S U M M A R Y

This research was conducted under laboratory and glass house conditions through the Agricultural systems development project, Ministry of Agriculture during 1988-1991.

Plant materials of seven potato varieties namely Alfa, Cara, Daimont, Desire, Foundal, Jaerla and Spunta previously proved to be infected with potato virus X were assigned as a source of tissues in all experiments of this work except in case of the tuberlets formation process, which was restricted for the varieties Cara, Spunta and Foundal. The main results could be summarized as follows:

1. Using the longer apical meristem i.e. 0.4 mm increased survival percentage, number of developed plantlets and their relative growth rate compared to those of the shorter ones i.e 0.2 mm. However the used varieties were reacted differently in this respect.

2. The percentage of PVX free plantlets resulting from the small size apical meristem i.e 0.2 mm was greater than those from the large size ones i.e 0.4 mm. They were 47.4% and 21.2% for these two lengths, respectively.

3. Depending on potato variety, the percentage of virus free plantlet resulting from the small apical meristems ranged from 25.0 to 66.7%. The opposites were ranged from 13.0-28.6% when using the large size apical meristems.

2. The excised meristem tips 0.4 mm long were died within less than one week when exposed directly to 37°C. As a result,

these meristem tips were replaced by 1 cm nodal cuttings taken from in vitro plantlets originally produced from 0.4 mm apical meristems and grown on nutritive medium before the thermal application.

5. Growth of different variety was varied in response to heat treatment. No clear effect was shown on the relative growth rate of Cara and Diamont varieties due to exposing the nodel cutting to 37°C for 2, 4 or 6 weeks. Increasing the exposure period to 6 weeks resulted in the death of the nodel cuttings as well as the renewed growing shoot(s) of Desiree, Foundal and Jaerla varieties. Regarding Alpha and Spunta, the growth was reduced significantly due to increasing periods of the thermal application.

6. Reduction in the survivals as well as plantlets developed from the excised shoot apices taken from the renewed growths, replanted on the nutritive medium was more pronounced especially after 4 and 6 weeks of heat treatment compared to the control (pre-conditioning heat treatment).

7. The percentage of PVX free plants increased to 64% when the exposure to 37°C was extended to 6 weeks compared to 28.8% in the control treatment. A significant difference was recorded between the varieties in this respect.

8. Generally when heat treatments were prolonged up to 4 or 6 weeks, the percentages of plantlets that freed from PVX were ranged from 60.0% to 81.8% according to the variety.

9. The higher concentration of thiouracil i.e. 50, 100 and 150 ppm when added to culture media had a poisonous and

lethal effect as all the nodal cuttings place in the presence of these concentrations died and did not performed any new vegetative growths.

10. Although, nodal stem segment cultures were relatively able to grow in the presence of the lower concentrations of thiouracil i.e 10, 20 and 30 ppm, but it was observed that this growth in all tested varieties was significantly lower than that in the control treatment (without thiouracil).

11. Increasing concentrations of thiouracil in nodal segment culture media from 10 to 30 ppm resulted in an obvious reduction in both survivals and rooted plantlets that developed from shoot apicies 1.0 mm long taken from shoot(s) that grew during treatments.

12. The varieties varied in their response to the thiouracil treatment. For example, the percentages of developed plantlets were ranged from 38.7% in Foundal variety (the lowest rate) to 71.1% in Diamont one (the highest one).

13. No clear differences in the number of PVX free plantlets were recorded due to application of 10, 20, or 30 ppm thiouracil. However, percentage of such plantlets would be increased, it being 46.2% (43/93) 57.8% (48/83) and 65.3% (49/75) for these three concentrations, respectively compared to 23.8 (36/15) in the control (without thiouracil).

14. In Foundal variety application of 30 ppm resulted only in four plantlets, all were freed from PVX, so it was performed 100% freedom. However this percentage was varied and ranging from 50.0-81.3% according to the cultivar.

15. Nodal stem segments incubated under darkness conditions showed highly increases in the average length of its initiated shoot(s) and the number of roots especially in the presence of GA_3. On the contrary, a weak growth and a reduction in the number of roots were recorded when incubation was under continuous illumination conditions.

16. Shoot apicies from renewed growths during previously incubation under complete darkness $+GA_3$ lead to a great reduction in the percentages of developed plantlets when compared with that from pre-incubated under continuous light conditions. These were 57.2% and 82.8% for the two treatments, respectively.

17. PVX was eliminated from great numbers of plantlets as a result of continuous illumination compared to continuous darkness with or without GA_3 in the growth medium, these were 34/171, 29/119 and 35/147 PVX-free plantlets with corresponding percentages of 19.9%, 24.4% and 23.8% for these three variants, respectively.

18. In vitro microtuber productivity of both plantlets either infected with or freed from PVX were established. The comparison between both was very conspicous. Elimination of PVX lead to great increases in the total numbers of the obtained microtubers, the means of microtuber weight and diameter compared to those produced from cultures that remained infected.

19. Both size of microtubers and frequency of that have diameter equal to or larger than 5 mm were greatly improved by elimination of PVX in all tested potato varieties.

20. Potted potato plants arised from PVX-free plantlets remained healthy even up to more than 3 months after transplanting. The contrast was in those arised from plantlets previously proved to be PVX-infected. The same results were observed when microtubers taken from cultures free from or infected with PVX was planted in pots.