

Effect of Irrigation and Amino acid Application Rates in Growth and Yield of Toroh (*Cucumis melo* var. *flexuosus*)

Abdelmoneim A. Elgubshawi^{1,2} and Hussin Attia²

1- College of agricultural studies, SUST, SUDN.

2- Soil and fertilizers dep. Plant wealth Directorate, Bahrain kingdom

Correspondence : aelgubshawi@mun.gov.bh

Abstract

*Experiments were carried out in the Experimental Farm; Budaiya, kingdom of Bahrain, to investigate the growth and yield of snake cucumber (*Cucumis melo* var. *flexuosus*), locally known as Toroh (local variety) in relation to irrigation and foliar application of amino acid rates.*

Traditionally, vegetables cultivation practice throughout the country with low production contributed to 14% of demand. To improve production, several techniques adopted of which drip irrigation, chemical fertilizers, soil conditioners and plant growth regulators.

In this, regard Irrigation at rates of 5L/hr for 10 min (1, 2 and 3 times/week frequencies) and amino acid foliar application of 0.00 ml/L (Null), 500 ml/L and 750ml/L were investigated.

Water quality, soil properties plant height, fresh weight, fresh root weight, and yield count and yield weight measured.

The plant growth parameters and yield are significantly responded to irrigation rates and to less degree to amino acid (biostimulant). The interaction between treatments was significant at $P < 0.05$. The application of amino acid at rate of 750 mg L⁻¹ is relatively better but statistically insignificant. Such other parameters, Soil salinity effect, source of amino acid and application rates and time should be considered.

Introduction

Worldwide agricultural sector is evolving fast, become an industry of great importance. Beside the goal of maximizing profit, now a day agriculture has its politic, economic, stability and security of states.

Depending only on technology, fertilizers and pesticides is hardly to achieve these goals and by the end food security. Moreover, despite of management, use of bioenergetics and biochemical aspects, the plant production worldwide is very crucial.

At the end no profitability will achieved without better quality and better yielding

In Bahrain, low plant quality and productivity are due to low water quality, poor soil, poor managements and low skills. TO develop the agricultural sector in Bahrain a continuous improvements is required, as well as encourage and support research across the public and private sectors.

Traditionally vegetables cultivation is practiced throughout the country that are shallow-rooted, yield and quality are suffer of being subjected to abiotic stresses. Stress can begin in as little as few days after irrigation in such crops.

As it is known, watering management is essential for vegetables production; Water stress may occurs early in the crop's development delay maturity and reduce yield or occurs late may reduce the quality.(<http://www.irrometer.com/pdf/research/ANR-1169.pdf>)

Namich, (2007) explain that exposing plants to water stress adversely affect plant growth and productivity, and in other words; Osborne et al., (2002) added that water deficiency affects physiological and chemical processes in plants.

However, farmers should know about their soils water availability, soil types and soil water capacity, plant water requirement and plant life stage. There is a critical need to balance water availability, water requirements and water consumption. Known so far, irrigation rates depend on soil type and high application rates of water may cause water loss as well as fertilizers.

Drip irrigation system is one of the technique is adopted in Bahrain for water conservation and to compete salt effect. To promote plant production, fertilizers and soil conditioners as well amino acid become (biostimulant) widely used as a means to increase yield and overall quality of crops.

Amino acids also known as Plant hormones, phytohormones and plant growth substances and are fundamental ingredients in the process of Protein Synthesis. Many studies have proved that Amino Acids directly or indirectly influence the physiological activities and yield of the plant (Mohamed, 2006).

According to Davis (1982), amino acids act as buffers within the plant and as stimulator for plant cell growth (Rai, 2002). Amino acids have a significant role to mitigate stress problems and positive effects on root growth and yield (Azimi et al., 2013).

