

## **Evaluation of Growth and Productivity of Some Mango Varieties Grown under Aswan Climatic Conditions**

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### **ABSTRACT**

Ten mango varieties Hindy Bisinnara, Zebda, Mabrouka, Taimour, Alphonse, Dabsha, Ewaise, Sukkary, Keitt and Kent grown in a private mango orchard at Wady El-Nokra region, were evaluated under Aswan governorate climatic conditions during two successive experimental seasons of 2011 and 2012 years. Evaluation parameters included: growth characters, flowering aspects, fruit setting %, fruit dropping %, yield per tree and fruit physicals and chemicals properties were determined in these mango varieties. Results showed that there was a wide and major variation of these parameters among the studied varieties. Mango cv.s Hindy Bisinnara, Zebda, Mabrouka, Taimour, Alphonse, Dabsha, Ewaise, Sukkary, Keitt and Kent, in descending order is recommended to be cultivated successfully under Aswan conditions, based on their higher yields and relatively better fruit quality.

**Keywords:** Mango varieties, Fruit setting, Fruit dropping, Descending order, Aswan conditions

### **1. INTRODUCTION:**

In Aswan region where the present study took place, mango ranks the second crop after date palms, since it occupies more than 1500 feddans produced 6075 metric tons fruit (2011 statistics). Additionally, in Egypt, the total cultivated area with mango reached 209040 Fed. in 2010 (Statistics' of 2011, Ministry of Agriculture, Egypt). The average yield per feddan is only 3.33 Ton. Generally, in spite of the fact that Egypt has good opportunity for mango production, productivity of different mango varieties is associated with soil and climatic conditions [El- Masry and Said- Galila, 1998]. Overcoming the incomplete understanding about the prime mango cv.s grown successfully in Aswan region is necessary as a guide for mango growers. Different varieties of mango were varied in their performance and these differences are governed by genetical and environmental factors.

Previous studies showed that there was a wide differences on growth and fruiting behaviours among various mango varieties grown under various climatic conditions [Donadio et al., 1994; Gowda and Ramanjaneya, 1995; Donadio, 1995; Galan- Sauco, 1996; Guzman et al., 1997; Abou- Rageb- Zainab, 1997; Avilan et al., 1998; Ahmed et al., 1998; Concalves et al., 1998; Kakar et al., 1999; Coo and Wang, 1999; Dod et al., 1999; Hammam, 2000; Mohamed, 2002; Mouftah, 2007; Avilan and Rodrigues, 2008 and Baghel and Nema, 2009].

This study was an attempt to know more about growth, flowering, fruit setting %, fruit dropping %, yield as well as physical and chemical characteristics of fruits of mango cv.s Hindy Bisinnara, Zebda, Mabrouka, Taimour, Alphonse, Dabsha, Ewaise, Sukkary, Keitt and Kent grown under Aswan region conditions.

## **2. MATERIALS AND METHODS:**

The present study was carried out to evaluate ten mango varieties namely Hindy Bisinnara, Zebda, Mabrouka, Taimour, Alphonse, Dabsha, Ewaise, Sukkary, Keitt and Kent during 2011 and 2012 seasons. Forty (four trees  $\times$  ten cultivars) 12 years old mango trees were carefully selected and planted in a private mango orchard located at Wady El- Nokra region Aswan governorate, at  $7 \times 7$  meters in sandy soil, and drip irrigated with Nile water was adopted. All the selected trees received similar and regular horticultural practices which are already applied in the orchard. A complete randomized block design was followed.

Evaluation continued through two successive seasons in 2011 and 2012 seasons. The following measurements were recorded: Shoot length (cm.) and leaf area ( $m^2$ ) were measured according to [Ahmed and Morsy, 1999]. In the Spring growth cycle, number of panicles per tree, number of flowers per panicle, percentages of male and perfect flowers, initial fruit setting % , fruit retention % , June fruit dropping % , preharvest fruit dropping % , harvesting date and yield / tree (kg.) were calculated and recorded. Pomological characteristics of fruit: including physical fruit properties i.e fruit weight (g.) and edible to non- edible portions, and chemical fruit properties i.e total soluble solids % , total and reducing sugars % , total acidity % (as g a citric acid/ 100 ml juice), fiber % , tannins % and vitamin C content (mg/ 100 ml juice) were determined according to [A.O.A.C., 1995].

The obtained data were statistically analyzed according to the procedures outlined by [Snedecor and Cochran 1972] using new L.S.D

test at 5% to approve the differences between mango varieties statistically.

