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GROWTH, DEVELOPMENT AND YIELD OF CUCUMBER AS AFFECTED BY IRRIGATION FREQUENCY AND MINERAL FERTILIZATION VERSUS ORGANIC MANURE

Mohamed H. Dokashi and Mohamed F. Mohamed

Department of Horticulture, Faculty of Agriculture, Assiut University

ABSTRACT :

The production of cucumber (*Cucumis sativus* L.) cv. 'Beta alpha' was investigated under the conditions of amended irrigation frequency and fertilization (mineral vs. organic) during the summer season of 2002 and 2003 in Assiut. The irrigation was at 5, 8 or 11day intervals that, on average, corresponded to 15%, 27% and 35% depletion of the soil water content relative to the field capacity, respectively. The application of NPK mineral fertilizers were at the recommended rates [200 kg ammonium nitrate (33.5% N), 300 kg superphosphate (15.5% P_2O_5) and 100 kg potassium sulfate (50% K_2O) per feddan (4200 m^2)]. The different manure sources were applied to provide available N quantity equal to or lower than the applied mineral N. The assessments of the immature fruit yield and its main components (number of branches, sex ratio, the fruit-set and weight), consistently, showed a significantly sharp decline with prolonged irrigation intervals than 5 days in the present study. The utilization of 3 tons/feddan chicken manure was comparable to the application of the mineral fertilization concerning the growth and developmental traits that constitute main yield components under 5-day irrigation intervals. The chicken manure gave the least deviation in the fruit characteristics including fruit length, diameter, shape and weight comparing with the mineral fertilization. The total yield was not affected or only marginally reduced by replacing the mineral fertilizers with chicken manure. It is concluded that 3 tons/feddan chicken manuring may be efficiently utilized as far as the organic production of cucumber is concerned providing that an adequate soil moisture is maintained during the plant growth and development.

INTRODUCTION:

Cucumber (*Cucumis sativus* L.) belongs to Cucurbitaceae and it is one of the economically most important vegetable crop in this family. Cucumber is grown for its immature fruits. The fruit yield of this species is directed by several main growth, development and fruit component traits (Hassan, 1993) including stem length, number of lateral branches, flower sex ratio and fruit-set. These yield component traits are genetically controlled but are greatly affected by prevailing climatic conditions and some main cultural practices related to the available soil moisture and amount of nutrient elements (Hassan, 1991). Therefore, management of irrigation and mineral fertilization, especially nitrogen, have long been a subject of interest to maximize the cucumber fruit yield (Matsuzaki and Hayase, 1963; Cselotel, 1965; Cardoza *et al*., 1979; Csermi *et al*., 1990; El-Gindy *et al*., 1991; El-Fiki *et al*., 1993 and Gazal, 1995).

Mineral fertilizers have played an important role in crop production over the last century where they constituted one of the main

four production technologies of the green revolution. However, current interests in the environmental and human health issues and in the sustainable agriculture oriented development are not in favor of intensive chemical-dependent crop production systems (Abdel-Monem *et al.*, 1997; El-Nawawy, 1997; Saber, 1997). Bio-organic production, therefore, has received a renewed attention especially for production of vegetable crops and in particular for exportation (Abdel-Naem, 2002; Shalaby, 2002; Tartoura and El-Saei, 2001 and 2002). There are several sources of manure that are locally available in varying levels including farmyard and poultry ones but little information is reported on their efficiency in production of cucumber (Sadek, 2000). The present investigation, therefore, was implemented to assess the growth, development, yield and some fruit characteristics of the cucumber cv. Beta alpha as affected by irrigation frequency in combination with mineral versus manure fertilization application.

MATERIALS AND METHODS:

The present study was conducted during 2002 and 2003 summer seasons in the Agricultural Experimental Station, Faculty of Agriculture, Assiut University. Seeds of 'Beta alpha' cucumber (*Cucumis sativus* L.) were planted on March, 5 in both years. The seed planting was spaced 30 cm apart on the northern side of 90 cm wide ridges. The physical and chemical characteristics of the soil at the experimental site are presented in Table (1).

Table (1): Physical and chemical characteristics of the soil of the experimental site at the Experimental Station, Faculty of Agriculture, Assiut University.

