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In vitro MICROTUBERIZATION OF SOME POTATO (*Solanum tuberosum* L.) CULTIVARS AS RESPONSE TO MEDIA CONSTITUENTS AND PHOTOPERIOD

Amina M. Wafa[1], Wafaa A. Fekry[1], A. A. Hassaan[1] and I. A. Khatab[2]

1. *Plant Prod. Dept., Fac. Technol. and Dev., Zagazig Univ., Egypt.*
2. *Genetics Dept., Fac. Agric., Kafr El- Sheikh Univ., Egypt.*

Corresponding author: *E-mail drwafaadel@hotmail.com.*

ABSTRACT

This work was carried out in cooperation with the plant production Dept., Fac. Technol. and Develop., Zagazig Univ., and Genetic Engineering and Tissue Culture Lab., Genetics Dept., Fac. Agric., Kafr El- Sheikh Univ., during the period from 2020 to 2022 to study the performance of potato (Solanum tuberosum L.) genotypes, i.e. Diamant and Spunta for producing in vitro microtubers. The effect of media constituents, i.e. various combinations between kinetin and sucrose concentrations, as well as incubation photoperiod conditions were observed in two separate experiments. These experiments were arranged with Randomized complete design (RCD) with three replicates. As for the first experiment, there were fourteen treatments used, two potato cultivars with seven media combinations, i.e. 3, 6 and 9% sucrose without Kin or 6 and 9% sucrose either with 2 or 3 mgl^{-1} Kin.

Meanwhile, in the other experiment, double nodes segment explants for both cultivars were cultured on MS medium (0.75% strength) contained 3 mgl^{-1} Kin + 6% sucrose and incubated under three photoperiods: 1) 16h/8h (light/dark), 2) 8h/16h (light/dark) and 3) full darkness (six treatments) two experiments were conducted in RCD with three replicates. The obtained results revealed that Diamant cultivar was more response to treatments than Spunta cv. MS medium supplemented with 3 mgl^{-1} Kin + 6 or 9% sucrose reduced the number of days to microtuber induction, increased tuberization percentage, number of microtubers after 30 and 75 days (at harvest) as well as average of microtubers fresh weight. Diamant cv. achieve the highest results for these parameters. Moreover, incubation cultures under photoperiod condition 8h/16h (light/ dark) or darkness provides best results as compared with light condition especially with Diamant cultivar.

Conclusively, it can be concluded that increasing Kin up to 3 mgl^{-1} + 6 or 9% sucrose with MS medium (0.75% strength) and incubated explants in short day

or darkness particularly with diamante *cv*. enhanced and improved the production and development of *in vitro* microtubers.
Key words: Potato, tuberization, sucrose, kinetin, photoperiod, microtubers.

INTRODUCTION

Potato (*Solanum tuberosum* L.) belongs to nightshade family (Solanaceae) grown for its starchy edible tubers. It considered as one of the most important worldwide food crops for its great economic importance. It is the world's fourth cultivated crop after wheat, rice and maize (FAOSTAT, 2022). According to the FAO data, globally, the total area harvested in 2021 was 18,132,694 hectares produced 376 million tons of potato tubers. Potato looks at the importance vegetables in local and exported abroad in Egypt, where it ranks the second in the list than other exported agricultural crops (CAPMAS STAT, 2022). The conventional asexual propagation way is still used through selection the clonal and repeated tuber multiplication (Garcia and Bolaños, 2017), but this method although keep up the genetic stability of the varieties that reduced seed quality during clonal generations because of the accumulation of pathological problems (Hossain *et al.*, 2017). Several years ago, different studies have been utilized tissue culture for producing quality planting materials and multiplication of potato. Nowadays, the optimization of culture conditions for high *in vitro* microtuberization remains a big challenge. There are various advantages of microtubers expressed as diseases free, easy to handle, storage and transport because it has small size and weight. Moreover, it can produce all the year, and has an identical morphological and biochemical characteristic (Borna *et al.*, 2019 and Sallam *et al.*, 2021). *In vitro* microtuber formation was influenced by many factors including medium constituents (salts, sucrose, growth regulators and gelling agents), environmental factors (light, i.e. photoperiod, intensity and wave length, as well as temperature), explant type and genotype (Emaraa *et al.*, 2017 and Astarini *et al.*, 2021).