Marschner, (1995) added amino acid facilitate absorption and transport of micronutrient inside plant through chelating and influencing the cells membrane permeability. With same context other researcher such as A, M. A. El-Said. and Mahdy, A.Y. (2016), Akladious and Abbas (2013), Abo Sadera et al., (2010) and El-Din and Abd El-Wahed (2005) stated; its application increase fresh and dry weight, plant height, number of flower of plant through its role in metabolism and protein assimilation. While R, A.M. Abdel-Mawgoud; et.al. (2011) found no significant effect on growth parameters and low concentration of amino acid may improve plant growth. Moreover, others linked the effect of amino acids with soil salinity and irrigation water

The objective of this study is to figure out the optimum irrigation rate as well as the application of biostimulants (amino acids) effect on Toroh (cucumber) plant yield.

Material and methods

I- Experimental site

experiments were carried out during two summer seasons 19/2020 at the Experimental Farm Budaiya, Bahrain kingdom, to investigate the performance and yield of snake cucumber, locally known as Toroh in relation to irrigation rates 0.5gal/hr. (1,2and 3 times/week) and foliar application with amino acid “commercial name (concord). Seeds were offered from local farmers.

II- Characteristics of Budaiya irrigation water

The following table demonstrate the brackish water characteristics used in Budaiya

Table 1: Brackish water characteristics used for irrigation in Budaiya

Location	pH	EC	TDS	Boron	Soluble anions (meq/l)									SAR
		uS/cm	ppm	Meq/l	Ca	Mg	Na	K	CEC	CO ₃	HCO ₃	Cl	SO ₄	
Budaiya	7.2	3620	2317	0.5	11	6.9	17.6	0.7	36.2	0	3	24	9.2	5.9

III- Soil analysis

Soil samples of experimental site were randomly collected from active depths of 0 to 60 cm using auger to determine some physical and chemical properties of the soil according to Jackson (1973), Chapman and Pratt (1978) and Klute (1986) . Table 2 showed the average of soil parameter in active depth.

Table3: Average of soil parameters in active depth, Bodayia research station, Bahrain kingdom.

Texture			Class	H.C	SP	PH	EC	soluble anions and cations (meq/l)							CaCO ₃	CaSO ₄	OM	CEC
Sand	Silt	Clay						HCO ₃	Cl	SO ₄	Ca	Mg	Na	K				
87.7	5.4	6.9	ls	34.2	22	7.5	13.85	2.93	10	43.6	34.5	6.8	14.3	0.85	17	11.8	0.47	1.5

IV- Field preparation and treatments

Field was prepared before transplanting with basic organic and mineral fertilizers addition. At transplanting, the field had irrigated. Recommended fertilizers packages and other cultural practices applied.

The experiments included 9 treatments which were all possible combinations of irrigation rate and doses of amino acid (natural substances).

Traditionally farmers irrigate into daily high rates, to reduce water consumption as well as to maintain production 1,2 and 3 times per week at a rate of 0.5gal/hr were examined.

Plants treated with amino acid (Spanish product from local market) at 0.00 ml/L (Null), 500 ml/L and 750ml/L. Untreated plants taken as control. The treatments sprayed three times; the first one was 25 days after sowing and repeated each 15 days. (Table 3)

Table 3 Nursery, field and treatments applications plan

Phase I	
1. Nursery	
- seeding on	2 March
- Transplanting	22 March
2 - Addition of base mineral fertilizer /transplanting/ at rate	10gm/plant
- N P K supplement	once/ week
- One month after transplanting addition of	
- 5gm N, 46%	
- 5gm KO 48%	
.....	
Phase II	
1- Irrigation	
- Daily.....	1/3hr
- Every 2days.....	1/3hr
- Weekly.....	1/3hr
- Discharge rate.....	0.5gal/hr
2- Base treatment	
- Chicken manure	2 kg/m ²
3- Treatment	
- amino acid at 0.00 ml/L (Null), 500 ml/L and 750ml/L ng	
4- Toroh (cucumber) variety	(Local)
5- Replication	3times

V- Measurements

Four growth characters of randomly five plants selected of each treatment, that are Plant height, fresh weight/plant, roots mass weight/plant and yield.

The differences among the means of different treatments tested using the Turkey test at probability 5%. Statistical analysis done using the SPSS package program, v-24.

Results and discussion

I- Irrigation Rates

Generally known water affects plant internode elongation, leaf expansion as well as tissue water content through its effect on cell expansion and pressure. As well as water, stress (high frequency and low rate) will reduce plant growth.

