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RESPONSE OF GRWOTH, YIELD AND QUALITY Of EGGPLANT TO VARYING NITROGEN RATES AND THEIR APPLICATION SYSTEMS.

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ABSTRACT

Two field experiments were conducted with eggplant (cv. Black beauty) during the successive summer seasons of 2001 and 2002, at the Agricultural Experimental Station farm, Alexandria University. The objective of these experiments was to determine the effects of N rates (60, 90 and 120 kg N fed^{-1}) and their application systems (three, four, five and six split applications), on growth, yield and quality of eggplant. The obtained results, of the two seasons, indicated that increasing N applied rate was accompanied with significant increases in vegetative growth characters; i.e., plant height, number of branches and leaves, leaf area and dry weight $plant^{-1}$. Moreover, early and total fruits yield, fruits number $plant^{-1}$ and fruits firmness as well as leaf N,P and K contents were significantly increased with increasing N applied rate up to 120 kg N fed^{-1}. Increasing number of split N applications up to six equal split doses, significantly increased the previous mentioned vegetative growth characters as well as total yield, fruits number $plant^{-1}$ and average fruit weight. The interaction between the two studied factors showed significant increments on most of the studied characters. Application of 120 kg N fed^{-1} at six equal split doses, during the growing season, appeared to be the most efficient combination treatment, which gave the best results on growth and yield characters of eggplant.

INTRODUCTION

Eggplant (*Solanum melongena*, L.) is one of the most important and popular vegetable crops in Egypt and is considered as a national diet in many other tropical and sub-tropical countries. Increasing the productivity and quality of eggplant crop can be achieved through improving the cultural practices, particularly, the utilization efficiency of applied fertilizers. Nitrogen is the most important nutrient in any fertilization program. In this respect, nitrogen requirements of eggplant are relatively high (Oliveira *et al.*, 1971); but the excessive application of mineral N fertilizer creates pollution of agro-ecosystem and leads to some adverse effects on soil fertility (Fischer and Richter, 1984), as well as increasing production cost (EL-shobaky, 2002 ; Rizk, 2002). The previous investigators reported that maximum yield of eggplant can be achieved with application of N fertilizer at rates ranging from 50 – 400 kg ha^{-1} (Verma *et al*.,1974; Addae-Kagya and Norman,1977; Duranti and Cuocolo,1982 ; Bobadi and Van Damme, 2003). In addition, Osman (1981) and Abd Allah *et al*.,(2001) reported that fertilization eggplant with N at rate of 30 to 120 kg fed^{-1}, significantly, increased vegetative growth, fruits yield and yield components.

Most commonly, number and time of N application are considered the important factors to achieve maximum yield of fruit crops and minimizing the loss of N added. With eggplant, it is advisable to apply only a moderate amount of nitrogen at the time of planting, in order to minimize leaching. After the eggplant plant has set some fruits, most of nitrogen amount is applied. Whereas, eggplant is a slow growing crop that often accumulates maximum plant weight and N uptake during early and mass fruiting. Oliveira *et al*.,(1971) found that, at the 1^{th} 60 days of growth eggplant plants grew slowly. Moreover, Petrov and Doikova (1975) stated that the maximum increment in plant weight of eggplant took place during mass fruiting. Also, Doikova,(1979) reported that, N uptake was most intensive during early and mass fruiting. Therefore, improvement the system of N application is of a great importance to enhance production and quality of eggplant and probably more important than the amount of applied N fertilizer.

Thus, the objective of the present work was to determine the effects of various nitrogen fertilizer rates and their application systems on growth, productivity and quality of eggplant.

MATERIALS AND METHODS

This study was carried out at the Experimental Farm, Faculty of Agriculture, Alexandria University, during the successive summer seasons of 2001 and 2002. Before Planting, Soil samples of 30 cm depth were randomly taken from each experimental site and analysed to determine some important physical and chemical properties, according to the methods described by Black (1965). Results of the soil analyses and given in table 1.

Table (1). Soil physical and chemical analysis of the two experimental sites, in 2001 and 2002 seasons.