Physical properties:	
Mechanical analysis	
Sand	**18.7**
Silt	**34.8**
Clay	**46.4**
Texture	**Clay**
Saturation	**60.0**
Field capacity	**44.0**
Wilting point	**21.0**
Chemical properties:	
PH	**7.6**
Organic matter %	**2.0**
N %	**0.1**
P ppm	**11.0**
K meq/100 g soil	**0.36**
Ca meq/100 g soil	**0.5**
Mg meq/100 g soil	**0.3**
Na meq/100 g soil	**0.57**
B ppm	**0.5**

The experiment was arranged according to strip-plot design. The horizontal plots were assigned to three irrigation treatments while the vertical ones were for fertilization treatments. The irrigation treatments were the watering at 5, 8 or 11 day intervals. The soil samples taken at depth of 30 to 40 cm before irrigation indicated, on average, that the soil water depletion relative to the field capacity were 15 %, 27% and 35% for the irrigation at 5, 8 and 11 day intervals, respectively. The application of mineral NPK fertilizers were with amounts in the range of the recommended rates (Hassan, 1991; Gazal, 1995). Mineral N was applied using

200 kg./feddan ammonium nitrate (33.5% N). Phosphorus was obtained utilizing 300 kg./feddan superphosphate (15.5% P_2O_5) and Potassium was added in form of potassium sulfate (50% K_2O, 100 kg./feddan). The analytical properties of the different manure sources are shown in Table (2). Because the production of cucumber is affected largely by nitrogen application, the three manure sources were calculated to provide available N equal to or lower than the supplied amount of mineral N from the ammonium nitrate. Farmyard was applied at rate of 7 tons/feddan whereas the rabbit and chicken manure were used at rate of 3 tons/feddan. Accordingly, the amount used of chicken manure is potentially could provide the same quantity of N as the ammonium nitrate fertilizer but less P and K. All added manure sources could provide the same amount of P. However, farmyard and rabbit manure sources could provide less N than chicken manure. Farmyard manure could give more K than both the chicken and rabbit ones. Each irrigation (horizontal) treatment contained 8 ridges while each fertilization (vertical) treatment occupied 6 ridges. The ridge length was 3 m.

Irrigation was applied to all seedling of the experiment after emergence and subsequently the different irrigation intervals (5, 8 and 11 days) were implemented. Mineral P fertilizer was added during soil preparation. N fertilizer was applied at three equal doses; one after seedling emergence, the second about 2 weeks later, and the third at the plant flowering stage. All K fertilizer amount was applied at the early fruit setting stage. The three manure sources (farmyard, rabbit and chicken) were applied at two equal quantities; one during the soil preparation and the other about 2 weeks after seedling emergence. Data were recorded for the length of the main stem, the number of lateral branches, sex ratio (male : female flowers) and the percentage of fruit-set. Ten open flowers were labeled at random for ten plants in each treatment per replicate during early and the mid-season of fruit setting. The fruits developed from these flowers were harvested at the same chronological age (6 days) and used to determine the average fruit weight, length, diameter and shape index. The weight of the fruit crop allover the season was expressed as the total yield in tons per feddan.

All data were subjected to the analysis of variance relevant to the strip-plot design (Gomez and Gomez, 1984). The 'Least Significant Difference' (LSD) was calculated for the following comparisons: 1) means of two irrigation intervals averaged overall types of fertilizers, 2) means of two fertilizer types averaged overall irrigation intervals, 3) means of two irrigation intervals at the same fertilizer type and 4) means of two fertilizer types at the same irrigation interval. Emphasis was given to LSD type 3 and 4 when a significant interaction between irrigation intervals and the fertilizer types was detected.

Table (2): The main analytical properties for three manure sources (A) and the calculated applied NPK and pure organic matter (OM) by the different fertilizers (mineral and manure) in kg/feddan (B).

