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Physiological Studies on Fertilization of Keitt Mango Transplants

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ABSTRACT

The Mango is an important tropical fruit tree with very huge vegetative growth. Their botanical name is Magiferra indica belongs to the family Anacardiaceae. Ripe mangoes are the more popular and delicious fruit of the Orient and have been described as a king of all fruits. Also, it is greatly preferred and required with great demand especially superior cultivars. Two experiments were conducted to study the effect of different sources of N fertilizers and different concentrations of either Uncoated urea (Fast release chemical fertilizer or Coated urea (Slow-release fertilizer) on the growth and development of Keitt Mango transplants. Application of different nitrogen fertilizers in the form of Nitrobin+ urea (combination of bio and chemical fertilizer) followed by Coated urea (slow-release fertilizer) enhanced improvement in most parameters of plant dimensions, vegetative growth, plant fresh weight, fresh & dry root weight, Maximized leaf N level and both leaf P &K levels, Chlorophyll A& B, and Carotene parameters. Also, Coated urea (slow-release fertilizer) was superior to Uncoated urea (Fast release fertilizer) in maximizing most parameters under study. Furthermore, the superiority of using 10gm/L concentration from Coated Urea over 15 gm/L increases the most parameters under study.

KEYWORDS: Physiological, Fertilization, Coriander, Keitt Mango, Transplants

1. INTRODUCTION

Mango is an important tropical fruit tree with a very huge vegetative growth. Their botanical name is *Magiferra indica* belongs to family *Anacardiaceae*. Ripe mango fruit is more popular and delicious and has been described as king of all fruits. Vegetative propagation of mango by cuttings is not successful due to insufficient rooting (Yang et al., 1993). So, mango cultivars are commercially propagated by grafting on seedling rootstocks. Nevertheless, seedling rootstocks often lack their uniformity or defined origin, respectively. Numbers of grafting methods have been reported in propagation of mango with varying success. Multiplication by stone grafting has become popular in last few years on account of economy. Mango trees of all varieties need a good nutrition and a fertile soil with low ground water in order to grow well and economically (Sharma et al., 2000; Stassen et al., 2000)., The nutrient elements must be sufficient and present in formulas and structures that the roots can be absorbed and

supplied to the leaves to be manufactured into different compounds required for growth and fruiting (Stassen et al., 1999). This depends mainly on the fertility of the soil and the extent of its suitability for each type of mango trees and their adequate containing of various mineral elements. So, the lack of nutrients must be remedied by carrying out the fertilization process in order to compensate the less of soil mineral contents as results of consumption & leaching (Xiuchong et al., 2001). Depending on their source, fertilizers are classified into three main categories: organic (natural), chemical (industrial) and bio-fertilizers.

The aims of this study are studying different sources of nitrogen (biological, fast release and slow release nitrogen fertilizer), Also, making a comparison between fast & slow release N fertilizers with different concentrations for determining the best suitable source of nitrogen and the best concentration to enhance vegetative growth and minerals contents and reducing the juvenile period of mango transplants.

2. MATERIALS AND METHODS

This study was conducted during two successive seasons of 2020 &2021 in the green-house of the Experimental Research Station, Horticulture Research Institute, Agriculture Research Center. Uniform and healthy (one year old) seedlings of Sukkary mango were taken as rootstocks and grafted with “Keitt” cultivar planted in black poly ethylene bags filled with soil mixture consisted from 2 parts of washed sand, one part peatmoss & one part clay. This study includes two experiments and started after one year of grafting in green-house. These experiments were conducted as follow:

2.1. First experiment

This experiment studied the effect of nitrogen (N) sources on the growth and development of Kite mango transplants. Different N sources include chemical fertilizer urea (uncoated urea) which is a fast-release fertilizer, coated urea which is a slow-release fertilizer, Nitrobin (microbien) which is a bio-fertilizer and the control treatment that is used as a recommended dose by the Ministry of Agricultural. These different sources of N fertilizers were applied as soil application with the same concentration of 10 g/l for kite mango transplant.

2.2. Second experiment

This experiment is conducted to make a comparison between fast release (uncoated urea) and slow release (coated urea) fertilizers with two concentrations 10 & 15 g/L.

All treatments were applied once a week and every treatment comprised three replicates (3plantes/replicate) and the randomized complete blokes design was adopted for experiments. Moisture content of soil was kept within 65-70% of the field capacity throughout the period of the experiment in both seasons (2021-2022) from March.