There are many researchers reported that genotype was considered the changeable factor which causing the *in vitro* microtuber formation response.

Potato tuberization look at a complex developmental process, it requires the interaction between genetic, environmental and biochemical factors (Mohapatra *et al.*, 2018, Abeuova *et al.*, 2020 and Isidron *et al.*, 2021).

Growth regulators can be used as one of the most important factors affecting on *in vitro* potato induction of microtuberization and microtuber development. Supplemented MS medium with cytokinin, i.e. kinetin had enhancing effect on different stages of *in vitro* potato microtuberization (Ali *et al.*,

2018, Garcia *et al.,* 2019, Astaríni *et al.,* 2021, Venat *et al.,* 2022 and Mohamed and Girgis, 2023).

Sugars, i.e. sucrose is main factor at *in vitro* potato tuberization as source of energy, osmotic potent agent and it serves as a signal for the response of microtuber formation under high concentration (Emaraa *et al.,* 2017, Ali *et al.,* 2018. Vural *et al.,* 2018 and Astarini *et al.,* 2021).

Light plays a principal role plant growth *in vitro* culture and development. Light is one of among many various physical micro environmental factors affect photosynthesis at *in vitro* cultures, moreover, each of the quantity and quality of light participating in several development processes, such as photomorphogenesis and photoperiodism, as well as the genes expression (Fujiwara and Kozai, 1995 and Hopkins, 1999). In this respect, the response of photoperiodic length and its effect on *in vitro* microtubers production was observed by Al-Ahmar *et al.,* 2016, Ali *et al.,* 2018, Astarini *et al.,* 2021 and Isidron *et al.,* 2021).

There are many investigators demonstrated that environmental agents had permitting effects but plant growth regulators applied to the medium had a regulating role during *in vitro* potato microtuberization from the variety to another of potato (Al-Hussaini *et al.,* 2015, Al-Ahmar *et al.,* 2016, Ali *et al.,* 2018, Astarini *et al.,* 2021 and Homsuwan *et al.,* 2021).

Several studies reported the different responses of potato genotypes by cultured in medium containing various concentrations of kinetin and sucrose (Nasiruddin *et al.,* 2013, Momena *et al.,* 2014, Al- Ahmar *et al.,* 2016 and Astarini *et al.,* 2021).

Therefore, this work aimed to study the ability of two potato cultivars Diamant and Spunta for production *in vitro* microtubers through combination of kinetin and sucrose, as well as photoperiod.

MATERIALS AND METHODS

The present investigation was carried out in cooperation with the plant Production Dept., Fac. Technol. and Develop., Zagazig Univ. and Tissue Culture Lab. of Genetics Dept., Fac. Agric., Kafr El- Sheikh Univ., Egypt, during the period from 2020 to 2022.

Plant material

Potato tubers (*Solanum tuberosum* L.) of two cultivars, Diamant and Spunta were obtained from Potato Brown Rot Project Unit (PBRP), Agricultural Research Center (Ministry of Agriculture and Land Reclamation, Egypt).

Potato sprouts of the two cultivars developed up to 1-3 cm in length were cut, rinsed with tap water for 5min. Then in a laminar air- flow hood sprout tips sterilized with 70% ethanol for thirty seconds, follows by immersion in 1% (V/V) sodium hypochlorite for 15 minutes, then rinsed four times in sterile distilled water. Sterilized shoot meristem tips (0.3 mm) were isolated under binuclear, cultured in baby jar food (five meristems/jar) containing 40 ml of basal medium contained 4.4 gl^{-1} Murashige and Skoog medium (1962) with 30 gl^{-1} sucrose, 2 gl^{-1} gelrite, 0.2 mgl^{-1} BA + 0.2 mgl^{-1} Kin + 0.1 mgl^{-1} Ads.