Seasons	Soil Properties									
	Sand %	Silt %	Clay %	Texture	EC. $dS.m^{-1}$	PH	T.N. %	P ppm	K $Meq.L^{-1}$	O.M %
2001	40.3	14.5	45.2	Clay	3.21	7.8	0.08	13	0.068	0.14
2002	40.5	10.8	48.7	Clay	3.01	8.1	0.14	16	0.067	0.11

Seedlings of eggplant "Black Beauty cv." were transplanted into the field, in rows 4m long and 70 cm apart with a spacing of 50 cm between plants, on April 5, 2001 and April 12 , 2002 . Each experiment included 12 treatments which were the combinations of three N rates (60, 90 and 120 kg N fed^{-1} as ammonium nitrate, 33.3% N) and four applicants systems (three, four, five and six split doses). The doses and time of application for each nitrogen level are shown in Table (2).The experimental design used was split - plot system in a randomized complete blocks design with three replications. Nitrogen rates were, randomly, arranged in the main plots, while systems of N application were, randomly, distributed in the sub-plots. Each sub-plot contained 4 rows having area of 11.2 $m^{2.}$. A guard row was left between each two adjacent plots. A basal uniform dose of 50 kg P_2O_5 $fed.^{-1}$ as calcium superphosphate (15.5% P_2O_5) was broadcasted before planting. While, 100 kg fed^{-1} potassium sulphate (48% K_2O), was added at two equal applications; during soil preparation and 45 days after transplanting. All agricultural practices were done as commonly followed in the commercial production of eggplant.

In each experimental unit, the outer two rows were allocated to measure the vegetative growth characters and mineral content of

leaves. The inner two rows were saved to determine the yield and its components.

Table (2): Schedule of the doses and time of N application levels to eggplant plants, in the two growing seasons.

Treatments		Amount dose (Kg N fed^{-1}) and time of addition					
		Vegetative growth stage			Flowering and fruiting stages		
N Rates ($Kg.fed^{-1}$)	Doses Number	10 DAT*	20 DAT	30 DAT	45 DAT	60 DAT	75 DAT
60	Three doses	10	20	30	-	-	-
	Four doses	10	10	20	20	-	-
	Five doses	10	10	10	10	20	-
	Six doses	10	10	10	10	10	10
90	Three doses	15	30	45	-	-	-
	Four doses	15	15	30	30	-	-
	Five doses	15	15	15	15	30	-
	Six doses	15	15	15	15	15	15
120	Three doses	20	40	60	-	-	-
	Four doses	20	20	40	40	-	-
	Five doses	20	20	20	20	40	-
	Six doses	20	20	20	20	20	20

***DAT= days after transplanting.**

Data recorded

Vegetative growth characters: Five randomly selected plants were taken from each experimental unit after 90 days from transplanting and the measurements of plant height, number of leaves and branches $plant^{-1}$, leaf area $plant^{-1}$ and dry weight $plant^{-1}$, were recorded.

Leaf's mineral contents: 90 days after transplanting, random samples taken from the fully expanded leaves, nearest to the growing tip, were collected from five plants, in each sub-plot. The contents of N, P and K in leaves were performed according to the methods described in A.O.A.C. (1992).

Fruits yield and its components: Fruits were harvested by hand at the consumptive maturity stage. Early fruits yield $plant^{-1}$ (first two pickings), Number of fruits $plant^{-1}$ and total fruits yield $plant^{-1}$, were recorded. Average fruit weight was, also, calculated.

Fruit's quality: Dry matter (%), total soluble solids (TSS) and firmness ($lb.Inch^{-2}$) of eggplant fruits, were measured at the fourth picking.

Yield pattern distribution plot^{-1}: The fruits **yield of the different harvesting pickings expressed as a percentage from the total yield plot^{-1} .**

All obtained data were statistically analyzed using COSTAT software (1985), and the Revised L.S.D. test was used to compare the differences between treatment means as illustrated by El-Rawy and Khalf-Allah (1980).

RESULTS AND DISCUSSION

Vegetative Growth

Data in Table 3 showed that the application of nitrogen, in successive amounts, to the growing eggplant plants, resulted in corresponding and significant increases in all tested vegetative growth characters, i.e. plant height, number of branches and leaves, leaf area and dry weight plant^{-1}, in both seasons. The enhancing effect of N on vegetative growth characters of eggplant can be explained on the basis of the physiological fact that N plays a major role in protein and nucleic acids synthesis and protoplasm formation. Moreover, it stimulates the meristamic activity for producing more tissues and organs (Russel,1973; Yagodin,1984). These results, generally, agreed with those obtained by Addae-Kagy and Norman(1977); Osman (1981) and Abd Allah *et al.*, (2001), who mentioned that the plant height, and the fresh and dry weights plant^{-1} of eggplant, increased with N application at rate of 80 - 120 kg N fed^{-1}.