2.3. Growth parameters

Growth parameters including plant weight [g], leaves weight [g], dry leaves weight [gm], Stem weight [gm], Dry stem weight [gm], Root weight [gm], Dry root weight [gm], leaves numbers [n], branchs, [n], growing cycles no. [n], roots number [n], plant length [cm], scion length [cm], scion thickness (mm)rootstock length [cm], rootstock thickness [mm], root length [cm], root thickness (mm)

2.4. Minerals determination

Samples of leaves were dried at 70C until constant weight and prepared for determined elements as Jackson (1958), Brown and Lilleland (1964). Brown and Lilleland (1946), and Brandifel and Spincer (1965)

2.5. Determination of leaf pigments

Sample of fresh leaves (0.5g) were taken to determine chlorophyll (A, B) and carotene according to Saric et al (1967). Pigments content was calculated using the formula of Holm (1954) and Wetsttein (1957).

2.6. Total carbohydrate

Total carbohydrate was determined according to Dubois et al. (1956)

2.7. Statistical analysis

The treatments were arranged in a complete randomized block design; data were subjected to analysis of variance (ANOVA) according to Snedecor and Cochran (1967). The significance of the differences among

treatments was evaluated with Duncan range test at 1 % level (Duncan, 1955).

3. RESULTS AND DISCUSSION

3.1. Effect of different nitrogen fertilizer sources:

3.1.1. Effect on plant growth parameters:

Table (1) deals with the effect of different N sources *i.e*., Control, Uncoated urea, Coated urea, and Nitrobin + urea treatments on plant growth. It is clear that combination of Nitrobin as biological fertilizer+ urea was significantly surpassed to other fertilizer sources in all parameters under study *i. e.* plant length, scion length & thickness, rootstock length & thickness, and root length & thickness as compared with control with few exceptions. Also, Coated urea fertilizer (slow-release fertilizer) took the second rank in significantly maximizing growth parameters in the first season of the study as compared with control and without significant differences with Nitrobin + urea treatment. However, urea fertilizer treatment failed to induce enhancement in plant growth.

Table 1. Effect of different N fertilizer sources on plant growth parameters of Keitt mango transplants during both seasons (2020-2021).

Treatments	Plant length(cm)		Scion length (cm)		Scion thickness cm)		Rootstock length(cm)	
Fertilizer source	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
control	67.08 c	114.17b	38.97c	72.00b	2.57d	8.00a	28.12b	42.17a
Coated urea	105.67a	79.92c	69.83a	50.40c	5.00b	5.60c	35.83a	29.52b
urea	84.53b	71.60d	55.87b	40.60d	4.00c	7.60b	28.67b	31.00b
Nitrobin + urea	97.33a	128.83a	61.83a	86.17a	9.33a	8.33a	35.50a	44.33a

Treatments	Rootstock thickness (mm)		Root length (cm)		Root thickness (cm)	
Fertilizer source	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
control	6.77c	14.67a	21.47b	43.67a	7.93c	14.33a
Coated urea	9.33b	10.27c	29.33a	30.57b	14.00a	10.03c
urea	7.47c	12.53b	23.47b	28.40b	11.20b	12.00b
Nitrobin + urea	14.33a	15.00a	34.83a	34.67a	14.67a	15.67a

Means of fertilizer source followed by the same letter within each column are not significantly different from each other at 1% level.

The above results can be summarized that application of Nitrogen fertilizer in the form of Nitrobin+ ruea was recommended in improving most of plant growth parameters. These results may be occurred because of using combination of two sources of N (Chemical & Biological). These results are general agreement with Mansour (1998) who recommended using of Nitrobeine for Anna apple trees as it had a positive effect on growth parameters.

The data in Table (2) reflected the effect different N Sources on vegetative growth parameters of Keitt mango transplants during both seasons. It showed that Nitrobin + urea treatment was significantly maximized root number as compared with the other treatments except the treatment of Coated urea at the first season. However, the other vegetative growth parameters showed an increase with Nitrobin + Urea treatment with more or less significant differences among treatments & control in both seasons. Most of vegetative growth parameters of Keitt mango transplants *i.e*., plant length, branch no., growing cycle no., and root no. were responded positively to the application of Nitrobin + urea treatment. These results go in line with the findings of Ragab (1999) who indicated bio-fertilizers either applied singly at 10 g/pot of Chen olive transplants or in combination with triple superphosphate were significantly very effective in improving all growth parameters compared with control.

Table 2. Effect of different N sources on vegetative growth parameters of Keitt mango transplants during both seasons (2020-2021).

Treatments	Leaves number		Branch No.		Growing cycle no.		Root number	
Fertilizer source	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
control	13.53 b	24.67 a	0.70 c	1.00 a	0.93 b	1.00 a	43.47 b	43.33 b
Coated urea	15.33b	17.27 b	1.00 b	0.70 b	1.50 a	0.70 b	57.33 a	30.33 b
Uncoated urea	12.27 b	13.87 c	0.80 b	1.60 a	1.20 a	1.60 a	40.13 b	40.00 b
Nitrobin + urea	29.00a	26.67 a	2.67 a	1.33 a	1.67 a	1.67 a	61.67 a	80.67 a

Means of Fertilizer source followed by the same letter within each column are not significantly different from each other at 1% level

3.1.2. Effect on fresh and dry weight parameters

The tabulated data in Table (3) verified that Nitrobin +Urea treatment was significantly surpassed other treatments in increasing plant fresh weight, leaves fresh & dry weights, root fresh & dry weight parameters.

