

5- SUMMARY AND CONCLUSION

This study was carried out during two successive seasons (1985/86 and 1986/87) to evaluate growth , adaptability , yield and fruit quality of some local cultivars (Hindi , Maghrabi and Mohamed Ali) as compared with the introduced cultivars (Basrai , Williams , Poyo , Paradica , Ambel . and Sindihi) planted , at El-Kanater Horticultural Research Station , Kalubia Governorate.

The plants were planted in March , 1983 on a loamy clay soil using the square system of 3.5 m. apart for Hindi and Basrai cultivars and 4.5 m. apart for other cultivars.

Studied banana cultivars were arranged in a randomized block design with four replicates with 20 mats per each.

Obtained results revealed that :

I- Growth :

1- Pseudostem height of different banana cultivars could be arranged under three ranges of height. The first was < 250 cm. which include Hindi and Basrai (shortest cultivars). The second group had a range 251 - 400 cm. for Williams , Poyo and Maghrabi cultivars in ascending order. The third group had pseudostem taller

than 400 cm. which include Sindihi , Ambel , Paradica and Mohamed Ali cultivars.

2- Pseudostem circumference of different banana cultivars lied under three groups. The first group had pseudostem circumference of less than 86 cm. as Hindi , Ambel and Basrai cultivars. The second one ranged from 87 to 96 cm. as for Poyo , Williams and Maghrabi cultivars in ascending order. The third group exceeded 96 cm. as for Mohamed Ali , Sindihi , and Paradica cultivars.

3- Height/circumference ratio of different banana cultivars could be placed under three groups. The first one had a ratio less than 3.55 which covered Basrai , Hindi and Williams cultivars. The second one varied from 3.56 to 4.74 for Poyo , Maghrabi , Sindihi , and Paradica cultivars in an ascending order. The third exceeded the ratio of 4.75 that involved Mohamed Ali and Ambel cultivars.

4- Total number of leaves per plant of different banana cultivars lied under three classes. The first class with a total number of leaves per plant less than 40 which included Mohamed Ali , Sindihi , Ambel , Paradica , Maghrabi and Poyo cultivars. The second class varied from 40.1 to 43.0 leaves for Williams and Poyo cultivars in a descending order. The third class had > 43 leaves/plant as for both Basrai and Hindi cultivars.

5- Banana cultivars in relation to number of green leaves could be divided into three groups. The first one had < 11.49 as for Maghrabi and Ambel cultivars. The second group differed from 11.5 to 11.9 leaves which resembled Poyo , Basrai and Hindi cultivars. The third group had > 12 functional green leaves. Williams , Mohamed Ali , Sindihi and Paradica cultivars lied under this range.

6- Banana cultivars under study appeared under two categories as total number of suckers was concerned. The first category gave less than 4.5 suckers and included Hindi , Basrai , Poyo , Maghrabi and Williams cultivars. The second one gave more than 4.5 suckers as for Ambel , Mohamed Ali , Sindihi and Paradica cultivars.

7- Whole plant fresh weight of banana cultivars under study appeared to be in three classes. The first class had a fresh weight that was less than 70 Kg. as for Hindi , Basrai and Williams cultivars. The second class varied from 70 to 110 Kg. including Poyo , Maghrabi , and Mohamed Ali cultivars. The third group had fresh weight > 110 Kg. as for Paradica , Ambel , and Sindihi cultivars.

8- Values of leaves fresh weight for studied banana cultivars could be arranged in three ranges. The first range included Hindi , Basrai , Ambel , Mohamed Ali and Sindihi with average leaves weight of < 8.5 Kg. The second range varied from 8.6 to 11.0 Kg. as for Williams and Poyo cultivars. The third category involved Maghrabi and Paradica cultivars with an average leaves weight of > 11.1 Kg.

9- Banana cultivars indicated three levels of pseudostem fresh weight. The first level had a pseudostem of < 50 Kg. fresh weight as for Hindi , Basrai and Williams cultivars. The second one ranged from 51 to 75 Kg. as Poyo , Maghrabi , and Mohamed Ali cultivars. The third level with a pseudostem of > 76 Kg. fresh weight. This category covered Sindihi , Ambel , and Paradica cultivars.

10- Values of different cultivars under study indicated three obvious levels of corm fresh weight. The first one with corms less than 12.7 Kg. as for Hindi , Basrai , and Williams cultivars. On the other hand , the second one with a range of 12.7 to 18.6 Kg. for Poyo ,

Maghrabi and Mohamed Ali cultivars. The third level with corms of more than 18.6 Kg. which covered Sindihi , Ambel and Paradica cultivars.