Regarding the effect of N application systems on vegetative growth characters, the results shown in Table (3) indicated that increasing the number of split applications of nitrogen fertilizer, to the growing eggplant plants, up to six doses correspondingly and significantly increased plant height, number of branches and leaves, leaf area and dry weight plant^{-1}, in both seasons of 2001 and 2002. This was with the exception that the differences between the five and six split applications were not significant, for plant height and number of branches in 2001 season, and plant height and dry weight per plant in 2002 season. These results are in agreement with the findings of Midan *et al*., (1985) and El-shobaky (2002).

The interaction effects of N rates and their application systems on the vegetative growth characters of eggplants were significant, in both seasons (Table 3). Increasing the number of split applications up to six doses within any N rate, generally, increased plant height, number of branches and leaves, leaf area and dry weight plant^{-1}. The application of 120kg N fed^{-1} at six split applications can be considered the best combined treatment as the values of all vegetative growth characters were the best.

Leaf's mineral contents

Concerning the elemental content in leaves of eggplant, data in Table 4 showed that nitrogen fertilization had a significant effect on N, P and K contents, during 2001 and 2002 seasons. Increasing N dose up to 90kg N fed^{-1} significantly increased the contents of N, P and K in leaves. The obtained results are, generally, in accordance with those of Osman(1981) and Abd Allah *et al*., (2001), who found that the highest increase in N uptake of eggplant was recorded in plants that were fertilized with 80 kg N fed^{-1}.

Data in Table (4) showed that splitting the amount of nitrogen applied during growth period failed to reflect any significant effect on the contents of N, P and K in leaves of eggplant, in both seasons. The obtained results are, generally, in accordance with those found by El-Shobuky (2002).

The interaction effects of N rates and their application systems on the contents of N, P and K in the eggplant leaves, were not significant, in both seasons of 2001 and 2002.

Fruits yield and its components

Data presented in Table 5 indicated clearly that, increasing N applied rate, to the growing eggplant plants, up to 120 kg N fed^{-1} led to progressive significant increases in early and total fruits yields plant^{-1} and fruits number plant^{-1}, in 2001 and 2002 seasons. Nitrogen application, however, failed to reflect any significant effect on average fruit weight, in both seasons. The beneficial effects of N, on total fruits yield and its components could be related to the role of N in activating vegetative growth which was reflected on significant increases of the tested growth parameters (Table 3). It is, also, possible that the sufficient quantity and the efficient absorption of N

Table 3. Effect of nitrogen rates and their application systems on the vegetative growth characters of eggplant plants during the summer seasons of 2001 and 2002.