Fertilizer	Total OM	PH	EC ds/m	N%	P%	K%
		(A)				
Farmyard	38.4	7.23	4.45	0.75	0.53	0.62
Rabbit	40.6	7.21	4.38	1.76	1.20	1.09
Chicken	43.8	7.18	4.31	2.25	1.21	0.75
	Pure OM	(B)				
Mineral	-	-	-	67.0	46.5	50.0
Farmyard	26.9	-	-	52.5	37.1	43.4

Rabbit	**12.2**	**-**	**-**	**52.8**	**36.0**	**32.7**
Chicken	**13.1**	**-**	**-**	**67.5**	**36.3**	**22.5**

RESULTS AND DISCUSSION :

Main stem length and number of lateral branches: There was a significant increase in the main stem length for the plants irrigated at 5 day intervals as compared with those irrigated at 8 day intervals in both 2002 and 2003 seasons (Table 3). This increase existed also with application of mineral or any0 of the three manure types. Except when the farmyard manure was utilized in 2002, the shortest main stem among the treatments of the irrigation intervals was found for those plants that were irrigated at 11 day intervals. Among the different manure types, the tallest main stem was developed by the plants received the chicken manure in both seasons when irrigated at 5 or 8 day intervals. When the irrigation interval was 11 days, there was no difference detected between rabbit and chicken manure in 2002. Otherwise, chicken manure produced plants with the tallest main stem when compared with rabbit or farmyard manure. Chicken manure was comparable to mineral fertilizer in both seasons regarding the main stem length when the irrigation frequency was 8 days. However, mineral fertilization produced plants with taller main stem than chicken manure when the irrigation frequency was increased (11 days) or decreased (5 days).

The number of branches increased with decreasing the irrigation intervals (Table 3). This occurred whether the means overall fertilization treatments were compared (in 2002) or means within each type of the fertilizer treatments were compared (in 2003). Obviously, the greatest number of branches was developed by the plants irrigated at 5 day intervals in both years. Fertilization with chicken manure produced plants having greater number of lateral branches than application of farmyard manure when comparing means averaged overall irrigation intervals (in 2002). This result was found also when the plants were irrigated at 5 or 11 day intervals in 2003. Comparable number of branches was obtained when the chicken or farmyard manure types were used in 2003 for the plants irrigated at 8 day intervals. No differences were detected when comparing means of fertilization with farmyard versus rabbit or chicken versus rabbit in both years. Mineral fertilization produced plants with larger number of branches than farmyard and rabbit in 2002, but comparable to chicken manure. Plants developed by mineral fertilization in 2003 had comparable number of lateral branches to those produced using rabbit manure or chicken manure when the irrigation interval was 5 or 11 days. Under irrigation intervals at 8 days only the chicken manure that produced plants having comparable number of branches to the application of mineral fertilizers.

The above mentioned results of plant growth parameters recorded on the main stem length and the number of the lateral branches suggest an existence of strong main effects due to each of the irrigation frequency and the fertilization source. Irrigation at 5 day intervals appeared to be the most credible among the other studied intervals of irrigation. The increase in the main stem length obtained by mineral fertilization comparing with organic ones was not shown in the number of the lateral branches, which is a main component for the immature cucumber fruit yield. Most likely the increased main stem length was due to increased length of the internodes. Therefore, application of manure both from chicken and rabbit (3 tons/feddan) sources could be considered as an efficient alternates to mineral fertilization utilized in the present study (200 kg/feddan ammonium nitrate 33.5%N, 300

super phosphate 15.5%P_2O_5 and 100 kg/feddan potassium sulphate 50%K_2O) as far as the studied parameters of the cucumber growth are concerned.

Sex expression and the fruit set percentage: Lower ratio of these characteristics indicating a preferential production of female flowers was obtained with the irrigation at 5 day intervals than with 8 day intervals when the plants were fertilized with farmyard or rabbit sources of manure in both seasons of this study (Table 4). There were no differences in the flower sex ratio whether the plants were irrigated at 5 or 8 day intervals with application of mineral fertilizers or chicken manure. Also the flower sex ratio showed no differences in the plants irrigated at 8 day intervals as compared to 11 day intervals when using mineral fertilizers or farmyard manure in 2002 and rabbit manure in 2003.

Among the different utilized manure types, the lowest flower sex ratio (preferential production of female flowers) was obtained by the application of the chicken manure when the plants were irrigated at 5 or 8 day intervals in both years. No difference was detected for the flower sex ratio when the farmyard or the rabbit manure types were applied and the plants were irrigated at 5 day intervals. The sex ratio increased showing a preferential production of male flowers when farmyard or the rabbit manure types was applied and the irrigation was at 8 day intervals. Nevertheless, no difference was detected between the use of either one of these two manure types. When used farmyard manure in 2002 and rabbit manure in 2003, prolonging the irrigation intervals to 11 day did not affect the sex ratio. The mineral fertilization significantly decreased the flower sex ratio when compared with the use of chicken manure for the plants irrigated at 5 in both years or 8 day intervals in 2002.