11- Studied cultivars showed three levels of leaf blade length. On this basis , the first level had leaf blades of less than 200 cm. in length as for Hindi and Basrai cultivars. The second class ranged from 201 to 250 cm. Williams and Sindihi cultivars belonged to this class. The third group had leaf blades longer than 250 cm. which included Poyo , Maghrabi , Paradica , Ambel , and Mohamed Ali cultivars.

12- Banana cultivars could be divided into three groups with respect to leaf blade width. The first group included Poyo , Paradica , Ambel , and Sindihi cultivars with narrow leaves (< 80 cm.). The second group had leaves varied in their width from 80 to 85 cm. Hindi cultivar belonged to this group. The third class covered Basrai , Williams , Maghrabi , and Mohamed Ali cultivars with leaves width of (> 85 cm.).

13- Leaves of various cultivars had oblong shape mainly Poyo , Paradica , Ambel , and Mohamed Ali where values exceeded 3.0. Beside , Basrai and Hindi had values < 2.0 in this respect hence their leaves were more wide. On the other hand , Williams , Maghrabi , and Sindihi cultivars had leaf index with intermediate values (2.55 - 3.00).

14- Leaf petiole length of banana cultivars under study could be arranged in three groups. The first one having petioles < 35 cm. in length as for Hindi , Basrai , Williams and Poyo cultivars. The second range was 35.0 - 52.5 cm. which resembled Maghrabi cultivar. The third class with long leaf petiole that is more than 52.5

cm. Paradica, Ambel , Mohamed Ali , and Sindihi cultivars belonged to this range.

15- The period from leaf emergence to unfolding stage for banana cultivars could be divided into three classes. The first group required less than 5.0 days. That was true for Mohamed Ali and Sindihi cultivars. The second range was from 5.0 to 6.0 days for Paradica , Maghrabi , Ambel , and Poyo cultivars. The third level required more than 6.0 days which covered Williams , Basrai , and Hindi cultivars.

16- Leaf area of banana cultivars lied under three classes. The first class had leaves with area ranged from $< 1.8 \text{ m}^2$ which refer to Hindi , Basrai and Sindihi cultivars. On the other hand , Poyo and Ambel plants had leaves with medium area ($1.81 - 2.24 \text{ m}^2$). The third group included Williams , Maghrabi , Paradica , and Mohamed Ali with large leaf area $> 2.25 \text{ m}^2$.

17- Leaf area coefficient for banana cultivars could be divided into two groups. The first class ranged from 0.70 to 0.80 for Paradica (0.70) , Ambel (0.70) , Mohamed Ali (0.74) , Sindihi (0.74) , Poyo (0.77) , and Maghrabi (0.79). The second level varied from 0.81 to 0.90 for Williams (0.86) , Hindi (0.88) and Basrai (0.90).

II- Flowering :

1- Female flower clusters of banana cultivars under study could be arranged in three groups. The first group has less than 11.0 female flower clusters as for Sindihi , Hindi , Basrai , Paradica ,

and Ambel cultivars. The second level from 11.0 to 12.25 for Williams , Poyo , and Maghrabi cultivars. The third group has more than 12.25 female flower clusters for Mohamed Ali cultivars.

2- The number of hermaphrodite flower clusters show three levels. The first level with < 92 clusters as for Hindi , Basrai , Williams , Poyo and Maghrabi cultivars. The second level with a range of 92 - 125 for Paradica and Ambel cultivars. The third group with above 125 clusters for Mohamed Ali and Sindihi cultivars.

3- Banana cultivars under study could be divided into two categories in number of male flower clusters. The first one ranged with less than 32 clusters which covered most cultivars i.e. Williams , Poyo , Maghrabi , Paradica , Ambel , and Mohamed Ali . The second class having more than 32 male clusters as for Hindi , Basrai , and Sindihi cultivars.

4- Total number of flower clusters for banana cultivars under study lied under three groups. The first group with less than 140 flower clusters for Hindi , Basrai , Williams , Poyo , and Maghrabi. The second group from 140 - 175 included Paradica , Ambel . and Mohamed Ali cultivars. The third class with higher than 175 clusters as for Sindihi cultivar.

5- Female flower clusters percentage of studied banana cultivars gave three categories. The first range was lower than 6.6 % as for Sindihi cultivar. The second group varied from 6.6 to 8.6 % as for Paradica , Ambel and Mohamed Ali cultivars. The third level having more than 8.7 % which involved most banana cultivars under study i.e. Poyo , Maghrabi , Hindi , Basrai , and Williams.