### **3. RESULTS AND DISCUSSION:**

#### **Growth characters:**

Data in Table (1) showed that the differences among the ten mango varieties, concerning the two growth traits, the shoot length and leaf area in the spring growth cycle were statistically significant in most cases and during both seasons. The maximum values of the shoot length were recorded in Hindy Bisinnara, Zebda and Mabrouka mango cv.s in ascending order. Dabsha and Sukkary mango cv.s gave the highest leaf area. The lowest values of shoot length and leaf area were recorded in Kent and Keitt mango cv.s. These results are in agreement with those obtained by [Hammam, 2000; Mohamed, 2002].

#### **Flowering aspects:**

It is clear from the data in Table (1) that great variation was observed on the number of panicles per tree, number of flowers per panicle as well as percentages of male and perfect flowers among the ten mango varieties. The maximum number of panicles per tree was recorded in Taimour and Mabrouka cv.s. Mango cvs Ewaise and Alphonse produced the maximum number of flowers per panicle. The lowest percentages of male flowers were recorded of Sukkary and Hindy Bisinnara mango cv.s, but the percentages of perfect flowers were maximized in the same varieties. Significant differences on these flowering aspects were detected among the ten mango cvs. Similar trend was observed during both seasons. These results are in agreement with those obtained by [Hammam, 2000; Mohamed, 2002].

#### **Fruit setting %:**

Table (2) obviously reveals that significant differences were observed on the percentages of initial fruit setting and fruit retention among most mango cvs. The highest initial fruit setting % was recorded in mango cv.s Hindy Bisinnara, Keitt and Kent, while mango cv.s Ewaise and Dabsha produced the minimum values of initial fruit setting %. The maximum values of fruit retention were recorded in Zebda, Sukkary, Hindy Bisinnara and Mabrouka mango cv.s. The lowest values of fruit retention were recorded in cv.s Kent, Keitt and Taimour. These results were true during both seasons. These results are in harmony with those obtained by [Dod, et al., 1999; Baghel and Nema, 2009].

### **June and preharvest fruit dropping percentages:**

It is clear from the data in Table (2) that percentages of June and preharvest fruit dropping were significantly varied among the ten mango varieties. Percentage of June dropping significantly lowered in mango cv.s Hindy Bisinnara and Dabsha, while it was maximized in Sukkary and Kent mango cv.s. Mango cv.s Hindy Bisinnara and Sukkary had the lowest values of preharvest fruit dropping. The maximum values of preharvest fruit dropping were recorded in the mango cv.s Mabrouka, Kent and Keitt. These results were true during 2011 and 2012 seasons. These results are in conformity with those obtained by [Mouftah, 2007; Avilan and Rodrigues, 2008].

### **Harvesting date:**

Harvesting date as shown in Table (2) was significantly varied among the ten mango cv.s. Mango cv.s Hindy Bisinnara, Alphonse, Ewaise and Sukkary ripened early, while Dabsha, Keitt and Kent mango cv.s were in late of maturity date. Similar trend was noticed during both seasons. These results of [Hammam, 2000] were supported the present results.

### **Yield/ tree:**

Yield expressed in weight was significantly varied among the ten mango cv.s. It was maximized in mango cv.s Hindy Bisinnara, Zebda and Mabrouka, in descending order. Mango cv.s Kent, Keitt, Sukkary and Ewaise produced minimum values. The yield of mango cv.s Hindy Bisinnara and Zebda reached 155.5 & 171.6 kg and 140.0 & 100.0 kg during 2011 and 2012 seasons, respectively. These results were true during both seasons (Table 2). These results are in harmony with those obtained by [Hammam, 2000; Mohamed, 2002; Mouftah, 2007].

### **Some physical and chemical characteristics of the fruit:**

It is evident from the data in Tables (2 and 3) that fruit weight, edible to non- edible portions, total soluble solids %, total and reducing sugars %, total, acidity %, fiber %, tannins % and vitamin C content were significantly varied among the ten mango varieties. The largest fruits were recorded in Keitt, Taimour, Dabsha and Kent mango cvs, in ascending order. The small fruits were recorded in Hindy Bisinnara, Sukkary and Ewaise mango cv.s, in ascending order. The maximum values of total soluble solids and total and reducing sugars were

recorded in Ewaise, Sukkary and Taimour fruits. Fibre content was lowered in mango cvs Ewaise, Sukkary and Taimour, while the higher was found in the fruits of Keitt, Kent, Zebda, Mabrouka and Alphonse mango cv.s. Mango cv.s Sukkary, Ewaise and Taimour had lower tannin content. The mango cv.s Kent, Keitt and Dabsha registered the maximum values of tannins. The highest values of vitamin C were found in Ewaise and Hindy Bisinnara fruits. But, Kent and Keitt cv.s had lower content of vitamin C. These results were true during both seasons. These results are in harmony with those obtained by [Hammam, 2000; Mohamed, 2002; Mouftah, 2007].

