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V-SUMMARY AND CONCLUSION

This study was established during three consecutive seasons of 1999, 2000 and 2001 in a private mango orchard situated at Kom Ombo region, Aswan Governorate on twenty grafted mango cultivars (thirteen polyembryonic and seven mono-embryonic mango cvs). The thirteen polyembryonic mango cvs were Hindy Sennara, Zebda, Misk, Goleck , Taimour, Long, Ewase, Aremanis , Hindy El-khassa, Sadiek, Sukkary, Ceylan No 48 and Bullock's Heart. The seven monoembryonic mango cvs were Mabrouka, Dabsha, Tota pari, Alphonse, Langra Banares , Fagri Kalan and Keitt.

The goal of this study was to evaluate the behaviour of these mango cvs grown under Aswan conditions as well as to know more about these mango cvs for detecting the prime mango cvs in such region.

All mango cvs except Fagri Kalan and Keitt were 18years old at the start of the experiment . Both mango cvs Fagri Kalan and Keitt trees were nine years old. Trees of all mango cvs. were planted at 7.0 X 7.0 meter apart. Each cultivar was represented by five trees. The soil texture of the tested orchard is silty clay with a water table depth not less than two meters . All the undertaken mango cvs received a basal recommended fertilizer including the application of 20m³ farmyard manure, 450 kg. ammonium sulphate and 200kg mono calcium superphosphate and the same amount of potassium sulphate per feddan , in addition to the regular agricultural and horticultural practices which were followed in the orchard including pruning, hoeing, irrigation with Nile water as well as pathogens, pest and weed control .

The experiment was arranged in completely randomized blocks design with five replicates one tree per each.

Generally, the following measurements in all the tested mango cvs were recorded during the three seasons of the study.

- 1- Length and thickness of shoot, number of leaves per shoot as well as width, length and area of leaf in the three growth cycles.
- 2- Flowering aspects such as dates of first and full bloom, anthesis period, number of panicles pr tree, panicle length, number of flowers per panicle , percentages of male and perfect flowers and sex ratio.
- 3- Percentages of initial fruit setting and fruit retention
- 4- Percentages of June and preharvest fruit dropping.
- 5- Yield expressed in weight (kg) and number of fruits per tree.
- 6- Physical properties of the fruits namely weight, size, width length, thickness and shape of fruit, percentages of pulp, seeds and peels and ratio between edible and non edible portions.
- 7- Chemical characteristics of the fruits including the percentages of total soluble solids, total, reducing and non reducing sugars, total acidity, fibre, protein, fat, and total tannins. Total soluble solids /acid and vitamin C content were also calculated.
- 8- Susceptibility of the mango cvs fruits to infection with fruit rot.
- 9- Storage duration of fruits under room temperature.

The nearly same obtained results in the three seasons could be arranged under the following main topics.

1- Growth aspects in the three growth flushes.

1-1 The shoot length in the three growth cycles:

There was remarkable differences on the shoot length in the three growth flushes among the twenty mango cvs, Dabsha mango cv recorded the lowest shoot length of Spring growth cycle and the maximum shoot length was registered in mango cv Goleck. Shoot length in the summer growth cycle reached the minimum in mango cv Dabsha and the

maximum value was presented in Tota pari mango cv. The maximum values of shoot length in Autumn growth cycle were recorded in mango cvs long, Zebda , Misk , Langra Banares , Dabsha , and Bullock's Heart, in descending order. Mango cvs. Ewase Fagri Kalan and Taimour recorded the minimum values in Autumn growth cycle.

1-2 The shoot thickness in the three growth cycles:-

Mango cv Taimour produced the thickest shoots in the Spring growth cycle compared to the other mango cvs. Mango cvs long , Sukkary and Hindy-El Khassa produced the minimum shoot thickness in the Spring growth cycle.

In the summer growth cycle, the maximum values of shoot thickness were recorded in mango cvs Alphonse, Taimour Dabsha and Sukkary. Mango cvs Langra Banares, Hindy-El Khassa , Ewase and Keitt produced the thinner shoots.

The thickest shoots of Autumn growth cycles were recorded in mango cvs Dabsha Aremanies and Zebda. While the thinnest shoots were recorded in mango cvs Sukkary, Fagri kalan , Langra Banares and Alphonse.

1-3 Number of leaves per shoot in the three growth cycles.

Number of leaves per shoot in the three growth cycles was varied among the twenty mango cvs. The maximum number of leaves per shoot in the Spring growth cycle were recorded on mango cvs. Goleck , Ewase and Sukkary. Mango cvs Keitt, Dabsha and Hindy El-Khassa bore the shoots with the lowest number of leaves .

In summer growth cycle, the lowest values of number of leaves per shoot were recorded in mango cvs keitt and Hindy Sennara mango cv. Bullocks Heart bore the shoots with the maximum number of leaves.