Moreover, Coated urea was statistically increased fresh & dry stem weight parameters during the first season as compared with the other treatments. On the other hand, Uncoated urea had the lowest statistical effect on all parameters under study. Generally, Nitrobin + Urea treatment was effective in increasing plant weight, fresh & dry weight, root fresh & dry weight parameters. Also, Coated urea enhanced fresh & dry stem weight parameters during the first season treatments while uncoated urea had the lowest effect on all the parameters under study. These results were in accordance with the findings of Khaosumain, et al. (2013), they investigated the effect of nitrogen (N) sources on longan trees and reported that increasing N application tended to increase leaf area, fresh weight and dry weight.

Table 3. Effect of different N sources on fresh and dry weight parameters of Keitt mango transplants during both seasons (2020-2021).

Treatments	Fresh Plant weight (gm)		leaves Fresh weight (gm)		Leaves Dry weight (gm)		Stem Fresh weight (gm)	
	2020	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
control	61.4 c	95.5 b	5.08 b	10.27b	2.17 b	5.93b	43.72c	60.34a
Coated urea	114.19a	66.89c	6.28b	7.19c	3.10b	4.15c	81.94a	42.24b
Uncoated urea	79.93b	78.34c	4.39b	3.04d	2.17b	1.78d	57.36b	58.93a
Nitrobin + urea	96.74a	126.32a	20.17a	17.86a	10.81a	7.32a	56.47b	64.02a

Treatments	stem Dry weight (gm)		Root Fresh weight (gm)		Root Dry weight (gm)	
Fertilizer source	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
control	18.19c	26.37b	12.62c	21.46b	6.11c	10.78b
Coated urea	35.50a	18.46c	25.97a	15.02c	12.02a	7.55c
urea	24.85b	26.78b	18.18b	18.11c	8.41b	10.06b
Nitrobin + urea	23.18b	36.17a	20.11a	27.66a	10.12a	13.76a

Means of Fertilizer source followed by the same letter within each column are not significantly different from each other at 1% level.

3.1.3. Effect of N sources on mineral content of mango transplants:

It is clear from Table (4) that application of Nitrobin + Urea treatment encouraged a significant increase in N in both seasons while it induced a significant increase in P or K the second season only in relation to the other treatments. However, statistical difference among treatments were disappeared in case of Ca & Mg. In general addition of Nitrobin as biological fertilizer supplemented with Urea as chemical fertilizer treatment was valuable in maximizing N level and both P&K levels in the second season. These results are somewhat in agreement with findings of Silber, et. al. (2022). They revealed that Urea-formaldehyde (UF) (38% N) was used as a slow release nitrogen fertilizer on four fruit seedling species (grape, mango, banana and date palm) comparing with the traditional urea (46% N) to investigate the effect of using UF at the same or half dose of the traditional urea on growth parameters and leaf mineral content, the results indicated that UF treatments either as full or half dose had a positive effect as enhanced leaf mineral content in the leaves especially grape and date palm seedlings. Moreover, it is noticed that UF treatments increased the available forms of N, P and K in the soil of the four crops seedlings in comparing with the traditional urea.

Table 4. Effect of different N sources on macro nutrient elements content of Keitt mango transplants during both seasons (2020-2021).

Treatments	N		P		K		Ca	
Method of application	2020	2021	2020	2021	2020	2021	2020	2021
control	0.89a	0.75b	0.10c	0.11c	1.20a	1.15a	0.23	0.25
Coated urea	0.88a	0.65c	0.08b	0.08b	0.68b	0.82b	0.21	0.25
Urea	0.61b	0.46c	0.09a	0.09b	0.69b	0.83b	0.21	0.25
Nitrobin +urea	1.20a	1.54a	0.08b	0.12a	0.62b	1.21a	0.17	0.18
Treatments	**Mg**		**Fe**		**Mn**			
Method of application	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**		
Control	0.17	0.18	7067.65 b	33601.56	2153.19a	2637.99a		
Coated urea	0.15	0.16	7240.57a	28408.38a	1875.82a	2058.76b		
Urea	0.16	0.17	7240.58b	28408.39b	1875.83a	2058.77b		
Nitrobin +urea	0.14	0.14	10335.31a	10096.57a	1005.34b	2182.18b		

Means of Fertilizer source followed by the same letter within each column are not significantly different from each other at 1% level.

Dealing with micro nutrient elements, Table (5) showed that Nitrobin + Urea and Coated Urea treatments were significantly increased Fe content as compared with the other treatments. On the other hand, Mn, Zn, and Cu elements showed an opposite case as control had enhanced more or less significant increases compared with other treatments. However, the statistical differences were disappeared as B element considered.