Treatments		2001					2002				
N Rates (Kg.fed^{-1})	Systems of application	Plant Height (cm)	No. Branches plant^{-1}	No. Leaves plant^{-1}	Leaf area plant^{-1} (m^2)	Dry Weight plant^{-1} (g)	Plant Height (cm)	No. Branches plant^{-1}	No. Leaves plant^{-1}	Leaf area plant^{-1} (m^2)	Dry Weight plant^{-1} (g)
60		80.1C	6.7C	70.3C	0.44C	67.4C	79.6C	6.3C	69.5C	0.42C	64.6C
90		89.8B	8.0B	85.4B	0.53B	84.8B	86.3B	7.2B	86.8B	0.51B	80.4B
120		98.3A	9.0A	92.4A	0.69A	90.1A	94.4A	9.0A	90.2A	0.67A	102.1A
	Three doses	79.7C	6.9C	71.9D	0.45D	72.0D	79.2C	6.7C	70.6D	0.44D	75.1C
	Four doses	86.7B	7.5B	81.8C	0.52C	76.4C	82.9B	6.8C	80.9C	0.48C	79.9B
	Five doses	95.9A	8.4A	86.6B	0.58B	73.9B	91.1A	7.8B	85.9B	0.58B	87.1A
	Six doses	95.3A	8.8A	90.3A	0.66A	90.8A	93.9A	8.8A	91.2A	0.63A	87.6A
60	Three doses	73.3h	5.9f	58.0h	0.34i	59.6j	70.7h	5.3h	55.5h	0.33g	51.6g
	Four doses	77.7g	6.3ef	68.7g	0.40h	62.2i	76.0g	6.0fgh	66.7g	0.37g	58.7f
	Five doses	83.3e	7.2d	72.8f	0.45g	67.6h	87.7d	6.9efg	73.2f	0.46f	68.5e
	Six doses	86.0d	7.2d	81.6d	0.57de	80.1f	84.0e	7.2def	82.4e	0.51e	79.8d
90	Three doses	80.7f	6.6e	75.3f	0.45g	71.1g	83.0e	6.4efg	73.0f	0.43f	77.0d
	Four doses	86.7d	7.6d	84.5d	0.50f	87.5de	79.7f	6.0gh	87.3d	0.44f	77.8d
	Five doses	96.0c	8.5c	90.5b	0.54e	90.0cd	89.3d	7.5cde	92.7b	0.56d	88.1c
	Six doses	96.0c	9.3b	91.2b	0.61d	90.6c	93.3c	9.0ab	94.2ab	0.60c	78.9d
120	Three doses	85.0de	8.1c	82.3d	0.56e	85.3e	84.0e	8.5bc	83.3e	0.55de	96.6b
	Four doses	95.7c	8.5c	92.3b	0.67c	79.4f	93.0c	8.3bcd	88.7cd	0.62c	103.1a
	Five doses	108.3a	9.5ab	96.6a	0.75b	94.0b	96.3b	9.1ab	91.8bc	0.72b	104.7a
	Six doses	104.0b	9.9a	98.2a	0.79a	101.8a	104.3a	10.1a	97.1a	0.79a	104.0a

**Values having the same alphabetical letter in common, within a particular group of means in each character, do not significantly differ, using the revised L.S.D test at 0.05 level.

perhaps coupled together and promoted the production of more photosynthates required for fruits formation. Similar findings were obtained by Verma *et al*., (1974) who, concluded that the fruits yield of eggplant linearly rose with increasing N up to 150 kg ha^{-1}. Also, Osman(1981) ; Duranti and Cuocolo (1982) and Abd Allah *et al.*, (2001) found that the total fruits yield and its components of eggplant significantly increased with increasing the applied N level up to 120kg fed^{-1}.

Table 4. Effect of nitrogen rates and their application systems on the percentages of N, P and K contents in the eggplant leaves during the summer seasons of 2001 and 2002 .

Treatments		2001			2002		
N Rates ($Kg.fed^{-1}$)	Systems of application	N (%)	P (%)	K (%)	N (%)	P (%)	K (%)
60		2.08B	0.53C	1.19B	1.97B	0.59C	1.13B
90		2.33A	0.74B	1.29A	2.42A	0.82B	1.26A
120		2.48A	0.92A	1.36A	2.53A	0.93A	1.32A
	Three doses	2.18A	0.71A	1.25A	2.09A	0.79A	1.22A
	Four doses	2.33A	0.73A	1.26A	2.44A	0.78A	1.17A
	Five doses	237A	0.71A	1.31A	2.30A	0.74A	1.28A
	Six doses	2.31A	0.76A	1.30A	2.39A	0.82A	1.28A
60	Three doses	1.78a	0.45a	1.14a	1.47a	0.58a	1.07a
	Four doses	2.07a	0.56a	1.14a	2.30a	0.61a	1.07a
	Five doses	2.23a	0.52a	1.27a	1.80a	0.53a	1.16a
	Six doses	2.27a	0.60a	1.23a	2.30a	0.68a	1.20a
90	Three doses	2.27a	0.74a	1.28a	2.30a	0.83a	1.25a
	Four doses	2.43a	0.74a	1.29a	2.43a	0.78a	1.19a
	Five doses	2.37a	0.68a	1.29a	2.50a	0.83a	1.31a
	Six doses	2.27a	0.75a	1.29a	2.43a	0.83a	1.31a
120	Three doses	2.50a	0.94a	1.34a	2.50a	0.95a	1.34a
	Four doses	2.50a	0.89a	1.35a	2.60a	0.94a	1.24a
	Five doses	2.50a	0.91a	1.38a	2.60a	0.87a	1.36a
	Six doses	2.40a	0.93a	1.37a	2.43a	0.95a	1.34a

**Values having the same alphabetical letter in common, within a particular group of means in each character, do not significantly differ, using the revised L.S.D test at 0.05 level.