Number of leaves per shoot in the Autumn growth cycle was minimized in mango cv Hindy Sennara. However, the maximum values were recorded in mango cv. Bullock's Heart, long and Mabrouka.

1-4 Leaf width in the three growth cycles:-

Leaf width in the three growth cycles was considerably varied among the twenty mango cvs. In Spring growth cycle, the minimum values were recorded in Alphonse mango cv. On the other hand, mango cv Dabsha achieved the maximum value. In Summer growth cycle, leaf width was minimized in mango cvs Keitt and maximized in mango cv. Dabsha.

Taimour mango cv recorded the lowest value of leaf width in Autumn growth cycle. The maximum values were registered in Zebda, Aremanis and Hindy Sennara mango cvs.

1-5 Leaf length in the three growth cycles:

A remarkable variation on leaf length in the three growth cycles was observed among the twenty mango cvs.

In Spring growth cycle, the minimum values were recorded in Aremanis mango cv. While the maximum values were recorded on mango cv. Dabsha. In Summer growth cycle, the minimum values of leaf length were recorded in mango cv Keitt and the maximum values were obtained in mango cv. Dabsha. In Autumn growth cycle, Ewase mango cv produced the leaves with the lowest length. The maximum leaf length was recorded in mango cv Hindy El-Khassa.

1-6 Leaf area in the three growth cycles :

There was great variations on the leaf area in the three growth cycles among the twenty mango cvs.

The maximum leaf area of the Spring growth cycle was recorded in mango cv. Dabsha. Mango cvs Alphonse and Aremanis produced the lowest value of leaf area. Keitt mango cv recorded the minimum leaf

area in the Summer growth cycle. The maximum values obtained in mango cv. Dabsha.

The maximum and minimum values of leaf area in Autumn growth cycle were recorded in Hindy El-Khassa and Taimour mango cvs, respectively.

1-7 Growth aspects as average of the studied mango cvs in the three growth cycles.

Values of growth aspects in the investigated mango cvs varied according to growth cycle, Growth characters namely shoot thickness, leaf dimensions and area were maximized in Spring growth cycle. Shoot length and number of leaves per shoot were tended to promote in Autumn growth cycles compared to the other growth cycles.

2-Flowering , fruit setting and fruit dropping .

2-1 First bloom date .

First bloom date was varied among the twenty mango cvs. The early in bloom mango cvs were Hindy Sennara , Alphonse , Aremanise , Ewase , Zebda , Goleck, Taimour , Long and Hindy El-Khassa. They bloomed during the periods from the first week to the fourth week of January. The other mango cvs started bloom through February.

2-2 Full bloom date:

Most of the studied mango cvs full bloomed through February and March except mango cv. Misk that full bloomed on the first week of April . Full bloom date of mango cvs Hindy Sennara, Goleck, Alphonse and Aremanis was between the third week and last week of February.

2-3 Anthesis period:-

Anthesis period was varied among the twenty mango cvs. It varied from four to seven weeks for all the twenty mango cvs.

2-4 Number of panicles per tree.

Number of panicles per tree was considerably varied among the twenty mango cvs. The minimum values of panicles number per tree were recorded in mango cvs Keitt, Fagri Kalan, Alphonse , Goleck, Hindy Sennara, Tota pari and Sadiek. The mango cvs Langra Banares and Aremanis produced the maximum values.

2-5 Length of panicle:-

The minimum panicle length was observed in mango cvs Aremanis and Zebda. The maximum length of panicle was observed in mango cv Misk.

2-6 Number of flowers per panicle:-

The maximum number of flowers per panicle was detected in mango cvs Ewase, Tota pari and Alphonse. Mango cvs Aremanis, Goleck, Mabrouka and Sukkary recorded the minimum values.

2-7 Percentages of male and perfect flowers in panicle:

Percentages of male and perfect flowers in panicle were materially varied among the twenty mango cvs. The maximum values of male flowers percentage in the panicle were recorded in mango cvs. Dabsha , Ewase and Tota pari. Panicles of mango cvs Bullock's Heart and Langra Banares bore, the minimum values of male flowers. Panicles of both mango cvs Langra Banares and Bullock's Heart had the maximum percentage of perfect flowers. The minimum values were recorded on the panicles of mango cvs Dabsha and the Tota pari.

2-8 Sex ratio in the panicle :-

Panicles of mango cv Dabsha had the maximum sex ratio compared to the other mango cvs. Mango cvs Bullock's Heart and Langra Banares recorded the minimum sex ratio.

2-9 Percentages of initial fruit setting and fruit retention

Percentages of initial fruit setting and fruit retention were substantially varied among the twenty mango cvs. The minimum initial

fruit setting was recorded in mango cvs Ewase , Dabsha , Tota pari and Misk. Mango cvs. Hindy Sennara, Long , Langra Banares and, Fagri Kalan had the maximum values. The maximum and minimum percentages of fruit retention were recorded in mango cvs Zebda and Tota pari, respectively.

