

## V- SUMMARY AND CONCLUSION

This study was conducted in the experimental station at the Faculty of Agriculture, Ain-Shams University, during two successive seasons of 1990 -1991 and 1991-1992 for studying propagation ability of two apple rootstocks namely, MM.106 and Mc.9 by either stem hardwood cuttings or by air-layering. Producing standard nursery plants through enhancing rooting ability in both cuttings and air-layers by applying some preplanting / pre-layering treatments were the main purpose of this work. Hence, the wounding and dipping/or treated with lanoline paste in various solutions of IBA combined with date of cuttings preparation or date of layering application. In addition, anatomical studies were also carried out for the basal portion of cuttings/or air-layers to throw some lights on the initiation of root primordia and difficulties may be presented and reflected negatively either on their initiation or penetration of the adventitious roots through tissues of cuttings or layers. Thus, the two following field experiments were included:-

### **V. I. Experiments on rooting of MM.106 and Mc.9 apple rootstocks by stem hard wood cuttings.**

### **V. II. Experiments on Propagation of MM.106 and Mc.9 apple rootstocks by air-layering.**

### **V. I. Experiments on Rooting of MM.106 and Mc.9 apple rootstocks by stem hard wood cuttings.**

The stem hardwood cuttings of two apple rootstocks, i.e., MM.106 and Mc.9 with 15 cm. length and 5-7 mm. diameter were prepared from the medium part of 1-year old wood collected at three different dates (15<sup>th</sup> December, 15<sup>th</sup> January and 15<sup>th</sup> February) in both seasons. One factorial experiment was

conducted for every apple cultivar<sup>98</sup> and each one including 24 treatments, i.e., combinations between three collecting dates from one hand and 8 preplanting treatments applications of dipping the wounded or unwounded cuttings in (water, IBA at 1000, 2000 and 4000 ppm) from the other. All treated cuttings were stored in moist mixture of sand and peat moss (v : v) at equal proportions till 1<sup>st</sup> March of each experimental season (planting date) for investigating growth parameters responses devoted cuttings were planted in wooden boxes contained sand and peat moss at 1:1 by volum, whereas, the different treatments (combinations) were arranged in a complete randomise design as each treatment was replicated six times and every replicate was represented by 10 cuttings. Meanwhile, other smaller boxes was devoted from planting treated cuttings needed for anatomical study. Data of some rooting measurements viz. a- Percentage of rooted cuttings, b- Number of roots/cutting and c- Average length of root developed per cutting were recorded 7 weeks later for planting date. Since, all planted cuttings in boxes were carefully taken off and the aforesaid three parameters were immediately determined. Moreover, all succeeded rooted cuttings were counted and transplanted individually each in a polyethylene bag filled with a mixture of peatmoss and sand at equal proportions (v : v). Such rooted cuttings were allowed to grow for 6 months from transplanting in order to carrying out the other growth measurements (Survival %, stem length, root length, number of leaves / rooted cutting, dry weight of leaves, stem, root and total plant dry weight).

## **V. II. Experiments on Propagation of MM.106 and Mc.9 apple rootstocks by air-layering :-**

Two apple rootstocks, i.e., MM.106 and Mc.9 were used. The air-layers with 40-50 Cm. length and 1 - 1.5 Cm. diameter of one-year-old selected shoots

were done on two dates (15<sup>th</sup> August and 15<sup>th</sup> September) in both seasons. Thus, two factorial experiments were conducted each one including 12 treatments, i.e., combinations between two layering dates from one hand and 6 pre-layering treatments applications of treated the unwounded or wounded layers with lanoline paste containing 0, 1000 and 2000 ppm IBA from the other. Layers were separated after 4 months when the developed roots emerged under the polyethylene cover of the layers. The same vegetative measurements previously estimated with cuttings were recorded during 1990-1991 and 1991-1992 seasons.

As for the anatomical study, air-layering samples (each consisted of one shoot) were randomly taken weekly during the study to examine their anatomical structure may be affect the rooting process.

The obtained results in this work could be summarised as follows:-

#### **V. I. Experiments of stem hardwood cuttings:-**

1- No rooting was obtained by Mc.9 apple rootstock cuttings regardless of collecting dates and preplanting treatments of wounding and dipping in different concentrations of IBA at (0, 1000, 2000 and 4000 ppm.). However, rooting had been taken place in cuttings of MM.106 apple rootstock with a various degrees of success according to the investigated treatments.