Table (3): Averages of the main stem length and the number of lateral branches of the cucumber Beta alpha as affected by irrigation intervals and fertilization with mineral versus different manure sources, Assiut, 2002 and 2003 summer season.

Fertilization Treatments	Irrigation Intervals (Days)				Irrigation Intervals (Days)			
	5	8	11	Mean	5	8	11	Mean
	2002							
Manure	Main stem length (cm)				Branches per plant (no.)			
Farmyard	177.4	150.1	145.7	157.7	5.9	5.1	3.7	4.9
Rabbit	190.7	168.3	159.2	172.7	6.2	5.0	3.9	5.0
Chicken	207.4	198.0	163.9	189.8	6.4	5.3	4.2	5.3
Mineral	224.5	199.1	174.2	199.3	6.8	5.8	4.3	5.6
Mean	200.0	178.9	160.8		6.3	5.3	4.0	
$LSD_{0.05}$								
Irrigation[1]	1.8				0.4			
Fertilization[2]	3.1				0.3			
Interaction[3]	4.9 (4.5)				ns[4]			
Manure	2003							
Farmyard	178.7	152.0	145.9	158.9	6.1	5.2	3.8	5.0
Rabbit	191.7	166.8	159.8	172.8	6.5	5.3	4.1	5.3
Chicken	210.5	200.3	165.9	192.2	6.7	5.6	4.5	5.6
Mineral	227.1	200.3	175.4	201.0	6.9	5.9	4.5	5.8
Mean	202.0	179.9	161.7		6.5	5.5	4.2	
$LSD_{0.05}$								
Irrigation[1]	2.2				0.3			
Fertilization[2]	3.2				0.2			
Interaction[3]	5.0 (5.0)				0.5 (0.4)			

[1] To compare means of irrigation intervals averaged overall (main effect) fertilization treatments.
[2] To compare means of fertilization treatments averaged overall (main effect) irrigation intervals.

[3] To compare means of irrigation intervals at the same fertilization treatment; between parenthesis is the value for use to compare means of fertilization treatments at the same irrigation interval.
[4] Nonsignificance.

Table (4) : Averages of flower sex ratio and the percentage of fruit-set for the cucumber 'Beta alpha' as affected by irrigation intervals and fertilization with mineral versus different manure sources, Assiut, 2002 and 2003 summer season.

Fertilization Treatments	Irrigation Intervals (Days)				Irrigation Intervals (Days)			
	5	8	11	Mean	5	8	11	Mean
	2002							
Manure	Flower sex ratio (male: female)				Fruit-set (%)			
Farmyard	3.33	3.90	4.10	3.78	91.7	90.4	79.7	87.3
Rabbit	3.12	3.70	3.94	3.59	94.5	90.8	82.9	89.4
Chicken	2.83	3.00	3.72	3.18	96.2	92.2	84.4	90.9
Mineral	2.48	2.67	3.52	2.89	97.1	94.1	87.1	92.8
Mean	2.94	3.32	3.82		94.9	91.9	83.5	
$LSD_{0.05}$								
Irrigation[1]	0.13				0.4			
Fertilization[2]	0.13				1.0			
Interaction[3]	0.23 (0.21)				1.2 (1.4)			
Manure	2003							
Farmyard	3.53	4.17	4.40	4.03	91.9	91.2	79.7	87.6
Rabbit	3.40	4.00	4.12	3.84	94.5	91.6	83.1	89.7
Chicken	3.07	2.92	3.98	3.32	96.3	92.6	85.2	91.4
Mineral	2.75	2.97	3.82	3.18	97.0	94.2	87.3	93.0
Mean	3.19	3.52	4.08		95.0	92.4	83.8	
$LSD_{0.05}$								
Irrigation[1]	0.24				0.5			
Fertilization[2]	0.13				0.9			
Interaction[3]	0.28 (0.20)				1.8 (1.7)			

[1] To compare means of irrigation intervals averaged overall (main effect) fertilization treatments.
[2] To compare means of fertilization treatments averaged overall (main effect) irrigation intervals.
[3] To compare means of irrigation intervals at the same fertilization treatment; between parenthesis is the value for use to compare means of fertilization treatments at the same irrigation interval.