Table (5) shows, clearly, that increasing the split applications of nitrogen fertilizer, to the growing eggplant plants, significantly, increased the total fruits yield , fruits number $plant^{-1}$ and average fruit weight, in the two seasons of 2001 and 2002. The exception was in both seasons, where average fruit weight was similar whether the number of split N applications was 5 or 6. However, splitting the

amount of N applied up to six doses caused significant progressive reductions in early yield plant^{-1} of eggplant plants, in both seasons. The only exception was in 2001 season where the difference between five and six split N applications was not significant. The positive effects of split N applications on total fruits yield and its components of eggplant plants could be related to the ideal distribution of N during the entire growing period, especially through the stage of relatively high N requirements of flowering and setting. (Oliveira *et al*., 1971). These results are similar to those reported by Dod *et al*., (1983), Midan *et al*., (1985), Fonseca *et al*., (1988), Wivutvongvana *et al*.,(1991) and El-shobaky (2002) , who found that N-application at five or six times significantly increased fruits yield plant^{-1} and total yield fed^{-1} Of tomato plants.

Concerning the interaction effect of N-rates and their application systems on yield characters, were significant in both seasons of 2001 and 2002 (Table 5). At any N rate, increasing number of split N applications, generally, decreased early fruits yield plant^{-1}, but increased total fruits yield, fruits number plant^{-1} and average fruit weight, in both seasons. Eggplant plants which received 120kg N fed^{-1} added at five or six split applications, gave the highest mean values of total fruits yield and fruits number plant^{-1}, in both seasons.

Fruit's quality

Concerning the effect of N rats on the fruits quality of eggplant, the results shown in Table (6) indicated that increasing N applied level up to 120 Kg fed^{-1}, to the growing eggplant plants , led to significant reductions in the percentages of dry matter and total soluble solids of eggplant fruits, in the two seasons of 2001 and 2002. However, application of N fertilizer, in increasing rates, correspondingly increased the firmness of eggplant fruits, in both seasons. Such enhancing effects of nitrogen could be attributed to the fact that N tended to increase the proportion of water in the protoplasm and ,accordingly, increased fruits firmness and decreased the dry matter and total soluble solids percentages. Similar results were obtained by Vose (1963). Addae-Kagya and Norman (1977), reported that the T.S.S. percentage, in eggplant fruits, decreased as the N rate increased.

Table 5. Effect of nitrogen rates and their application systems on total fruits yield and yield components of eggplant plants during the summer seasons of 2001 and 2002.

Treatments		2001				2002			
N Rates ($Kg.fed^{-1}$)	Systems of application	Early yield $plant^{-1}$ (g)	Total yield $plant^{-1}$ (kg)	Total fruits number $plant^{-1}$	Average fruit weight (g)	Early yield $plant^{-1}$ (g)	Total yield $plant^{-1}$ (kg)	Total fruit number $plant^{-1}$	Average fruit weight (g)
60		385.5C	2.78C	9.48C	293.2A	365.7C	2.96C	8.8C	`336.4A
90		529.2B	3.34B	11.1B	300.9A	539.9B	3.24B	10.8B	300.0A
120		584.9A	3.86A	13.0A	299.2A	598.5A	3.81A	12.7A	300.0A
	Three doses	583.1A	2.43D	9.2D	264.1B	553.6A	2.29D	9.3C	246.2C
	Four doses	509.8B	2.67C	10.3C	259.2B	513.2B	2.60C	9.2C	282.6B
	Five doses	459.8C	3.96B	11.7B	315.4A	482.0C	3.88B	11.5B	337.4A
	Six doses	446.8C	4.26A	13.5A	317.8A	456.7D	4.23A	13.1A	322.9A
60	Three doses	457.3f	1.90g	7.7g	246.8e	392.3f	1.81i	7.0g	258.6f
	Four doses	378.3g	2.10f	8.5f	247.1e	367.7g	2.06h	8.3f	248.1f
	Five doses	358.0gh	3.38e	9.9e	341.4a	370.0g	3.27g	9.0e	363.3b
	Six doses	348.3h	3.75d	11.8d	317.8bc	332.7h	4.68f	10.9d	429.4a
90	Three doses	607.3b	2.52e	9.0f	280.0d	578.3c	2.28g	9.3e	245.2f
	Four doses	564.3cd	2.78d	10.1e	275.2d	566.3c	2.68f	8.5g	315.3cd
	Five doses	471.7f	3.79d	11.5d	329.6a	503.3e	3.80e	11.8c	322.0c
	Six doses	473.3f	4.28b	13.8b	310.1c	511.7de	4.19c	13.7b	305.8d
120	Three doses	684.7a	2.88d	10.8e	266.7de	690.0a	2.80e	11.6c	241.4f
	Four doses	586.7bc	3.12c	12.4c	251.6e	605.7b	3.07d	10.8d	284.3e
	Five doses	549.7d	4.69a	13.7b	342.3a	572.7c	4.56b	13.7b	332.8c
	Six doses	518.7e	4.74a	14.9a	318.1b	525.7d	4.81a	14.8a	325.0c