6- Male bud length of banana cultivars under study could be arranged in three groups. The first group had a range below 17.5 cm. as for Mohamed Ali , Ambel , Maghrabi and Williams cultivars. Beside , the second level differed from 17.5 to 25.1 cm. for Poyo , Basrai , Hindi and Sindihi cultivars. The third group having male bud longer than 25.1 cm. as for Paradica cultivar.

7- Three ranges for male bud girth were observed. The first one is below 20 cm. for Mohamed Ali and Ambel cultivars. The second class differed from 20.0 to 26.7 cm. which covered Maghrabi , Poyo , and Williams cultivars. The third category was above 26.7 cm. for Paradica , Basrai , Hindi and Sindihi banana cultivars.

8- Studied banana cultivars lied under three ranges as male bud weight was concerned. The first range was below 295 gm. for Mohamed Ali , Ambel , and Maghrabi cultivars. The second one varied from 295 to 540 gm. which included Poyo , Williams , Hindi , and Basrai cultivars. The third class was above 540 gm. for Paradica and Sindihi cultivars.

9- Banana cultivars were arranged in three levels concerning male axis length. The first range having main axis shorter than 80 cm. for Basrai , Hindi , Williams , Poyo , and Maghrabi cultivars. The second one was from 80 to 106 cm. which was true for Ambel , Mohamed Ali , and Sindihi cultivars. The third class was above 106 cm. for Paradica cultivar.

10- Paradica , Ambel , and Sindihi cultivars were earlier in bunch shooting followed with Williams , Poyo and Maghrabi. In contrast , Hindi , and Basrai cultivars were the latest in bunch shooting.

11- Suckers of Paradica cultivar reached bunch shooting rapidly (12.9 months) than the other cultivars while suckers of Basrai and Hindi cultivars reached bunch shooting much later 15.5 and 15.4 months , respectively. Moreover , the suckers of Ambel , Mohamed Ali , and Sindihi cultivars required 13 months for reaching bunch shooting while Williams , Poyo , and Maghrabi cultivars required 14.5 months.

12- Paradica , Ambel , Mohamed Ali , and Sindihi cultivars needed 2.5 months for harvesting of bunches. Moreover , Williams , Poyo , and Maghrabi cultivars required 3.5 months in this respect. On the other hand , bunches of Hindi and Basrai cultivars required longer time (4.3 months) for harvesting.

13- Paradica , Ambel , Mohamed Ali , and Sindihi cultivars required 15.7 months for cropping cycle while Williams , Poyo , and Maghrabi cultivars were intermediate in this respect where these cultivars needed 17.8 months. Both Hindi and Basrai cultivars required longest time (19.7 months) for cropping cycle.

III- Yield and fruit quality :

III-1. Bunch characters :

1- Bunch length of banana cultivars lied in three ranges. The first range was below 85.5 cm. for Ambel , Mohamed Ali , Sindihi and Hindi cultivars. The second one differed from 85.6 to 95.5 cm.

for Basrai and Paradica cultivars. The third group exceeded 95.6 cm. for Williams , Poyo , and Maghrabi cultivars.

2- Bunch weight of studied banana cultivars lied under three groups. The first range was below 14 Kg. for Ambel cultivar (lightest one). The second class differed from 14.1 to 20.6 Kg. for Mohamed Ali , Hindi , Basrai , Sindihi , and Paradica. The heaviest cultivars (exceeded 20.7 Kg./bunch) were Williams , Poyo , and Maghrabi.

3- Three categories were noticed in stalk weight of studied banana cultivars. The first category had stalk weight < 1.2 Kg. for Hindi and Basrai cultivars. The second one differed from 1.21 to 1.37 Kg. for Ambel , Williams , Poyo and Maghrabi cultivars. The third level was > 1.38 Kg. for Mohamed Ali , Paradica , and Sindihi cultivars.

4- Banana cultivars belonged to three levels as stalk percentage was concerned. The first level below < 8.1 % which covered the majority of banana cultivars i.e. Hindi , Basrai , Williams , Poyo , Maghrabi and Sindihi. The second one varied from 8.11 to 11.33 % for Paradica and Mohamed Ali cultivars. The third group exceeding 11.34 % for Ambel cultivar.

5- Banana cultivars lied under three ranges of hands number per bunch. The first range was below 11 for Sindihi , Hindi , Paradica , and Ambel cultivars. The second range from 11 to 12 for Williams , Poyo , Maghrabi. The third group exceeded 12 which covered Mohamed Ali cultivar.