Fruit-set percentage decreased with prolonging the irrigation intervals except in the second year when comparing the irrigation at 5 and 8 day intervals for the plants received the farmyard manure applications (Table 4). Excluding this exception, the highest percentage of the fruit-set was obtained when irrigation was at 5 day intervals in both years. With regard to the manure fertilization, the highest fruit-set percentage was obtained in both years using the chicken manure for the plants irrigated at 5 or 11 day intervals. No differences were detected among the different manure types for the plants irrigated at 8 day intervals in both years. The mineral fertilization and the chicken manure utilization were comparable when irrigation was at 5 day intervals. However, the mineral fertilization gave a percentage of fruit-set higher than all the manure types for the plants irrigated at 8 or 11 day intervals.

From the depiction of the results for the effect of the irrigation frequency and the mineral fertilization versus manuring on the sex expression and fruit setting tended to be largely conditioned by the influence of the main effects of these two factors. Irrigation at 5 day interval is recommended in combination with application of either the chicken manure or mineral fertilizers. Here, sex expression and fruit setting seemed to be more affected by N

than the stem growth and branch development as chicken manure became superior to the rabbit manure. Improved flower sex ratio and percentage of fruit set in the cucumber 'Beta-Alpha', accordingly, could be efficiently maintained using 3 tons/feddan chicken manure application as an alternate to the used mineral fertilizers.

Fruit characteristics (length, diameter, shape index and weight): Fruit length, diameter and shape index were mostly influenced by the main effect of both the irrigation frequency and the fertilization types (Table 5 and 6). The longest and thickest fruits were produced by the plants that were irrigated at 5 day intervals in both years. The fruit length seemed to be more affected by the irrigation frequency as the shape index (length/diameter) is clearly declined with prolonging the irrigation intervals. Among the different manuring treatments, the greatest values for the fruit length, diameter and shape index were obtained with the application of chicken manure. The fruits produced by the plants receiving the application of farmyard manure appeared to be the shortest, thinnest and with the least value for the shape index. Mineral fertilization produced fruits longer and thicker than those obtained by chicken manuring. The shape index was clearly greater when using mineral fertilization than applying chicken manure.

The fruit weight showed a clear decline as the irrigation intervals were prolonged in both years of this study (Table 6). The heaviest fruits were produced by the cucumber plants irrigated at 5 day intervals. The lightest fruits were harvested from plants irrigated at 11 day intervals, except in the manuring treatments of the chicken where no difference was found between irrigation at 8 and 11 day intervals. With regard to manure application, the fruit weight was greater with utilizing chicken manure than adding the farmyard manure in both years and whether the irrigation was at 5, 8 or 11 day intervals. Comparison between utilizing chicken and rabbit manure showed that they did not differ when the irrigation was at 5 day intervals in both years and at 8 day irrigation intervals in the second year. Mineral fertilization produced fruits of greater weight than the chicken manure, except at 8 day irrigation intervals in the second year.

The aforementioned results on fruit size, weight and shape tended mainly towards recommending irrigation at 5 day intervals. The chicken manure (3 ton/feddan) would be the most advisable manure among the studied ones to be used in cucumber production under the condition of this study. Plants during fruit development seemed to be in a need of more available N than during pre-flowering stage. Organic fertilization in cucumber production utilizing chicken manure seemed to give the least alteration among the other studied manure sources in fruit size, weight and shape when compared with the popularly used mineral fertilizers. In addition to N availability, K may play a role.

Table (5): Averages of fruit length and diameter for the cucumber 'Beta alpha' as affected by irrigation intervals and fertilization with mineral versus different manure sources, Assiut, 2002 and 2003 summer season.