2-10 Percentages of June and preharvest fruit dropping:

The highest June drop percentage was detected in mango cvs Bullock's Heart, Aremanis, Sadiék, Sukkary and Hindy El-Khassa. Mango cvs Dabsha recorded the minimal value of June drop. The lowest value of preharvest fruit dropping was recorded in mango cvs Ceylan No.48, Sukkary , Hindy Sennara, Ewase and Zebda. Mango cvs Mabrouka, Langra Banares, Fagri Kalan , Keitt and Tota Pari produced the maximum values .

3-Harvesting date and yield:-

3-1 Anthesis-harvest period and harvesting date:

Anthesis-harvest period ranged from 14 to 22 weeks for all the studied mango cvs. Harvesting date for all mango cvs was through June and July. The early in harvesting date mango cvs were Hindy, Sennara, Goleck, Taimour Ewase , Alphonse , Aremanis , Hindy El-Khassa , Sadiék, Sukkary and Ceylan No. 48 . They were harvested in June. The other mango cvs were harvested in July .

3-2 Number of fruits and yield per tree :

Yield expressed in weight(kg) and number of fruits per tree was varied among the twenty mango cvs.

Mango cvs Hindy Sennara, Long, Ewase, Misk and Alphonse had the maximum number of fruits per tree, in descending order. The lowest number of fruits was recorded in mango cvs Keitt and Fagri Kalan.

Yield expressed in weight was maximized in mango cvs Hindy Sennara, Zebda , Misk Mabrouka, Taimour, Long Ewase and Dabsha .

Yield was low in mango cvs Keitt and Fagri Kalan. An intermediate yield was detected in mango cvs. Tota pari , Alphonse, Aremanis, Langra Banares, Hindy El-Khassa, Sadiek and Sukkary.

4-Physical and chemical characteristics of the fruits:

4-1 Physical properties of the fruits

4-1-1 Weight and size of fruit.

Weight and size of fruit were varied among the twenty mango cvs. The minimum values of fruit weight was recorded in mango cvs long, Hindy Sennara, Sukkary , Dabsha , Misk and Alphonse Mango cvs Goleck , Fagri Kalan , Keitt and Tota pari produced the fruits with the greatest weight. Fruit size was maximized in mango cvs Goleck, Fagri Kalan and Keitt.

4-1-2. Percentages of pulp, seeds and peels in the fruits

The maximum values of pulp percentage was presented in fruits of mango cvs Aremanis , Fagri Kalan, Goleck. Bullock's Heart and Ceylan No.48 . The minimum percentage of pulp was recorded in the fruits of mango cvs Long. Ewase , Alphonse and Misk . The minimum percentage of seed was recorded in the fruits of mango cv Goleck, while the maximum values were detected in the fruits of mango cvs Long and Misk. The minimum values of fruit peel weight percentage was recorded in mango cvs Ceylan No.48, Bullock's Heart, Fagri Kalan, Aremanis and Goleck.

4-1-3 Edible / non- edible portions.

The highest edible / non-edible portions were recorded in the fruits of mango cvs Aremanis, Zebda and Goleck. The lowest values were recorded on mango cvs Long, Ewase, Alphonse, Misk, Sukkary, Hindy Sennara, and Hindy El-Khassa.

4-1-4 Thickness , length , width and shape of fruit.

They were considerably varied among the twenty mango cvs.

The maximum fruit thickness was observed in mango cvs Fagri Kalan, Dabsha, Taimour and Keitt. The thinner fruits were recorded in mango cvs Long and Hindy Sennara.

Fruit length was maximized in mango cvs Goleck, Tota pari and Fagri Kalan . Alphonse mango cv. had the fruits with the lowest fruit length. Fagri Kalan mango cv. had the greatest fruit width, while the lowest value of fruit width was recorded in mango cv long. Fruits of mango cvs, Alphonse , Sukkary, Ewase, Misk , Keitt and Zebda tended to be roundish , while fruits of Goleck , Sadiek Long, Hindy Sennara and Hindy El-Khassa tended to be elongated.

4-2 Chemical characteristics of the fruits

4-2-1 Percentage of total soluble solids.

The maximum values of total soluble solids in the pulp were detected on mango cvs Ewase, Taimour , Alphonse , Hindy El-Khassa , Hindy Sennara and Ceylan No.48 . The minimum values were recorded in the fruits of Misk, Long and Zebda.

4-2-2 Percentage of total acidity

Total acidity percentage was minimized in the pulp of mango cvs Goleck, Ceylan No. 48, Taimour, Aremanis , Ewase , Alphonse, Hindy Sennara, Zebda , Fagri Kalan and Hindy El-Khassa. The other mango cvs had fruits with the highest total acidity.