6- Three groups were clearly observed as number of fingers per bunch of studied banana cultivars was concerned. The first

group was less than 171 fingers for Sindihi and Ambel cultivars. The second range was from 171.1 to 206.2 for most banana cultivars i.e. Paradica , Hindi , Basrai , Williams and Poyo. The third class covered Maghrabi and Mohamed Ali which was > 206.2 fingers/bunch.

III-2. Hand parameters :

1- Banana cultivars belonged to three levels of hand weight. The first level was < 1.16 Kg. for Ambel and Mohamed Ali cultivars. The second range was from 1.17 to 1.59 Kg. which included Hindi cultivar. The third class was > 1.60 Kg. for Paradica , Basrai , Maghrabi , Poyo , Sindihi and Williams cultivars.

2- Fingers number per hand of various banana cultivars gave three ranges. The first range was < 16 fingers for Sindihi and Ambel cultivars. The second level differed from 16 to 17.6 for Williams , Poyo , and Paradica cultivars. The third level was > 17.7 which covered Mohamed Ali , Basrai , Maghrabi , and Hindi cultivars.

III-3. Fruit quality :

A- Fruit physical properties :

1- Finger length of studied banana cultivars were divided into three ranges. The first one below 13.3 cm. for Mohamed Ali , Ambel and Paradica (shortest finger banana cultivars). The second range

was from 13.3 to 16.8 cm. for Hindi , Basrai , and Sindihi cultivars. The third class was > 16.8 cm. for Williams , Poyo , and Maghrabi cultivars.

2- Banana cultivars seemed to be divided into three levels of finger diameter. The first level was below 3.47 cm. for the majority of cultivars i.e. Mohamed Ali , Ambel , Poyo , Hindi , and Basrai. The second range was from 3.48 to 4.04 cm. for Williams , Maghrabi , and Paradica. The last group was higher than 4.05 cm. for Sindihi cultivar.

3- Three ranges of pedicel length of finger of banana cultivars. The first range was < 3.01 cm. for most banana cultivars i.e. Hindi , Basrai , Williams , Poyo , Maghrabi , Paradica and Mohamed Ali. The second one was from 3.02 to 3.78 cm. for Ambel cultivar. The third group was > 3.80 cm. for Sindihi cultivar.

4- Finger curvature of different banana cultivars varied significantly from 1.06 to 1.58 and from 1.04 to 1.36 for outer and inner rows , respectively.

5- Finger weight of banana cultivars could be arranged in three ranges. The first one was < 75 gm. for Mohamed Ali , Ambel , and Hindi. The second level was from 75 to 101 gm. for Basrai , Poyo , Maghrabi , and Paradica cultivars. The last group was > 101 g. for Williams , and Sindihi cultivars.

6- Values of pulp weight for banana cultivars were arranged in three categories. The first category was < 53 g. for Mohamed Ali , Ambel , Hindi , and Basrai. The second group was from 53 to 69 g. which covered Poyo , Maghrabi , and Paradica cultivars. The third level was > 69 g. for Williams and Sindihi cultivars.

7- As for pulp percentage , banana cultivars were classified into three categories. The lowest range was < 67 for Hindi , Basrai , Sindihi , and Poyo cultivars. The second level was from 67 to 74 for Maghrabi , and Williams cultivars. The last range was > 74 for Paradica , Ambel , and Mohamed Ali cultivars.

8- Three levels of peel thickness were noticed for banana cultivars. The first one (thinnest peel cultivars) was < 1.4 mm. for Ambel , and Mohamed Ali cultivars. The second range varied from 1.4 to 2.0 mm. for Paradica. The third group (thickest peel cultivars) was > 2 mm. for the remained banana cultivars.

9- Finger hardness of banana cultivars under study varied significantly from 38.1 Kg. for Mohamed Ali to 54.0 Kg. for Williams. Other cultivars studied were intermediate in their values.

10- Banana cultivars varied in their finger firmness from 16.5 (Lb/inch²) for Mohamed Ali (the softest cultivar) to 26.6 (Lb/inch²) for Williams (the solidest cultivar). Other cultivars were in between.

11- Pulp firmness values of banana cultivars varied significantly from 5.8 to 13.5 (Lb/inch²).

B- Chemical properties :

1- Banana cultivars had three levels of fruit total sugars. The first level was < 14 % for Sindihi and Paradica cultivars (low sweetness cultivars). The second group from 14 to 17 % for Ambel , Mohamed Ali , Hindi , and Basrai (intermediate sweetness cultivars).

The third level $> 17\%$ for Williams , Poyo , and Maghrabi (sweetness cultivars).