Generally, micro nutrient elements showed different responses as Nitrobin + Urea and Coated urea treatment was significantly increased Fe content as compared with the other treatments. On the other hand, control induced an increase in Mn, Zn, and Cu elements. These results were somewhat agreed with the findings of Tayeh, et al. (2003) studied four fast release N- fertilizers one *i.e.,* urea, ammonium sulfate, calcium nitrate and ammonium nitrate. A slow and fast release N fertilizers were added at 3 equal doses on January, March and August. The same three soil types were used in both experiments (silty loam, sandy loam and sandy soils). Data revealed t superiority of the N sources in stimulating leaf mineral (N, P, K, Fe, and Mn) contents.

Table 5. Effect of different N sources on micro nutrient elements content of Keitt mango transplants during both seasons (2020-2021).

Treatments	Zn		Cu		B	
Fertilizer source	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
Control	1025.69 a	1238.20 a	25064.32 a	5552.11 a	5108.92 Ns	5488.21 Ns
Coated urea	739.86 b	1099.92 b	1499.04 b	599.22 b	8682.86 Ns	2916.24 Ns
Urea	739.87 b	1099.92 b	1499.05 b	599.23 b	3888.23 Ns	5245.33 Ns
Nitrobin + urea	874.86 b	1159.53 a	3045.42 b	3045.42 b	88826.97 Ns	2871.45 Ns

Means of Fertilizer source followed by the same letter within each column are not significantly different from each other at 1% level.

3.1.4. Effect of N sources on physiological behavior of Keitt mango transplants:

Table (6) reflect the effect of different fertilizer sources on physiological behavior of Keitt mango transplants during both seasons (2020-2021). It is obvious that Coated urea was significantly enhanced accumulation of vhlorophyll A&B, varotene, and total carbohydrate as compared with Uncoated urea & control treatments. Also, Nitrobin + urea treatment was statistically encouraged increased contents of chlorophyll A &total carbohydrate in the second season, and chlorophyll B, carotene, in both seasons as compared with Uncoated urea & control treatments.

Table 6. Effect of different N Sources on physiological behavior parameters of Keitt mango transplants during both seasons (2020-2021).

Treatments	Chl A		Chl B		Carotene		Total carbohydrate %	
Fertilizer source	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
control	0.32 c	0.23 b	0.32 b	0.22 b	0.27 b	0.20 b	36.24 c	41.56 b
Coated urea	0.48 a	0.41 a	0.70 a	0.53 a	0.50 a	0.41 a	44.54 a	54.72 a
Urea	0.33 c	0.23 b	0.33 b	0.23 b	0.28 b	0.21 b	36.25 b	41.57 b
Nitrobin + urea	0.41 b	0.46 a	0.70 a	0.48 a	0.49 a	0.39 a	34.20 c	47.81 a

Means of Fertilizer source followed by the same letter within each column are not significantly different from each other at 1% level**.**

These results in harmony with the findings of Morales- Payan, (2015) he reported that, mango scion length and leaf chlorophyll concentration in response to bio stimulant rates, reaching maximum values at rate of 3 ml of bio stimulant per liter. These results indicate that peptide-based bio stimulants may be useful to accelerate grafted 'Parvin' mango for transplant production in the nursery.

3.2. Effect of different nitrogen fertilizer source and concentrations:

3.2.1. Effect on plant growth parameters:

Referring to the effect of different fertilizer types (fast or slow-release fertilizer & concentrations), Table (7) showed that Coated urea (slow-release fertilizer) with both concentrations was significantly surpassed Uncoated urea in improving most of plant growth parameters of Keitt mango transplants in one or both seasons *i.e.* plant length, scion length & thickness, rootstock length & thickness, root length & thickness in relation to Uncoated urea (fast release fertilizer).

In general conclusion Coated urea (slow-release fertilizer) with both concentrations (10 &15gm) increased most plant dimensions parameters of Keitt mango transplants in one or both seasons. These results may be due to the rate of release of coated urea is slow which maximized the plant utilization and reduced leaching of N nutrition for long period which in turn improved these parameters under study. These results go in line with the findings of Fernandez, et al. (2004) on Picual' olive trees that fertilized with traditional or slow-released N fertilizers to study their growth and to determine N leaching losses a low solubility

Table 7. Effect of different N fertilizer type with different concentrations on plant dimensions parameters of kitte mango transplants during both seasons (2020-2021).