4-2-3 Ratio between total soluble solids and acid.

Mango cvs had the highest ratio in the pulp were Ewase, Goleck, Taimour, Ceylan No.48 , Alphonse , Hindy Sennara and Hindy El-Khassa. The lowest values were detected on the pulp of mango cvs. Misk and long .

4-2-4 Percentages of total, reducing and non-reducing sugars in the pulp.

The maximum values of total sugars in the pulp were detected on mango cvs . Ewase, Taimour , Alphonse, Hindy El-Khassa, Hindy Sennara, Ceylan No.48 and Goleck. Mango cvs Misk, Long and Zebda produced the fruits with the minimum total sugars. Percentage of reducing sugars in the pulp was maximized in mango cvs Ewase, Taimour and Alphonse, in descending order. The lowest values were obtained in the mango cvs Misk, Zebda , Long and Dabsha. The maximum values of sucrose was recorded in the pulp of mango cvs Ewase , Taimour and Alphonse. The lowest percentage of sucrose was obtained in the pulp of mango cvs Long, Misk and Zebda .

4-2-5 Percentage of protein in the pulp

The maximum percentage of protein was presented in the pulp of mango cvs Bullock's Heart, Dabsha , Hindy Sennara and Sukkary. The lowest values were recorded in the pulp of mango cvs Long, Zebda, Misk and Sadiek.

4-2-6 Percentage of fat in the pulp:

Mango cvs Goleck and Dabsha produced the fruits with the highest value of fat. The lowest value of fat was recorded in the pulp of mango cvs Bullock's Heart. Tota pari and Mabrouka.

4-2-7 Percentage of Fibre in the pulp:

The maximum value of Fibres in the pulp was recorded in mango cvs Tota pari, Keitt, Aremanis and Hindy El-Khassa Mango cv. Ewase , Taimour, Hindy Sennara , Dabsha and Long had the fruits with the lowest fibres content .

4-2-8 Percentage of total tannins in the pulp:

The maximum values of total tannins in the pulp was detected in mango cvs Sediek , Tota pari, Langra Banares and Fagri Kalan.

The lowest percentage of total tannins was detected on mango cvs. Ewase, Hindy El-Khassa, Ceylan No.48, Taimour Armanis , Goleck and Hindy Sennara.

4-2-9 Vitamin C content of the fruits

The maximum values of vitamin C were detected on the pulp of mango cvs Goleck, Ewase, Aremanis and Hindy Sennara.

Mango cvs Misk, Ceylan No.48, Bullock's, Heart and Zebda produced the fruits with the lowest vitamin C content.

5-Susceptibility to fruit rot disease incidence of the twenty mango cvs.

Hindy Sennara, Zebda , Misk , Dabsha , Alphonse, Sadiek, Sukkary, Ceylan No.48 and Bullock's Heart were susceptibility to fruit rot disease incidence. Mabrouka, Taimour, Ewase, Hindy El-Khassa mango cvs were characterized as moderately resistant to fruit rot disease incidence. Mango cvs Tota pari and Fagri Kalan were leading towards their own highly resistant to fruit rot incidence. Mango cvs Goleck, Aremanis and Keitt were resistant to fruit rot disorder compared to the other mango cvs. The moderately susceptible and highly susceptible to fruit rot disease incidence mango cvs were Long and Langra Banares, respectively. The susceptibility degree of the twenty mango cvs. to fruit rot incidence surely decided the shelf-life of fruits after storing at room temperature.

6- Shelf –life of fruits after harvest:

The maximum shelf-life of the fruits after storing at room was recorded in mango cvs Taimour, Misk, Tota pari and Mabrouka. Fruits of mango cvs Sukkary, Alphonse and Long had the minimum shelf-life.

Conclusion:

It could be concluded from the obtained data that the twenty mango cultivars, Hindy Sennara, Zebda, Misk, Mabrouka, Goleck , Taimour, Long, Ewase , Dabsha , Tota pari, Alphonse , Aremanis, Langra banares , Hindy El-Khassa, Sadiék Sukkary, Ceylan No.48 , Bullock's Heart , Fagri Kalan and Keitt are widely varied towards their behaviour on growth, flowering , fruit setting, fruit dropping, yield, physical and chemical characteristics of the fruits, susceptibility to fruit rot disease incidence and shelf- life of fruits after harvest. Mmango cvs Hindy Sennara , Zebda , Misk , Mabrouka. Goleck, Taimour , Long Ewase, Dabsha, Tota pari and Alphonse are recommended to be cultivated successfully, in descending order under Aswan environmental conditions, Upper Egypt based on relatively better yield and fruit quality. Mango cv. Keitt had low yield but the expectations put such promising cv. in the top in the next year particularly after the trees reached the optimum age for bearing.