

# Propagation potato plant *Solanum tuberosum* L. by Tissue Cultivation

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## ABSTRACT

This study was conducted on initiation shoots from shoot tips of *Solanum tuberosum* L. cultured on MS medium supplemented with different concentrations of BA after 4 weeks and multiplication shoots after 8 weeks, BA were used for *In vitro* shoot regeneration and IBA were used for *In vitro* root regeneration. Also the Results are showed as follows: (6.9) shoots / explant with the highest shoot length (8.5) cm and average number of leaves (10.6) leaf/shoot were obtained from cultured shoot tips on MS medium supplemented with (3.0) mg/l BA after 8 weeks highest rooting ( 90)% was obtained from cultured shoots produced *in vitro* on 1/2 MS medium supplemented with (0.5) mg/l IBA, with the highest root length (8.5) cm and average number of roots ( 7.5) root/ plantlet.

**Key words :** *Solanum tuberosum* L., Shoot tips, Tissues culture.

## Introduction

Tissue culture from biotechnology have an important role in Plant propagation, A lot of advantages of the most important access to large numbers from plants free from a etiology and same mother plant in a short time and any time of the year furthermore use of these technology in areas search and applied including education and improving plant and produce medical drugs, medicines and rapid clonal propagation which is of application that are great significance that are by following different methods differentiation and training formal such as the composition of adventitious buds and stimulating the growth axillary buds and induction somatic embryogenesis as well as a study growth aspects and plant development and secondary metabolites.

Cytokinines are known to significantly improve

the growth of crop plants grown, there are many researchers conducted about Cytokinines ability to improve the plant growth by induced cell division and regulate cell metabolism and activated many specific enzymes (Al-Taey and Saadoon, 2012). Tissue culture technique has played a role in its ability to propagate plants and to obtain a large number of them in a short time and at low costs compared to traditional propagation methods. Suitable protocols have been developed for multiplication and improvement of different species (Kadhim *et al.*, 2019). Cultivated potato (*Solanum tuberosum* L.) is one of the most important vegetable crops in the world (Solmon-Blackburn and Baker, 2001). It is the fourth most cultivated food crop exceeded only by wheat, rice and maize in world production for human consumption (Ross, 1986). Potato tubers give an exceptionally high yield per acre many times that of any

grain crop (Burton, 1969) and are used in a wide variety of table, processed, livestock feed and industrial uses( Feustel, 1987). Its commercial product, the tuber, is the underground stem adapted to work as reserve source and reproduction mean (Fortes and Pereira, 2003).

**The study aims to** Induced the shoots from shoot tips of potato with find out the best concentration of cytokinin and then rooting the shoots to obtain plantlets.

## Materials and Methods

The tubers were surface sterilized by washing powder regular and tubers were washed with tap water for 15 minutes, then transferred to heparin 7% (v/v) sodium hypochlorite solution for 15 minutes (commercial bleach Clorox contain 6% sodium hypochlorite) and finally rinsed 3 times with sterile distilled water, shoot tips were cut for 1 cm in length for proliferation, a 250 ml glass vials were used to plant the vegetable parts with 40 ml of culture media at pH 5.7 and the bottle was covered with aluminium foil, sterilized. The culture media autoclave for 20 min at 121 °C and under pressure 1.04 kg /cm<sup>2</sup>, after planting the cultures were kept in growth chamber at 25 ± 2 °C under a 16 h photoperiod (supplied by fluorescent tubes) and 8 h dark periods with a light intensity of 300 lux, The experiments were arranged in factorial experimental based on completely randomized design (C.R.D.) with ten replicates per each treatment and one explant per replicate.

### Proliferation and Multiplication Stage

The first stage of transplantation for 4 weeks was considered a proliferation stage, in which the ex-

plants (shoot tips) were cultivated on MS media with different concentrations of growth regulator and the these cultures (Reculture) were transplanted for another four weeks on the same MS as they were considered a multiplication stage and data was recorded. On the vegetative part and its development at the end of each stage. This stage included the study of the effect of adding BA to the MS media in concentrations (0.0, 1.0, 2.0, 3.0, 4.0) mg/l in the proliferation and multiplication of the shoot tips taken from tubers and their data were taken after 4 and 8 weeks of cultivation.