**Values having the same alphabetical letter in common, within a particular group of means in each character, do not significantly differ, using the revised L.S.D test at 0.05 level.

With respect to the fruits quality of eggplant as affected by N systems of application, data in Table (6) showed that split application of N fertilizer did not reflect any significant effect on the percentages of dry matter and T.S.S. and firmness of eggplant fruits, in both seasons of 2001 and 2002.

Table 6. Effect of nitrogen rates and their application systems on the fruits quality of eggplant during the summer seasons of 2001 and 2002.

Treatments		2001			2002		
N Rates (Kg.fed^{-1})	Systems of application	Dry matter (%)	T.S.S (%)	Firmness (Ib. Inch^{-2})	Dry matter (%)	T.S.S (%)	Firmness (Ib. Inch^{-2})
60		12.1A	5.75A	60.4C	11.4A	5.61A	60.9C
90		10.7B	5.03B	63.8B	11.1A	5.38B	64.0B
120		9.4C	4.46C	66.2A	9.9B	4.49C	66.0A
	Three doses	11.0A	5.10A	63.0A	11.2A	5.07A	64.0A
	Four doses	10.7A	5.01A	64.3A	10.8A	5.27A	63.2A
	Five doses	10.7A	5.07A	63.9A	10.5A	5.16A	63.7A
	Six doses	10.5A	5.13A	62.6A	10.6A	5.16A	63.7A
60	Three doses	12.6a	5.90a	58.1h	12.0a	5.40bc	60.9e
	Four doses	12.2a	5.50b	60.9f	11.3a	5.83a	61.3
	Five doses	12.1a	5.70ab	62.9e	10.9a	5.30bc	59.9f
	Six doses	11.7a	5.90a	59.7g	11.4a	5.90a	61.6e
90	Three doses	10.9a	5.20c	63.8d	11.6a	5.50b	63.6d
	Four doses	10.6a	5.10cd	65.9b	11.2a	5.50b	64.0cd
	Five doses	10.7a	4.90d	64.0cd	10.9a	5.33bc	64.6c
	Six doses	10.4a	4.90d	61.3f	10.5a	5.20c	63.7cd
120	Three doses	9.5a	4.20f	67.0a	10.0a	4.30e	67.5a
	Four doses	9.4a	4.43e	66.2ab	9.9a	4.47e	64.3cd
	Five doses	9.3a	4.60e	64.9c	9.6a	4.83d	66.6ab
	Six doses	9.2a	4.60e	66.7ab	9.9a	4.37e	65.8b

**Values having the same alphabetical letter in common, within a particular group of means in each character, do not significantly differ, using the revised L.S.D test at 0.05 level.

Data in Table (6) revealed that the interactions of N rates by N application systems had significant influences on T.S.S and firmness of eggplant fruits, whereas, dry matter was not significantly affected. The results also showed that application of 60kg N fed^{-1} at six split applications as well as 120kg N fed^{-1} at three split applications were the favorite combination treatments for T.S.S and firmness of eggplant fruits, respectively.

Yield pattern distribution:

The results in Table 7 illustrated the effects of N fertilizer rates and their application systems on yield pattern distribution of eggplant throughout harvesting, expressed as percentage from the total fruits yield plot^{-1}, in both seasons of 2001 and 2002. The results indicated that the major peaks of the fruit yield were found to be concentrated in fourth and eighth pickings. At the last four pickings and as average of the two seasons, application 60 and 120 kg N fed $^{-1}$ gave fruits yield of 39.5 and 42.6 % relative to the total fruits yield, orderly . Likewise, nitrogen application at three and six split applications recorded 37.2 and 50.2 % relative to the total harvested fruits yield.