2- As for response of rooting aspects (7-weeks from planting) of MM.106 apple rootstock, to the specific effect of collecting dates, it was quite evident that 15<sup>th</sup> January was more suitable for rooting %, number of roots / cutting and average root length during two seasons of study.

3- Concerning the specific effect of preplanting treatments on rooting %, number of roots and roots length / cutting data obtained cleared that dipping of wounded or unwounded cuttings in different concentrations of IBA ( 1000, 2000

and 40000 ppm) were effective than control, while the higher concentration of IBA was more beneficial in this respect.

4- As for the interaction effect, obtained results showed that combinations of dipping both wounded and unwounded cuttings collected on 15<sup>th</sup> January, in IBA at 2000 / 4000 ppm were the superior ones in comparison with others as the rooting %, number of roots and root length / cutting during both seasons of study were concerned. On the other hand, the combination between 15<sup>th</sup> January collected cuttings and preplanting treatment of dipping in IBA at 4000 ppm with wounding application tended to be of more pronounced effect in this respect during the two seasons of study.

5- Regarding specific effect of collecting dates on survival %, number of leaves / rooted cutting dry weight of plant organs (Leaves, stem, roots and total plant) data obtained revealed that the highest values of MM.106 apple rootstock were closely related to 15<sup>th</sup> January collected cuttings in this concern.

6- Concerning the specific effect of preplanting treatments of wounding and dipping in IBA at 1000, 2000 or 4000 ppm. on survival %, number of leaves / rooted cutting stem length and the dry weight of plant organs (leaves, stem, roots and total plant) data obtained during both seasons of study showed that dipping of wounded cuttings in both higher concentrations of IBA (2000 / 4000 ppm) were the superior.

7- As for the interaction effect of both investigated factors, data obtained declared obviously that the combination between 15<sup>th</sup> January collected cuttings from one hand and dipping in IBA at 4000 ppm. with wounding application were the superior treatments during the two seasons of study.

## **V. II. Experiments on air layering:-**

1- No rooting was obtained by Mc.9 apple rootstock air-layers carried out either on 15<sup>th</sup> August or 15<sup>th</sup> September regardless of the prelaying treatments of wounding and IBA applications during the two seasons of study. In this respect, rooting was obtained only by MM.106 apple rootstock layers with various degree of response depending on combinations of both investigated factors applied during two seasons of study.

2- As for growth measurements (4-months from practising layers) for MM.106 apple rootstock, data obtained could be concluded as follows :-

a- Concerning the specific effect of layering date, it was quite evident that 15<sup>th</sup> August was more suitable than 15<sup>th</sup> September as successful %, number of root / plant, root length, stem length number of leaves / plant and dry weight of plant organs (leaves, stem, roots and total plant) were concerned during two seasons of study.

b- With respect to the specific effect of pre-layering treatments, the data revealed that treating with IBA at 2000 ppm plus wounding was more suitable for percent success, number and length of roots, stem length, number of leaves / layer and dry weight of plant organs (Leaves, stem, roots and total plant) during two seasons of study.

3- As for the interaction effect, data obtained declared obviously that layering of wounded shoots that treated with IBA at 2000 ppm on August 15<sup>th</sup> was the superior combination as successful % and vegetative measurements values during were concerned both seasons.

### **V. III. Anatomical examination:-**

Rooting ability of hardwood cuttings and air-layering of Mc.9 and MM.106 apple rootstocks was investigated. Wounding and or different concentration of IBA increased rooting of MM.106 apple rootstock only. The present study showed that

Mc.9 has no rooting ability (0.00%) compared to MM.106 which showed a relative higher rooting (32.42 - 73.95%). Anatomical studies revealed that the non rooting of Mc.9 due to a continuous scleroid sheet which restricted the penetration of root primordial. Such layer is not clear in MM.106. In addition, adventitious roots originated from the cambium zone and the pith in MM.106.

Generally, the highest rooting percentage and best vegetative growth measurements were obtained when cuttings from one year old branches were collected on 15th. January and treated with IBA at 4000 ppm wounding its base. Also, the same trend was found when air-layers were treated with 2000 ppm. IBA + wounding on 15<sup>th</sup> August during both 1990-1991 and 1991-1992 seasons.