It could be concluded from the obtained results that the ten mango varieties are widely different in their growth, flowering and fruit setting aspects, yield and fruit quality. This variations could be mainly due to their genetically differences as well as the reaction between genetical and environment. Mango cv.s Hindy Bisinnara, Zebda, Mabrouka and Taimour considered the best four promising mango cv.s grown successfully under Aswan climatic conditions.

#### REFERENCES:

- Abou- Rageb- Zainab, A. M. (1997).** Physiological studies on some mango cultivars grown under Fayoum conditions. M. Sc. Thesis, Fac. of Agric, Cairo Univ., Egypt.
- Ahmed, F. F and Morsy, M. H. (1999).** A new method for measuring leaf area in different fruit species. *Minia. J. of Agric .Res. & Dev.* (1) pp 97 – 104.
- Ahmed, F. F.; Mansour, A. E. M. and Ahmed, A. M. (1998).** A comparative study on flowering of nine mango cultivars grown under new reclaimed sandy soil. *Egypt J. Hort.* 25 No. 2 pp 187 – 193.
- Association of Official Agricultural Chemists (1995).** Official Methods of Analysis (A.O.A.C) 14<sup>th</sup> Ed, Benjamin Franklin Station, Washington, D.C, U.S.A. pp 490 – 510.
- Avilan, L.; Dorontes, I.; Rodriguez, M. and Arell- Amo, J. (1998).** Characterization and flowering behaviour of several mango cultivars. *Agronomic Tropical (Maracay)* 48 (1) 69 – 82.
- Avilan, L.; and Rodriguez, M. (2008).** Evaluation of some mango cvs grown under India. *Agronomic Tropical* 58 (1): 100 – 110.
- Baghel, B. S. and Nema, M. K. (2009).** Physiological studies on some mango cvs grown under Jabalpur conditions. *Recent Hort.* 16 (1): 10 – 20.

- Coo, X. and Wang, H. (1999).** Matoumang, a promising mango variety in Huizhou District. *South China Fruits* 28 (2): 33 – 41.
- Dod, V. N; Bharad, S. G. and Jadhao, B. J. (1999).** Flowering and fruiting behaviour of different varieties of mango (*M. indica* L.) under hot and dry climatic condition of Akola. *Crop Res. Hisar.* 17: 3, 29 – 332.
- Donadio, L. C. (1995).** Mango cultivars evaluation for processing. *Acta Hort.* No. 3799 137 – 140. 42.
- Donadio, L. C; Soares, N. B. and Sempionato, O. (1994).** Evaluation of mango varieties in San Paulo Brazil. *Proc. of the Interamer. Soc. for Tropical Hort.* 38, 32 – 36.
- EI- Masry, H. M. and Said- Galila, A. (1998).** Mango Varieties in Egypt. *Hort. Service Unite. Agric. Ministry* pp, 1 – 233.
- Galan- Saucó, V. (1996).** Main local mango types from the Canary Islands. *Mesfin Newsletter*, 2(1): 4 – 5.
- Goncalves, N. B; Carvahó, V. D. E; Goncalves, J. R; Coetho, S. R. M.; and Silva, T. (1998).** Physical and chemical characterization of fruit of mango (*Mangifera indica* L.) cultivars. *Cincia Agrotecnologica* 22 (1): 72 – 78.
- Gowda, I. N. D. and Ramanjaneya, K. H. (1995).** Evaluation of some mango varieties for their suitability for canned mango juice. *J. of Food Sci. and Technology* 32 (4) 323 – 325.
- Guzman, E. C.; Lavi, U.; Deganic, C.; Gazit, S.; Lahav, E.; Pesis, E.; Prusky, D.; Tomer, E. and Wysoki, M. (1997).** Fruit drop and yield of five mango cultivars in Southern Sinaloa. *Proc. of the 5<sup>th</sup> Inter. Mango Symp., Tel Aviv, Israel* 1 – 6 Sep. Vol. (1): *Acta Hort.* No. 455, 459 – 464.
- Hamman, M. S. (2000).** Evaluation of growth characteristics, alternate bearing and fruiting of nine mango cultivars grown under Sohag region climatic conditions. *J. of Agric. Sci, Mansoura Univ.* 27(3): 1693 – 1703.
- Kakar, A. A.; Sheikh, M. A.; Jamro, G. H. and Lagove, M. I. (1999).** Study of morphological characteristics of mango varieties. *Sarhad J. of Agric.* 15 (4): 297 – 298.
- M.A.L.R. (2011).** Ministry of Agriculture, and Land Reclamation Statistics. *Egypt*, Pp. 320.
- Mohamed, A. Y. A. (2002).** Morphological and biochemical studies on some mango cultivars grown in Aswan Governorate. *Ph. D. Thesis Fac. of Agric. Minia Univ. Egypt.*