Treatments		Plant length (cm)		Scion length (cm)		Scion thickness (mm)		Rootstock length (cm)		Rootstock thickness (mm)		Root length (cm)		Root thickness (mm)	
Fertilizer nature	Conc. (gm)	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Coated urea (Slow release Fert.)	10 gm	95.83a	89.50b	55.67a	50.75b	3.67b	9.50a	40.17a	38.75b	9.67a	15.67a	30.67a	35.50a	11.33b	15.00a
	15 gm	105.67a	114.17a	69.83a	72.00a	5.00a	8.00b	35.83a	42.17a	9.33a	14.67b	29.33a	43.67a	14.00a	14.33b
Uncoated urea (Fast release fert.)	10 gm	67.08c	71.60d	38.97b	40.60c	2.57b	7.60b	28.12b	31.00c	6.77b	12.53c	21.47b	28.40b	7.93c	12.00c
	15 gm	84.53b	79.92c	55.87a	50.40b	4.00a	5.60c	28.67b	29.52a	7.47a	10.27a	23.47b	30.57b	11.20b	10.03d

Means of Fertilizer source followed by the same letter within each column are not significantly different from each other at 1% level.

material (Floranid), and a resin-coated urea (Multicote). Fertilized plants showed significantly increased vegetative growth compared to controls, but plants fertilized with 0.75 g N exhibited a greater shoot growth than those that received 2 g N.

Table (8) revealed the effect of either fast or slow-release N fertilizer with both concentrations on some vegetative growth parameters. It is clear that Coated urea with both concentrations in both seasons induced statistical increment in all vegetative growth concentrations increased parameters *i.e.,* leaves numbers, branch numbers, growing cycle numbers, root numbers compared with Uncoated urea (slow-release fertilizer), Coated urea improved all vegetative growth parameters in relation to uncoated fertilizer. These results in general agreement with the findings of they mentioned that application of the 3 slow-release N fertilizers was superior than fast one in improving shoot length, number of leaves per shoot and leaf area in the 3 growth cycles, percentage of leaf N and number of branches per tree as well as fruit physical and chemical properties of mango cultivars production**.**

Table 8. Effect of different N fertilizer type &concentrations on some vegetative growth parameters of Keitt mango transplants during both seasons (2020-2021).

Treatments		Leaves number		Branch No.		Growing cycle no.		Root number	
Fertilizer type	**Method of application**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
Coated urea	**10 gm**	19.33a	17.33b	1.00a	2.00a	1.33a	2.00a	54.33b	50.00a
	15 gm	15.33a	24.67a	1.00a	1.00b	1.50a	1.00b	57.33a	43.33a
Uncoated urea	**10 gm**	13.53b	13.87c	0.70b	1.60b	0.93b	1.60b	43.47b	40.00b
	15 gm	12.27b	17.27b	0.80a	0.70c	1.20a	0.70c	40.13b	30.33c

Means of Fertilizer source followed by the same letter within each column are not significantly different from each other at 1% level.

3.2.2. Effect of N fertilizer type on fresh and dry weight parameters:

Data in Table (9) explain the effect of different N sources and concentrations on fresh and dry weight parameters of Keitt mango transplants. It is clear that addition of 15 g of Coated urea was significantly improved most parameters under study i.e., plant weight, leaves weight, and root weight in both seasons.

Coated urea treatment was superior in enhancing most of fresh & dry weights of leaves, stems, and roots as well as plant fresh weight. These results are disagreed with the findings of l-wakeel and Eid (2009) who treated a two years old Navel orange trees using (urea formaldehyde slow-release nitrogen fertilizer (40%N) and ammonium nitrate (33%N) were applied as two sources of nitrogen each at three rates 100,200 and 400g actual amount of nitrogen/tree/year. Ammonium nitrate at 100 or 200 g vegetative growth and leaf nutrient status of two peach seedling rootstocks (Missouri and Yazdi). The results showed that the application of 600 kg sulfate ammonium gave the highest dry weight of shoot and root.

3.2.3. Effect of N fertilizer on macro &micro nutrient parameters:

Data in Table (10) demonstrated that the leaves content of N&K % had statistically increased in Keitt mango transplants treated with 10 g/L of either Coated or Uncoated urea in comparison with the other concentration (15gm/L). However, non-significant differences among different treatments were recorded for P, Ca, and Mg elements. Regarding, micro nutrient elements it is noticed from Table (11) that application of 10 g/L of Coated urea (slow-release fertilizer) induced a statistical increase in accumulation of Fe, Mn, Zn, and Cu micro nutrients in relation to other treatments. However, B had not significantly affected with all treatments.

Table 9. Effect of different N fertilizer type and concentrations on fresh and dry weight parameters of Keitt mango transplants during both seasons (2020-2021).