### Rooting stage

The second stage, the regenerated shoots transferred to 1/2 MS media with different concentration (0.0, 0.25, 0.5, 0.75) mg/l IBA for rooting.

## Results and Discussion

The Table 1 effect of BA on the initiation and multiplication shoot tips of potato *Solanum tuberosum* L. on MS medium after 4 and 8 weeks of cultivation. the Results are showed as follows: (6.9) shoots / explant with the highest shoot length (8.5) cm and average number of leaves (10.6) leaf/shoot were obtained from cultured shoot tips on MS medium supplemented with (3.0) mg/l BA after 8 weeks (Fig. 1). The results of Table 1 explain the multiplication of cultivated parts that BA is one of the cytokines that play a role in controlling apical dominance and consequently the number of branches increased and as a result of the state of balance between internal hormones and added growth regulators the highest values were obtained and that the increased concentration leads to a decrease. The values are for the

**Table 1.** Effect of BA on the initiation and multiplication shoot tips of potato *Solanum tuberosum* on MS medium after 4 and 8 weeks of cultivation.

BA (Mg/l)	Initiation Stage			Multiplication Stage		
	Average shoots number	Highest shoot length (cm)	Average leaves number	Average shoots number	Highest shoot length (cm)	Average leaves number
0.0	1.8 b	2.5 b	5.2 b	2.7 b	3.5 c	7.2 b
1.0	2.5 b	4 b	5.6 b	3.4 b	5 b	7.2 b
2.0	4.5 a	8 a	5.8 b	5.4 a	8.4 a	7.4 b
3.0	4.7 a	8 a	8.8 a	6.9 a	8.5 a	10.6 a
4.0	2.6 b	4 b	5.0 b	3.1 b	4 b	6.0 b

\* Values with similar characters for each factor or their interactions individually are not significantly different according to the Dunkin Multipliers test below the 5% probability level.

**Table 2.** Effect of IBA on therooting shoot resulting from tissue culture of potato *Solanum tuberosum* on 1/2 MS medium after 4 weeks of cultivation.

IBA (Mg/l)	Rooting percentage	Highest root length (cm)	Average roots number/plantlet
0.0	40 b	1.3 d	1.7 b
0.25	70ab	4.2 c	3.1 b
0.5	90 a	8.5 a	7.5 a
0.75	80ab	4.5 b	3.3 b

\*Values with similar characters for each factor or their interactions individually are not significantly different according to the Dunkin Multipliers test below the 5% probability level.

number of branches because its effect becomes inverse (Smith, 2000 and Hopkins and Hiiner, 2004) and the composition of the branches and leaves of the cultivated parts when comparing in the initiation stage is due to the internal content in the tissues of the plant part of plant hormones (Murashige and Skoog, 1962) and explanation of increased lengths and number of sheets. Different factors indicate the effect of cytokines in the division and elongation of cells, which in turn is reflected in the characteristics of growth as well as its effect on building nucleic acids (Wasfy, 1995). This result is also supported by the

The Table 2 effect of IBA on therooting shoots resulting from tissue culture of potato *Solanum tuberosum* on 1/2 MS medium after 4 weeks of cultivation. The Results are showed as follows: highest rooting (90) % was obtained from cultured shoots produced *in vitro* on 1/2 MS medium supplemented with (0.5) mg/l IBA, with the highest root length (8.5) cm and average number of roots ( 7.5) root/plantlet. This result is also supported by the findings of Abd Elaleem *et al.* (2009) who obtained the best rooting shoots on 1/2 MS medium supplemented with (0.5) mg/l IBA.

**Fig. 1.** Effect of 3.0 mg/l BA on multiplication of shoot tips of Potato *Solanum tuberosum* on MS medium after 8 weeks of cultivation

findings of Wondimu *et al.* (2012) who obtained the best shoot multiplication on MS medium supplemented with BA.

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