($pods.plant^{-1}$): The number of pods has been calculated for a rate of three plants per treatment.
7. The weight of pods (g): The weight of the pod was calculated to average three plants of each treatment by using a sensitive balance.

Statistical analysis

The results analysis was conducted according to the user design (RCBD) and by three duplicates and the means were compared to the L.S.D test (SAS, 2012).

Results and Discussion

The results of table 1 indicate that the glycine amino acid has a significant effect on plant height, number of branches and number of leaves, and that each have increased significantly at the concentration of 15 ppm glycine amino acid. This concentration was given the highest plant height of 75.00 cm and the highest number of leaves 11.66 and the highest number of branches 3.00% compared to control treatment with an increase of 134.37%, 75.07% and 50.00%, respectively.

The results of the table 2 shows that the concentration of chlorophyll a and b have increased significantly after the treatment of the glycine amino acid. The concentration of the 15 ppm was given the highest chlorophyll a and b concentration rate of 1.0680 and 0.553 $mg.gm^{-1}$ tissue at respectively compared with the control treatment that gave less chlorophyll a concentration rate of 0.74200 and 0.332 $mg.gm^{-1}$ tissue at respectively with an increase preparation of 43.93% and 66.56%, respectively.

The results of table 3 indicate that the absolute growth rate was not significantly affected when the plants treated by differencing concentrations of glycine amino acid. The results of the table also showed that the number of pods and the weight of the pod have increased significantly when treating the plant with glycine. The concentration of 15 ppm has given the highest rate to the number of pods reached to 5.66 cm. $plant^{-1}$ compared with control

Table 1 : The effect of glycine on plant height (cm), number of leaves and branches.

Treatment	Plant height	Number of leaves	Number of branches
0	32.00	6.66	2.00
5	73.33	10.00	2.33
10	50.00	11.00	2.000
15	75.00	11.66	3.00
L.S.D	1.63 N.S	1.087	0.076 N.S

Table 2 : The effect of glycine on chlorophyll a, chlorophyll b and total chlorophyll content ($mg.gm^{-1}$).

Concentrations	Chlorophyll a	Chlorophyll b	Total
0	0.74200	0.332	1.224
5	0.93800	0.4193	1.545
10	0.884	0.367	1.427
15	1.0680	0.553	1.8466
L.S.D	0.1545	0.220	N.S

Table 3 : The effect of glycine on absolute growth rate (gm.day^{-1}), crop growth rate (gm.cm^{-1}.day^{-1}), weight of pod and number of pods.

Concentrations	Absolute growth rate	Crop growth rate	Number of pods	Weight of pod
0	0.142	0.67	2.00	0.460
5	0.477	0.072	3.66	1.22
10	0.187	0.432	3.33	0.596
15	0.66	0.165	5.66	1.32
L.S.D	N.S	0.290	0.203	N.S

treatment with an increase preparation of 183.00%. As well as the concentration of 15 ppm treatment has given the highest rate of the weight of pod was 1.32 g compared with the control treatment that gave the lowest rate of pod weight of 0.460 gm and an increase preparation of 12.83%.

The results of the table also showed that the rate of growth of the crop and the number of pods have increased significantly when treating the plant with glycine. The concentration 15 ppm has been given higher crop growth rate of 0.165 gm.cm^2.day^{-1} with an increase preparation of 146.26%. The concentration of 15 ppm of glycine amino acid has given the highest rate of the number of pods 5.66 pod.plant^{-1} compared with the control treatment that gave the lowest rate to the number of pods 2.00 pod.plant^{-1} with an increase preparation of 182%. May be that is because the glycine activates the photosynthesis process and contributes to the synthesis of the glutathione, which is the antioxidant that resulting on environmental stress conditions. It also helps increase plant tolerance for pollutant stress, inhibit formation of chlorophyll, chelating for nutritive elements, and has a role in improving the pollination process and the holding of fruit. As well as amino acids, including glycine, are an important nitrogen source in the synthesis of proteins and enzymes in addition to featuring amino acid is easily absorbed by the plant due to its small molecular weight and its role in influencing cellular membranes permeability (Sharaf *et al*., 2009; Sun *et al*., 2010; Hendry and Stobart, 1977; Rai, 2002; Jerry and Al-Mayahi, 2015; Khattab *et al*., 2016).

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