Treatments		Plant fresh weight (gm)		Leaves fresh weight (gm)		Dry leaves weight (gm)		Stem fresh weight (gm)		Dry stem weight (gm)		Root fresh weight (gm)		Dry root weight (gm)	
Fertilizer nature	**Concent-rations**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
Coated urea (Slow release fert)	**10**	76.79b	97.92a	6.35a	3.80b	2.71NS	2.22c	54.65b	73.66a	22.74b	33.48a	15.78a	22.63a	7.64b	12.57a
	15	114.19a	95.55a	6.28a	10.27a	3.10 S	5.93a	81.94	60.34b	35.50a	26.37b	25.97a	21.46a	12.02a	10.78b
Uncoated urea (Fast release fert.)	**10**	61.43b	78.34b	5.08a	3.04b	2.17 S	1.78c	43.72c	58.93	18.19b	26.78b	12.62b	18.11b	6.11b	10.06b
	15	79.93b	66.89b	4.39b	7.19a	2.17 S	4.15b	57.36b	42.24	24.85b	18.46c	18.18b	15.02c	8.41b	7.55c

Means of Fertilizer source followed by the same letter within each column are not significantly different from each other at 1% level.

Table 10. Effect of different N fertilizer type with different concentrations on leaves macro nutrient contents on Keitt mango transplants during both seasons (2020-2021).

Treatments		N (%)		P (%)		K (%)		Ca (%)		Mg (%)		Fe (ppm)		Mn (ppm)	
Fertilizer type	**Concentrations (gm/lit)**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
Coated urea	**10**	1.11a	0.94 a	0.09 NS	0.10	1.19 a	1.14 a	0.22 NS	0.25 NS	0.16	0.17	7367.64a	33601.55a	2353.18a	2637.98a
	15	0.88 a	0.65 a	0.08 NS	0.08	0.68 b	0.82 b	0.21 NS	0.25 NS	0.15	0.16	7140.57b	26408.38b	1935.82b	2058.76b
Uncoated urea	**10**	0.89 a	0.75 a	0.10 NS	0.11	1.20 a	1.15 a	0.23 NS	0.25 NS	0.17	0.18	7067.65b	25601.56b	1853.19b	2037.99b
	15	0.61b	0.46 b	0.09 Ns	0.09	0.69 b	0.83 b	0.21 Ns	0.25 Ns	0.16 Ns	0.17 Ns	6940.58b	25408.39b	1875.83b	1958.77b

Means of Fertilizer source followed by the same letter within each column are not significantly different from each other at 1% level.

Table 11. Effect of different N fertilizer type & concentrations on leaves micronutrient contents of Keitt mango transplants during both seasons (2020-2021).

Treatments		Zn (ppm)		Cu (ppm)		B (ppm)	
Fertilizer type	**Concentration gm/lit**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
Coated urea	**10**	1025.69 a	1338.19a	25064.31a	5552.10a	2108.32	5398.21
	15	739.86 b	1099.92b	1499.04b	3839.22b	2112.66	5788.92
Uncoated Urea	**10**	814.19 b	1038.20b	1506462b	3352.11b	2108.33	5398.22
	15	792.87 b	1087.92b	1539.05b	3629.23b	2090.67 Ns	5788.93 Ns

Means of Fertilizer source followed by the same letter within each column are not significantly different from each other at 1% level.

These results are gone on line with the findings of Abo-Hamda et. al. (2020) on first and second ratoon of healthy uniform banana cv. Williams plants grown in sandy soil. The obtained results showed that, all treatments had significant effect on enhancing the leaf macro element content (N, P and K) as (%) as well as leaf micro- element content (Fe, Zn and Mn) as (ppm).

3.2.4. Effect on physiological behavior of mango transplants:

Table (12) showed the effect of different N types either fast release N fertilizer or slow-release N fertilizer and concentrations on physiological behavior of mango transplants. It is clear that addition of 10 g/L from either Uncoated Urea (fast release fertilizer) or Coated Urea (slow release fertilizer) encouraged a significant increase in accumulation of most physiological behavior parameters of Keitt mango Transplants I.e. Chlorophyll A&B, Carotene, and total ccarbohydrates in comparison with other concentration (15 g/L) from both fertilizer natures.

Table 12. Effect of different N fertilizer type with different concentrations on physiological behavior of Keitt mango leaves during both seasons (2020-2021).

Treatments		Chl A		Chl B		Carotene (mg/100g FW)		Total carbohydrate %	
Fertilizer type	**Concentrations gm/L**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
coated urea	**10**	0.48 a	0.40 a	0.69 b	0.52 a	0.49 a	0.40 a	44.54 a	54.71 a
	15	0.32 b	0.23 b	0.32 c	0.22 b	0.27 b	0.20 b	36.24 b	41.56 b
Uncoated urea	**10**	0.48 a	0.41 a	0.70 a	0.53 a	0.50 a	0.41 a	44.54 a	54.72 a
	15	0.33 b	0.23 b	0.33 c	0.23 b	0.28 b	0.21 b	36.25 b	41.57 b

Means of Fertilizer source followed by the same letter within each column are not significantly different from each other at 1% level.