Fertilization Treatments	Irrigation Intervals (Days)				Irrigation Intervals (Days)			
	5	8	11	Mean	5	8	11	Mean
	2002							
Manure	Fruit length (cm)				Fruit diameter (cm)			
Farmyard	10.9	9.5	6.7	9.1	2.9	2.7	2.3	2.6
Rabbit	12.1	10.1	7.5	9.9	3.1	2.9	2.5	2.8
Chicken	13.3	10.9	8.3	10.8	3.3	3.0	2.7	3.0
Mineral	14.3	12.5	9.7	12.2	3.5	3.3	2.9	3.2
Mean	12.7	10.7	8.1		3.2	3.0	2.6	
$LSD_{0.05}$								
Irrigation[1]	0.4				0.1			
Fertilization[2]	0.4				0.1			
Interaction[3]	ns[4]				ns			
Manure	2003							
Farmyard	11.0	9.6	6.9	9.2	2.9	2.8	2.4	2.7
Rabbit	12.6	9.6	8.0	10.1	3.2	2.8	2.6	2.8
Chicken	14.3	11.3	8.9	11.5	3.4	3.1	2.9	3.1
Mineral	14.8	12.8	10.3	12.7	3.5	3.3	3.0	3.3
Mean	13.2	10.8	8.5		3.2	3.0	2.7	
$LSD_{0.05}$								
Irrigation[1]	0.3				0.1			
Fertilization[2]	0.3				0.1			
Interaction[3]	ns				ns			

Table (6): Averages of fruit shape index and weight for the cucumber 'Beta alpha' as affected by irrigation intervals and fertilization with mineral versus different manure sources, Assiut, 2002 and 2003 summer season.

Fertilization Treatments	Irrigation Intervals (Days)				Irrigation Intervals (Days)			
	5	8	11	Mean	5	8	11	Mean
	2002							
Manure	Fruit shape index				Fruit weight (g)			
Farmyard	3.8	3.5	2.9	2.4	89.5	81.3	69.5	80.8
Rabbit	3.9	3.5	2.3	3.5	90.3	82.4	72.1	81.6
Chicken	4.0	3.6	3.1	3.6	92.4	85.3	76.9	84.9
Mineral	4.1	3.8	3.3	3.8	96.3	88.4	80.6	88.4
Mean	4.0	3.6	2.9		92.1	84.3	74.8	
$LSD_{0.05}$								
Irrigation[1]	0.1				0.9			
Fertilization[2]	0.1				1.7			
Interaction[3]	ns[4]				2.2 (2.5)			
Manure	2003							
Farmyard	3.8	3.4	2.9	3.4	89.4	82.6	70.4	80.3
Rabbit	3.9	3.4	3.1	3.5	90.3	83.2	72.8	82.1
Chicken	4.2	3.6	3.1	3.6	93.7	86.3	86.8	88.9
Mineral	4.2	3.9	3.4	3.8	97.2	88.9	81.2	89.1
Mean	4.0	3.6	3.1		92.7	85.3	77.8	
$LSD_{0.05}$								
Irrigation[1]	0.1				2.2			
Fertilization[2]	0.1				2.3			
Interaction[3]	ns				3.9 (3.7)			

[1] To compare means of irrigation intervals averaged overall (main effect) fertilization treatments.
[2] To compare means of fertilization treatments averaged overall (main effect) irrigation intervals.
[3] To compare means of irrigation intervals at the same fertilization treatment; between parenthesis is the value for use to compare means of fertilization treatments at the same irrigation interval.
[4] Nonsignificance.

Total fruit yield: There were significant decreases in the cucumber fruit yield with prolonging irrigation intervals (Table 7). The highest yield was produced by the plants irrigated at 5 day intervals in both years of the study. On average, the decreases when irrigating at 8 day intervals comparing with 5 day intervals were 15% and 16% in the first and the second year, respectively. Irrigation at 11 day intervals in comparison with 8 day intervals reduced the yield by 19% in 2002 and 16% in 2003. Frequency of irrigation that maintained the soil moisture close to the field capacity was reported to optimize the cucumber fruit yield of the cv. Beta Alpha (El-Gindy *et al*., 1991; Gazal, 1995). As shown by Mannini and Gallina (1987), the cucumber cv. Early Set produced the highest fruit yield that accompanied with increased number of fruits and average fruit weight when irrigated at 3 day intervals.