- Mouftah, R. T. (2007).** Response of Taimour and Zebda mango trees to application of organic and biofertilization along with seaweed extract. Ph. D. Thesis. Fac. of Agric. Minia Univ. Egypt.
- Snedecor, G. W. and Cochran, G. W. (1972).** Statistical Methods. 6<sup>th</sup> Ed. Iowa State Univ. Press. Am. Iowa. U.S.A. pp 50 – 67.

### تقييم نمو وإنتاجية بعض أصناف المانجو تحت ظروف أسوان المناخية

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أجريت هذه الدراسة خلال موسمي ٢٠١١ و ٢٠١٢ بهدف تقييم عشرة أصناف مانجو نامية تحت ظروف محافظة أسوان هي الهندي بسنارة، الزيدة، المبروكة، التيمور، الفونس، الدبشة، العويس، السكري، الكيت والكنت ولقد تم تقدير صفات النمو الخضري، خصائص الأزهار والنسبة المئوية لعقد الثمار ونسب تساقط الثمار وكمية محصول الشجرة وكذلك الخصائص الطبيعية والكيميائية للثمار في هذه الأصناف.

أشارت نتائج الدراسة أن هناك إختلافات جوهرية كبيرة في هذه المقاييس ما بين أصناف المانجو تحت الدراسة. أصناف المانجو الهندي بسنارة، الزيدة، المبروكة، التيمور، الفونس، الدبشة، العويس، السكري، الكيت والكنت مرتبة ترتيبا تنازليا يوصي بزراعتها بنجاح تحت ظروف أسوان اعتماداً على إنتاجيتها الكبيرة وخصائص الجودة العالية نسبيا لثمارها.

**الكلمات المفتاحية:** أصناف المانجو، الثمار العاقدة، الثمار المتساقطة، الترتيب التنازلي، الظروف البيئية لأسوان.

**Table 1: Growth Characters as Well as Flowering and Fruit Setting Aspects of the Ten Mango cvs Grown under Aswan Region Conditions in 2011 and 2012 Seasons.**

Mango cvs	Shoot length (cm.)		Leaf area (cm <sup>2</sup> )		No. of panicles per tree		No. of flowers per panicle		Male flowers %		Perfect flowers %		Initial fruit setting %	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Hindy Bisinnara	20.5	20.9	107.0	108.7	315.0	325.0	1700.0	1600.0	82.0	80.0	18.0	20.0	13.00	12.0
Zebda	19.3	19.8	141.0	142.8	381.0	396.0	1500.0	1700.0	91.5	92.0	8.5	8.0	3.00	3.25
Mabrouka	19.0	19.4	95.0	96.7	550.0	560.0	780.0	790.0	86.0	87.0	14.0	13.0	4.80	4.80
Taimour	18.0	18.5	95.0	96.8	591.0	550.0	1400.0	1450.0	91.0	89.0	9.0	11.0	4.57	4.71
Alphonse	16.9	17.3	86.0	87.6	400.0	360.0	2200.0	2100.0	88.0	89.0	12.0	11.0	3.72	3.83
Dabsha	15.8	16.2	160.0	161.6	341.0	279.0	1400.0	1400.0	96.0	97.0	14.0	13.0	1.55	1.61
Ewaise	15.7	16.0	95.0	96.7	350.0	311.0	3100.0	3200.0	96.0	95.5	14.0	14.5	0.75	0.74
Sukkary	15.6	15.5	146.0	146.7	380.0	300.0	901.0	911.0	80.0	81.0	20.0	19.0	3.50	3.41
Keitt	15.4	15.2	85.0	87.0	200.0	210.0	1400.0	1410.0	88.0	88.0	12.0	12.0	6.25	6.30
Kent	15.3	15.1	88.0	89.4	185.0	200.0	1200.0	1250.0	86.0	86.0	14.0	14.0	5.55	5.62
New L.S.D at 5 %	1.0	1.1	2.2	2.4	10.0	9.9	7.1	7.5	2.9	3.1	2.5	2.3	1.11	1.14