Application of 10 g/L from either Uncoated Urea (fast release fertilizer) or Coated Urea (slow-release fertilizer) surpassed 15g/L in maximizing the levels content of chlorophyll A&B, carotene, and total carbohydrates. These results are gone in line with the findings of Abo-Hamda, et. al. (2020) carried out a study on the first and second ratoon of healthy uniform banana cv. Williams, they found that all treatments had a significant effect on enhancing leaf total chlorophyll content.

4. CONCLUSION

This study examined the effects of different nitrogen fertilizer sources, natures, and methods of applications on Kite mango transplants Magiferra indica. Results showed that Nitrobin + urea was recommended for improving vegetative growth parameters, while Coated urea enhanced an increase in fresh & dry stem weight parameters. Nitrobin + urea and Coated urea treatments increased Fe content, Mn, Zn, and Cu elements, and Chlorophyll A&B, Carotene, and Total carbohydrate levels. The second experiment showed that Coated urea enhanced accumulation of Chlorophyll B, Carotene, and Total carbohydrate as compared with Uncoated urea & control treatments. Coated urea (slow-release fertilizer) with both concentrations (10 & 15gm) is recommended to increase most plant dimensions parameters of kite mango transplants in one or both seasons.

It induced the best increment in all vegetative growth parameters, such as leaves No., Branch No., Growing cycle No., Root No., compared to Uncoated urea with both concentrations. The leaves contents from both N&K macro elements had maximized as Kite mango transplants treated with 10 gm/L of either Coated or Uncoated urea in comparison with the other concentration (15gm/L). The third experiment found that adding 10 gm/L of either Uncoated Urea (fast release fertilizer) or Coated Urea (slow-release fertilizer) surpassed 15 gm/L in maximizing the levels of Chlorophyll A&B, Carotene, and total carbohydrate. Soil application surpassed foliar application of Coated urea in increasing most parameters under study, except scion length & thickness. Foliar spray of either Coated or Uncoated urea enhanced increase fresh & dry weights of different parameters.

The results showed that soil application of either Coated or Uncoated urea significantly maximized both K, Mg & Ca increment in relation to the others. Foliar spray of either Coated or Uncoated urea in the first season (2020) increased Chlorophyll A & B as well as Carotene contents in comparison of other treatments. Total carbohydrate% accumulation in the second season (2021) increased as soil application of either Coated or Uncoated urea used. Nitrobin + urea (combination of bio and chemical fertilizer) followed Coated urea (slow-release fertilizer) was recommended for improving most plant dimensions, vegetative growth, plant fresh weight, fresh & dry root weight, Maximized N level and both P&K levels, Chlorophyll A&, Carotene parameters.

5. REFERENCES

Abo-Hamda BT, El-Henawy HM, El-Hamid AA and Abdelmonem EAA (2020). Effect of different slow release potassium fertilizer rates on growth and productivity of banana cv.Williams plants. Arab Universities Journal of Agricultural Sciences 2020. 28(1):239-251. 35 ref.

Brown JD and Lilleland O (1964). Rapid determination of potassium, calcium and sodium in plant material and soil extracts flaw phosphorus. Proc. Amer. Soc. Hort. Sci, 48:341-34.

Brown JD and Lilleland O (1946). Uptake determination of potassium and sodium in plant material and soil extracts by flame photometry. Proc. Amer.Soc. Hart.Sci**.**48:341-346.

Dubois M, Gilles KA, Hamilton JK, Rebers PT and Smith F (1956). Colorometric method for determination of sugars and related substances. Analyt. Chem. 28, 350–356.

Duncan DB (1955). Multiple Ranges and Multiple F. test Biometrics. Statistical Methods, 11(1), 1-42.

El-Wakeel FH and Eid MA (2009). Effect of Nitrogen Rate and source on Growth and Leaf Mineral Content of young navel orange trees.J. Biol. Chem. Environ.Sci. Vol. 4(1):735-749.

El-Wakeel FH and Eid MA (2011). The response of nonbearing navel orange trees for mineral and orange nitrogen fertilization treatments and K-humate addition. The Journal of American Science; 7(5):1023-1032. 11 ref.

Khaosumain Y, Sritontip C and Changjeraja S (2013). Effects of different nitrogen fertilization doses on growth, leaf nutrient concentration, flowering and fruit quality in off-season longan. ActaHorticulturae; 2013. (984):271-274. 8 ref.

Mansour AEM (1998). Response of Anna apples to some biofertilizers. Egypt. J. Hort., 25 (2): 241-251.

Ragab MA (1999). Effect of six biofertilizers on growth and uptake of some nutrients in Chemlali olive transplants. Minia J. of Agric. Res. & Develop. (19), 45-65.

Sharma RC, Mahajan BVC, Dhillon BS and Azad AS (2000). Studies on the fertilizer requirements of mango cv. Dashehari in sub-montaneous region of Punjab. *Indian Journal of Agricultural Research*, *34*(3), 209-210.