2- Reducing sugars of studied banana cultivars lied under three categories. The first one was $< 6\%$ for Sindihi and Paradica cultivars. The second group was from 6 to 7.3 % for Ambel , Mohamed Ali , Basrai , and Hindi cultivars. The third level was $> 7.4\%$ for Williams , Poyo , and Maghrabi cultivars.

3- Fruit starch of banana cultivars could be classified into two groups. The first group was below 6 % starch for Hindi , Basrai , Williams , Poyo , Maghrabi , Ambel , and Mohamed Ali cultivars. The second class exceeded 6 % starch as for Paradica and Sindihi (starchy cultivars).

4- Total sugars/starch ratio of banana cultivars may be divided into three groups. The first one was with sugar/starch ratio < 3 for Sindihi and Paradica. The second level was from 3.1 to 5.5 for Ambel and Mohamed Ali. The third range was > 5.6 which included the remaining banana cultivars i.e. Hindi , Basrai , Poyo , Williams and Maghrabi.

5- Banana cultivars belonged to three levels in fruit acidity. The first group was $< 0.6\%$ for Williams , Maghrabi , Hindi , Basrai , and Poyo. The second category was from 0.61 to 0.90 for Ambel and Sindihi. The third level was > 0.91 for Paradica and Mohamed Ali (Acid cultivars).

6- Twenty three volatile compounds were detected in ripe banana fruit of different cultivars. Only ten of these compounds were identified. They are ethyl acetate , ethyl butyrate , ethyl lactate , amyl acetate , amyl butyrate , butyle acetate , butyl butyrate

The second group differed from 0.78 to 1.00 % for Ambel , Mohamed Ali , Sindihi , and Paradica cultivars.

5- Concerning pulp magnesium content , banana cultivars showed two categories. The first class covered Hindi , Basrai , Williams , Poyo , and Maghrabi cultivars which ranged from 0.15 to 0.20 % . The second group was from 0.21 to 0.26 % for Paradica , Ambel , Mohamed Ali , and Sindihi cultivars.

B- Leaf :

1- Banana cultivars showed three categories in leaf nitrogen content. The first level with a range from 3.36 to 3.59 for Hindi and Basrai cultivars. The second range was from 3.60 to 3.83 for Williams , Poyo , Maghrabi and Ambel banana cultivars. The last level was from 3.84 to 4.04 which covered Paradica , Mohamed Ali and Sindihi cultivars.

2- Leaf phosphorus content of banana cultivars were similar from the statistical point of view.

3- Leaf potassuim content of banana cultivars had two groups. The first group was from 4.08 to 4.30 % for most cultivars except Sindihi , Ambel and Paradica cultivars which covered the second range from 4.31 to 4.53 %.

4- Banana cultivars showed three categories of leaf calcium content. The first level was from 1.03 to 1.14 % for Maghrabi , Basrai , and Poyo while the second one differed from 1.15 to 1.26 for Hindi and Williams. The third level was extended from 1.27 to 1.38 % for Paradica , Ambel , Mohamed Ali , and Sindihi cultivars.

5- Leaf magnesium content varied from 0.42 % to 0.59 % of banana cultivars under study.

IV- Corm analysis :

1- Corm total carbohydrates content of banana cultivars had three levels. The first level ranged from 22.52 % to 23.08 % for Hindi and Basrai cultivars. The second range was from 23.09 to 23.65 % for Williams , Poyo , Maghrabi , and Mohamed Ali cultivars. Paradica , Ambel , and Sindihi banana cultivars fell in the third group which varied from 23.66 to 24.21 %.

2- Banana cultivars lied under the range from 2.17 to 2.40 % in their corm nitrogen content , except Paradica and Sindihi cultivars which contained 2.51 and 2.87 % N , respectively.

3- corm C/N ratio of all studied banana cultivars , regardless of Sindihi and Paradica , fell under the range from 9.99 to 10.72. Anyhow , Sindihi and Paradica cultivars had values of 8.47 and 9.67 , respectively.

V- Cold hardiness :

Banana cultivars could be arranged in three groups concerning injury index. Mohamed Ali , Sindihi , and Paradica cultivars had the first group showing injury index lower than 82. The second class differed from 82 to 90.5 for Ambel and Maghrabi cultivars. The last group was > 95.6 which covered Hindi , Basrai , Williams , and Poyo cultivars.

VI- Evaluation :

As a result of cultivars evaluation based on the adaptability , yield and fruit quality , one can conclude that the cultivars recommended under similar environmental conditions were Williams (80.59) , followed by Maghrabi (52.71 %). However , Poyo cultivar ranked the third in this evaluation (48.88 %).