The result showed that; height, fresh weight/plant, roots mass weight/plant and yield affected negatively by water stress (1Day/week irrigation). There was a significant difference between 1Day /week irrigation and 2Days and 3Day/ week.

Our finding were agreed with Delfine et al.,(2002), Mujtaba et al. (2007), Maria et al. (2008) and Mahamed et al. (2011) as they studied the effect of water stress in plants

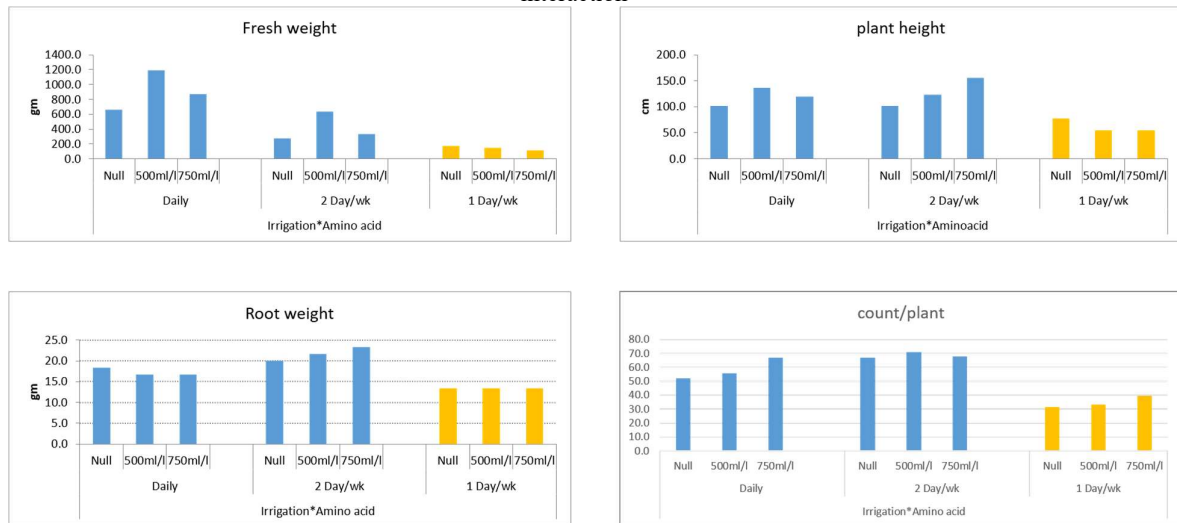
II- Amino acid application

In other hand, foliar application of simulative biostimulant (amino acids) rates were insignificantly affected growth parameters. In a time, many studies have proven the importance of these substances and their positive impact on plants such as, Barnett et al. (1990), Mohamed (2006) and Zaki et al. (2007). Furthermore, others studied the response of some certain plants to amino acids, including Nagodawithana, (1991) and Al-Thabet (2006) in wheat, and Hammad (2008) in pea.

In contrary Abdel-Mawgoud; et.al. (2011) found no significant effect on growth parameters and he suggested low concentration of amino acid might improve plant growth. Kamaryam (2016) also explained that the increase of salts in the soil reduces the effect of amino acids, and others studying different plants like, El-Lethy et al. (2013), Dawood et al. (2014) Sadak et al. (2015). Al-Busaïdi et al. (2009); they believed that the reason for the decrease in the effect of amino acids was due to the imbalance in mineral uptake and/or increased respiration rate due to an increase in salts. In addition, others noticed the effect of amino acids on some growth factors but not others

Management of amino acids doses and adjustment, their addition time and biotic or abiotic stresses are required The interaction of the irrigation and amino acid rates resulted into significant different. The following Figure display the result.

Fig1: Plant fresh weight, height, root weight and yield count as affected by irrigation and amino acid rates interaction



* Means with different colors are significant different at P<0.05

As a conclusion, the result is promising as we are looking for raising production and productivity while preserving the already scarce resources, especially water. Much more research to achieve our ultimate goal and the food security is encouraged.

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