Based on the results of this study, the combination treatment of 120 kg N fed.$^{-1}$ applied at six equal split applications after 10, 20, 30, 45, 60 and 75 days from transplanting, respectively, during the growing season, is the most efficient combination treatment, which gave the best results for growth and yield characters of eggplant.

Table 7. Effect of nitrogen rates and their application systems on the distribution of eggplant during the summer seasons of yield pattern 2001 and 2002.

Pickings	N rates kg fed^{-1}			Split doses of N			
	60	90	120	Three	Four	Five	Six
	% from the total yield plot^{-1}						
	2001						
First	2.3	2.1	2.0	3.1	2.5	1.9	1.6
Second	4.2	5.2	4.2	6.5	5.2	4.5	2.9
Third	5.9	7.4	6.0	7.2	8.3	5.0	4.6
Fourth	26.7	25.1	22.5	28.0	26.4	21.1	20.3
Fifth	11.5	11.6	12.0	11.8	11.6	11.5	10.1
Sixth	8.2	9.1	10.7	6.3	6.9	7.1	10.0
Seventh	10.2	7.7	8.4	9.0	6.1	7.5	7.8
Eighth	24.7	22.8	25.5	18.7	22.1	25.5	25.8
Ninth	4.6	6.5	6.0	7.5	5.7	8.5	10.5
Tenth	1.7	2.4	2.8	1.9	5.2	7.4	6.5
	2002						
First	2.1	2.4	2.4	3.4	3.3	2.1	1.7
Second	4.6	5.3	4.2	7.3	6.4	5.0	3.3
Third	6.5	7.2	5.7	7.3	7.8	5.3	4.5
Fourth	25.6	25.7	22.7	25.3	24.4	19.6	20.2
Fifth	12.6	10.4	11.8	11.2	10.9	11.5	10.4
Sixth	10.4	9.2	10.7	8.3	7.5	8.0	10.2
Seventh	7.9	8.0	8.7	8.6	6.3	7.3	8.1
Eighth	23.7	24.3	25.1	17.9	21.9	25.8	24.4
Ninth	5.6	5.8	4.1	5.0	6.0	9.2	10.2
Tenth	1.1	1.7	4.5	5.7	5.4	6.2	6.9

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الملخص العربي

استجابة نمو و محصول وجودة الباذنجان لمعدلات مختلفة من التسميد النيتروجيني و نظم أضافتها

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أجريت دراسة حقلية لمدة عامين خلال الموسم الصيفي لعامي 2001 و 2002 بالمزرعة التجريبية لكلية الزراعة - جامعة الإسكندرية بهدف دراسة تأثير ثلاث م عدلات مختلفة من التسميد النيتروجيني (60، 90، 120 كجم ن/فدان)، وطريقة إضافة كل منها (ثلاثة أو أربعة أو خمسة أو ستة اضافات متساوية) على صفات النمو و المحصول و جودته للباذنجان .أوضحت النتائج أن زيادة معدل السماد النيتروجيني المضاف كان مصحوباً بزيادة معنوية في صفات النمو الخضري لنباتات الباذنجان معبراً عنها بارتفاع النبات و عدد الأفرع و الأوراق و الوزن الجاف و المساحة الورقية للنبات . وعلاوة على ذلك فإن المحصول المبكر و الكلى و عدد الثمار و صلابة الثمار بالإضافة لمحتوى الأوراق من النيتروجين و الفسفور و البوتاسيوم زادت أيضا معنويا مع زيادة معدل السماد النتروجيني المضاف حتى 120 كجم ن / فدان . كما أدت زيادة عدد مرات الإضافة للسماد النيتروجيني خلال موسم النمو حتى ستة إضافات متساوية إلى زيادة صفات النمو الخضري و المحصول الكلي و عدد الثمار و متوسط وزن الثمرة . أما عن تأثير التفاعل بين العاملين تحت الدراسة فقد أوضحت النتائج وجود زيادة معنوية في معظم الصفات المدروسة حيث وجد أن معدل السماد النيتروجيني (120كجم/ للفدان) عند إضافته على ستة دفعات متساوية خلال موسم النمو أعطى أفضل النتائج لصفات النمو، والمحصول للباذنجان .