Cucumber received chicken manure produced the highest yield among the other sources of manure in both years when the irrigation was at 5 day intervals. In term of percentage, the yield produced by chicken manure exceeded the average yield obtained using rabbit and farmyard by 11% in 2002 and 8% in 2003. The crucial difference among the chicken, rabbit and farmyard was in the amount of N provided by the quantities applied of these manure sources (Table 2). There was no difference between the yield produced with application of mineral and chicken manure in 2002. The difference in 2003 between the mineral fertilization and the chicken manure, however, was marginally significant. This supports the importance of the supplied N amount during the flower and fruit development as suggested elsewhere above.

The comparisons between the yield produced by the three different manure types gave a different figure when the irrigation intervals were prolonged. In the most of the yield comparisons, the chicken manure did not give a significantly better yield. This possibly could be induced by the relative stress due to moisture shortage making it an influentially limiting factor. However, most yield comparisons for the mineral fertilization and the chicken manure were in favor of the former. Mineral fertilizers are readily soluble at the irrigation time and, therefore, the plants may get adequately more nutrient elements that reduced the adverse effects of the subsequent relatively prolonged irrigation (Borna, 1976).

In conclusion, the assessments of the immature fruit yield and its main components (number of branches, sex ratio and the fruit set and weight) for the 'Beit Alpha Hybrid' cucumber consistently suggested a crucial role for moisture availability. Irrigation is recommended at 5 day intervals in the present study. Among the different studied manure sources, the utilized amount of the chicken manure was mostly comparable with the recommended application of the mineral fertilization when considering the main yield components including number of lateral branches, fruit-set percentage and, to a large extent, the flower sex ratio. The chicken manure gave the least deviation in the fruit characteristics including fruit length, diameter, shape and weight comparing with the other manure sources relative to the mineral fertilization. The total yield, therefore, did not seriously reduced by replacing the mineral fertilizers with chicken manure comparing with the decrease occurred as a result of prolonging the irrigation intervals. As far as the sustainable agriculture development and the other environmental issues are concerned, 3 tons/feddan chicken manuring may be efficiently utilized in the cucumber production

providing that an adequate soil moisture (irrigation at 5 day intervals in this study) is maintained during the plant growth and development.

Table (7): Average total fruit yield for the cucumber 'Beta alpha' as affected by irrigation intervals and fertilization with mineral versus different manure sources, Assiut, 2002 and 2003 summer season.

Fertilization Treatments	Irrigation Intervals (Days)				Irrigation Intervals (Days)			
	5	8	11	Mean	5	8	11	Mean
	2002				2003			
Manure	Total fruit yield (ton/feddan)							
Farmyard	8.52	7.18	5.60	7.10	8.82	7.47	6.12	7.46
Rabbit	8.83	7.76	6.50	7.70	9.13	7.76	6.84	7.91
Chicken	9.70	7.97	6.33	8.00	9.77	8.27	6.63	8.22
Mineral	10.13	8.53	7.10	8.59	10.53	8.83	7.40	8.95
Mean	9.30	7.86	6.38		9.56	8.07	6.75	
$LSD_{0.05}$								
Irrigation[1]	0.33				0.32			
Fertilization[2]	0.34				0.52			
Interaction[3]	0.49 (0.46)				0.47 (0.59)			

[1] To compare means of irrigation intervals averaged overall (main effect) fertilization treatments.
[2] To compare means of fertilization treatments averaged overall (main effect) irrigation intervals.
[3] To compare means of irrigation intervals at the same fertilization treatment; between parenthesis is the value for use to compare means of fertilization treatments at the same irrigation interval.

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نمو ومحصول الخيار وتأثره بفترات الرى والتسميد المعدنى مقابل العضوى