Silber A, Goldberg T, Shapira O and Hochberg U (2022). Nitrogen uptake and acronutrients distribution in mango (Mangifera indica L. cv. Keitt) trees. Plant Physiology and Biochemistry 2022. 181:23-32. 48 ref.

Snedecor WB, and Cochran GW (1967). Statistical Methods 6th Ed. Iowa State College. Press Amer. Low, U.S.A.

Stassen PJC, Hoffman E and Grove HG (2000). The relationship between tree dimensions, yield and nutritional requirements of mango. Acta Hortic. 509, 347-358

Stassen PJC, Grove HG and Davie SJ (2000). Uptake, distribution and requirements of macro elements in 'sensation' mango trees. Acta hortic. 509, 365-374

Xiuchong, Z., Guojian, L., Jianwu, Y., Shaoying, A., & Lixian, Y. (2001). Balanced fertilization on mango in Southern China. *Better Crops International*, *15*(2), 16-20.

Tayeh, EA, El-Fangary MA and Hegab MY (2003). Effect of some sources of nitrogen fertilizers on prebearing and bearing Valencia orange trees. Annals of Agric. Sci. Moshtohor, 41(41), 1655-1680.

الملخص العربي

دراسات فسيولوجيه على تسميد شتلات المانجو

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اجريت هذه الدراسه خلال موسمى ٢٠٢٠ و ٢٠٢١ فى صوبة المزرعه البحثيه لمعهد بحوث البساتين مركز البحوث الزراعيه لدراسة تأثير مصادر مختلفه من السماد الأزوتى (اليوريا الغير مغلفه و (اليوريا المغلفه بالفورمالدهيد) والنيتروبين (سماد حيوى)+ اليوريا حيث تم اضافتهم بتركيز ١٠ جم/لتر وباضافه أرضيه تأثير أستخدام تركيزات مختلفه (١٠ و١٥ جم/لتر) من سماد اليوريا وسماد اليوريا فورمالدهيد أظهرت الدراسه تفوق واضح للمعاملة المشتركه بين النيتروبين و اليوريا على تحسين قياسات الطول والسمك المختلفه لشتلات المانجو صنف الكيت بينما احتل السماد بطىء التحلل (اليوريا فورمالدهيد) المركز الثانى فى تحسن النتائج بالمقارنه بمعاملة السماد الكيماوى اليوريا (السماد سريع التحلل) وكذلك نتائج جيده لتراكم الحديد ووجد كذلك ان محتوى شتلات المانجو الكيت فى الكنترول من المنجنيز والزنك والنحاس اعلى من المعاملات المختلفه تحت الدراسه بينما فشلت المعاملات المختلفه فى استحداث أى تغيرات واضحه فى تراكم البورون. أدى استخدام المعاملة المركبه من النيتروبين + اليوريا الى نتائج جيده لتراكم النيتروجين فى الأوراق أثناء موسمى الدراسه وظهر هذا التأثير واضحا أثناء الموسم الثانى لكل من البوتاسيوم والفوسفور بينما فشلت المعاملات المختلفه فى استحداث اختلافات واضحه لكل من الكالسيوم والماغنسيوم كما اظهرت النتائج تفوق واضح للسماد بطئ التحلل (اليوريا فورمالهيد) فى زيادة تراكم الكلوروفيل أ و ب والكاروتين والكربوهيدرات الكليه وكذلك أظهرت معامله النيتروبين + اليوريا حيث أعطت زياده واضحه فى الكلوروفيل أ و ب والكاروتين وذلك بمقارنتها بالسماد سريع التحلل (اليوريا) والكنترول تفوق التسميد باليوريا المغلفه (فورملدهيد يوريا) عن التسميد الكيميائى (اليوريا) باستخدام التركيزين تحت التجربه (١٠ و ١٥ جم/لتر) فى معظم قياسات النمو كما أعطت النتائج زياده واضحه فى تراكم كل من النيترجين والبوتاسيوم كعناصر كبرى فى أوراق شتلات المانجو صنف الكيت عند معاملتها بتركيز ١٠ جم/لتر باى من سماد اليوريا المغلفه أو الغير مغلفه . توصلت النتائج الى حدوث زياده واضحه فى تراكم كل من الحديد والمنجنيز الزنك والنحاس كعناصر صغرى فى أوراق شتلات المانجو صنف الكيت عند معاملتها بتركيز ١٠ جم/لتر من سماد اليوريا المغلفه بمقارنتها بالتركيز الآخر (١٥ جم/لتر) والسماد الغير مغلف بتركيزيه ١٠ و١٥ جم/لتر فى زيادة تراكم الكلوروفيل أ و ب ومحتوى الكاروتين والكربوهيدرات الكليه بمقارنتها بتركيز ١٥جم/لتر