**Table 2: Fruit Retention %, June and Preharvest Fruit Dropping %, Yield and Some Fruit Physical Characters of the Ten Mango cvs Grown under Aswan Region Conditions in 2011 and 2012 Seasons.**

Mango cvs	Fruit retention %		June drop %		Preharvest fruit dropping %		Harvesting date		Yield/ tree (kg.)		Fruit weight (g.)		Edible to non edible portion	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Hindy Bisinnara	0.39	0.29	37.0	35.0	25.0	30.0	26June	26June	155.5	171.6	140.0	150.0	1.70	<b>1.52</b>
Zebda	0.60	0.32	40.0	41.0	40.0	45.0	1 July	30June	140.0	100.0	300.0	330.0	1.99	<b>3.92</b>
Mabrouka	0.25	0.22	50.0	55.0	85.0	88.0	1 July	1 July	125.0	110.0	241.0	261.0	2.01	<b>1.95</b>
Taimour	0.11	0.14	50.0	59.0	65.0	70.0	30June	1 July	120.0	140.0	360.0	375.0	3.10	<b>3.15</b>
Alphonse	0.20	0.14	49.0	53.0	50.0	55.5	25June	26June	110.0	95.0	181.0	191.0	1.50	<b>1.75</b>
Dabsha	0.20	0.11	37.0	41.0	55.0	69.0	25July	25July	100.0	90.0	340.0	361.0	2.60	<b>2.45</b>
Ewaise	0.15	0.10	50.0	48.7	31.0	30.0	26June	26June	93.0	80.0	160.0	171.0	1.50	<b>1.25</b>
Sukkary	0.41	0.22	61.0	52.2	25.0	36.3	26June	26June	88.0	80.0	155.0	161.0	1.55	<b>1.25</b>
Keitt	0.12	0.09	50.0	56.0	74.0	72.0	25July	27July	60.0	50.0	371.0	381.0	2.75	<b>2.50</b>
Kent	0.11	0.10	59.0	60.0	76.0	78.2	25July	25July	50.0	45.0	350.0	360.0	2.50	<b>2.25</b>
New L.S.D at 5 %	0.02	0.02	2.4	2.3	3.0	3.4	--	--	5.3	5.8	21.2	22.1	0.14	0.15

**Table 3: Fruit Chemical Characteristics of the Ten Mango cvs Grown under Aswan Region Conditions in 2011 and 2012 Seasons.**

Mango cvs	T.S.S		Total acidity		Total sugars		Reducing sugars		Vitamin C		Fibre		Tannins	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
	%	%	%	%	%	%	%	%	(mg/100 g juice)	%	%	%	%	%
Hindy Bisinnara	19.3	20.2	0.370	0.380	14.7	15.2	6.8	7.1	47.0	46.0	0.7	0.6	0.09	<b>0.11</b>
Zebda	14.0	14.3	0.373	0.379	11.0	11.2	4.7	4.6	29.0	30.0	0.8	0.8	0.11	<b>0.11</b>
Mabrouka	16.9	17.3	0.390	0.399	12.2	12.5	6.0	6.3	26.0	27.3	0.8	0.8	0.11	<b>0.12</b>
Taimour	20.0	20.5	0.340	0.383	14.8	14.6	7.1	7.2	26.0	28.0	0.6	0.6	0.08	<b>0.08</b>
Alphonse	19.7	19.7	0.490	0.471	14.9	15.1	7.0	6.9	25.0	25.0	0.8	0.8	0.10	<b>0.10</b>
Dabsha	14.5	14.8	0.400	0.391	11.2	11.3	5.1	4.9	25.0	25.0	0.7	0.7	0.12	<b>0.12</b>
Ewaise	22.0	22.0	0.340	0.350	17.2	17.4	8.2	8.4	50.0	51.0	0.5	0.5	0.06	<b>0.06</b>
Sukkary	20.0	20.0	0.350	0.360	16.1	16.3	5.3	5.0	30.0	30.0	0.6	0.6	0.06	<b>0.06</b>
Keitt	16.5	16.5	0.380	0.388	13.0	13.0	5.4	5.3	24.0	25.0	0.9	0.9	0.18	<b>0.18</b>
Kent	16.0	16.0	0.400	0.371	12.6	12.6	5.0	5.1	22.0	23.0	0.9	0.9	0.19	<b>0.20</b>
New L.SD at 5 %	0.9	0.8	0.021	0.027	0.7	0.8	0.3	0.3	1.2	1.3	0.2	0.2	0.02	0.02