محمد حمام زين العابدين الدقيشى ومحمد فؤاد محمد

قسم البساتين – كلية الزراعة – جامعة أسيوط

أجريت هذه الدراسة بمحطة البحوث الزراعية بكلية الزراعة جامعة أسيوط موسمى صيف ٢٠٠٢ ، ٢٠٠٣ حيث استخدم الخيار صنف بيتا ألفا بغرض استبيان إمكانية الاعتماد على الأسمدة العضوية ودور فترات الرى فى إنتاج الخيار . كانت معاملات الرى على فترات ٥، ٨، ١١ يوماً بما يقابل فى المتوسط ١٥%، ٢٧%، ٣٥% على التوالى نقص فى مستوى الرطوبة الأرضية بالنسبة للسعة الحقلية ، وكانت معاملات التسميد هى مصادر مختلفة للسماد العضوى (مخلفات حيوانات المزرعة والأرانب والدجاج) مقارنة بالتسميد الكيماوى (المعدنى). أضيف السماد الكيماوى فى حدود الكميات الموصى بها، فقد أستخدم ٢٠٠ كجم/فدان نترات أمونيوم (٣٣.٥%ن)، ٣٠٠ كجم/فدان سوبر فوسفات أحادى (١٥.٥% بو٢أ٥) ، ١٠٠ كجم سلفات بوتاسيوم (٥٠% بو٢أ). أضيف السماد الفوسفاتى كله أثناء أعداد الأرض للزراعة أما السماد النتراتى فقد أضيف على ثلاث جرعات متساوية الأولى بعد الإنبات والخف والثانية بعدها بأسبوعين والثالثة عند بداية الأزهار أما السماد البوتاسى فأضيف كله مع بداية عقد الثمار . تمت إضافة الأسمدة العضوية لكى تعطى نيتروجين يساوى أو يقل عما يعطيه السماد الكيماوى. أضيفت الأسمدة العضوية على مرتين الأولى أثناء إعداد الأرض للزراعة والثانية بعد الإنبات بأسبوعين . أجريت التجربة فى تصميم (strip-plot) الوحدات الشريطية، وكانت الوحدات المستعرضة لمعاملات الرى والوحدات العمودية لمعاملات التسميد.

وكانت كل معاملة رى عبارة عن ٨ خطوط بالمكررة ومعاملة التسميد ٦ خطوط بالمكررة واستخدم فى التجربة ثلاثة مكررات. سجلت بيانات على طول الساق الرئيسى وعدد الأفرع الجانبية والنسبة الجنسية (الأزهار المذكرة : الأزهار المؤنثة) والنسبة المئوية لعقد الثمار وطول الثمرة وقطرها ومعامل الشكل (طول/قطر) ومتوسط وزن الثمرة ووزن المحصول الكلى من الثمار للفدان .

تم تحليل البيانات كلها إحصائياً ومنها أتضح وجود نقص معنوى فى صفات النمو ونسبة عقد الثمار ووزن الثمرة وحجمها (الطول والقطر) مع ارتفاع النسبة الجنسية (لزيادة إنتاج الأزهار المذكرة) ونقص فى معامل الشكل للثمرة (نتيجة تأثر الطول بدرجة أكبر من القطر) وكذلك نقص واضح ومحسوس فى المحصول الكلى للثمار بإطالة الفترات بين الريات عن ٥ أيام وبلغ النقص أقصاه عند الرى على فترات ١١ يوم . عند الرى على فترات كل ٥ أيام كان أفضل الأسمدة العضوية هى التى أخذت من مخلفات مزارع الدواجن ولم يكن الفرق معنوى بين السماد من مخلفات حيوانات المزرعة والسماد من مخلفات مزارع الأرانب. وقد وجد أن السماد العضوى من فضلات مزارع الدواجن كان مضاهياً للأسمدة الكيماوية فى تأثيره على عدد الفروع وعقد الثمار وإلى حد كبير النسبة الجنسية ، وكان الاختلاف بينها فى تأثيرهما على صفات الثمرة من حيث الوزن والحجم أقل ما يمكن مقارنة بالأسمدة العضوية الأخرى . كان المحصول الكلى للثمار باستخدام السماد من فضلات مزارع الدواجن إما مضاهياً أو منحرفاً نقصاً بدرجة طفيفة مقارنة بالتسميد الكيماوى. وقد أستنتج أنه يمكن الاعتماد بدرجة كبيرة على مخلفات مزارع الدواجن للإنتاج العضوى للخيار بما يتمشى مع الاتجاهات الحديثة فى تقليل استخدام الكيماويات فى إنتاج الخضر حفاظاً على البيئة من التلوث الناتج من الإسراف فى استخدام الأسمدة الكيماوية ودعماً للتنمية الزراعية المستدامة خاصة أن صناعة الدواجن منتشرة بشكل كبير فى مصر .