Meristem cultures were inoculated for eight weeks on the same culture medium until shoots were initiated. Meristem-derived plantlets were used for further *in vitro* multiplication using single node cuttings transferred into a fresh MS medium contained 4.4 gl^{-1} Murashige and Skoog medium (1962) with 30 gl^{-1} sucrose, 2 gl^{-1} gelrite, 2 mgl^{-1} BA+ 2 mgl^{-1}Kin +1 mgl^{-1}Ads to optimize shoot multiplication. Reculturing of single-node cuttings was done every four weeks intervals on the same fresh shoot multiplication medium until the desired numbers of *in vitro* plantlets for subsequent experiments, the pH was adjusted to 5.8 with 1N HCL or in KOH and autoclaving at 121°C and 1.2 kg/cm^2 air pressure for 15 minutes. Culture jars were placed in a growth chamber at 25°C±2 under 16/8hours photoperiod and light intensity of 2000 Lux as shown by Hamza and Hamouda (2013).

***In vitro* production of microtubers:**

This work included two experiments for studying the effect of some factors on microtuberisation of both varieties i.e., Diamant and Spunta.

a. *The first experiment*:

The investigation was conducted to studying the response of two potato genotypes Diamant and Spunta to media composition. Seven media combinations were used; T_1) 3% sucrose, T_2) 6% sucrose, T_3) 9% sucrose, T_4) 2mgl^{-1} Kin + 6% sucrose, T_5) 2mgl^{-1} Kin + 9% sucrose, T_6) 3mgl^{-1} Kin + 6% sucrose and T_7) 3 mgl^{-1} Kin + 9% sucrose. Explants (double nodes *in vitro*- cuttings) of each cultivar were cultured on MS medium (Murashige and Skoog, 1962) at 0.75% strength supplemented with 2gl^{-1} gelrite and different concentrations of Kin and sucrose. Cultures were incubated at 20°C±2 room temperature under 8/16hours (light/dark) photoperiod and light intensity 1000 Lux.

b. The second experiment

This experiment aimed to observe the varietal differences of each Diamant and Spunta cultivars in microtuberization and microtuber development affected by

the incubation photoperiod. There were three photoperiods used: 1) 16h/8h (light/dark), 2) 8h/16h (light/dark) and 3) Full darkness. Each cultivar explants (double nodes) were cultivated on MS medium (0.75% strength) supplemented with 3 mgl^{-1} Kin + 6% sucrose and incubated at 20°C ± 2 room temperature under the treatments of photoperiod.

Data were recorded as number of days to microtuberization, microtuberization percentage, number of microtubers/ explant after 30 days of incubation and at harvest time (75 days), as well as fresh weight of microtubers/ explant (mg) at harvest time.

Statistical analysis:

Two experiments were conducted in Randomized Complete Design (RCD) with three replicates (each replicate (jar) contained five explants). The recorded data were subjected to analyze by Microsoft Statistix 10 program and means were compared using least significant difference test (LSD) at 5% level according the method of (Steel *et. al.,* 1997).

RESULTS AND DISCUSSION

Effect of medium composition, cultivars and their combined

Data presented in Fig.1. show that there were significant differences between the two cultivars at the number of days to microtuberization and number of microtubers after 30 and 75 days. On the other hand, percentage of tuberization and average of microtuber weight had not affected by the genotype. In this respect, Diamant cv. scored the shorter duration of induction (16.47 days) with the highest microtuber % (57.62), number of microtuber formation after 30 and 75 days (1.72 and 2.33, respectively) and average microtuber weight (143.86 mg). The differences between the two potato cultivars in the above mention studied

Nistor *et al.* (2010) reported that potato tuber production depend on genotype where the most important factor was the genetic origin of clone and this consequently it played a main role of in vitro microtuberization under incubation environmental condition. The variation in tuberization amongst different cultivars has also been observed by Mohapatra *et al.,* 2018, Borna *et al.,* 2019, Abeuova *et al.,* 2020, Homsuwan *et al.,* 2021, Isidron *et al.,* 2021 and Sallam *et al.,* 2021).

Efficiency of microtuberization was mostly conditional on cytokinin and sucrose. Obtained data in Fig.2. explored that the treatment 3 mgl^{-1} Kin + 6% sucrose was the best effective, where it recordedthe minimum days for microtuberization (11.90 days), optimum tuberization% (73.33%) as well as No. of microtubers at 30 and 75 days (2.05 and 2.78, respectively). Application 3 mgl^{-1}

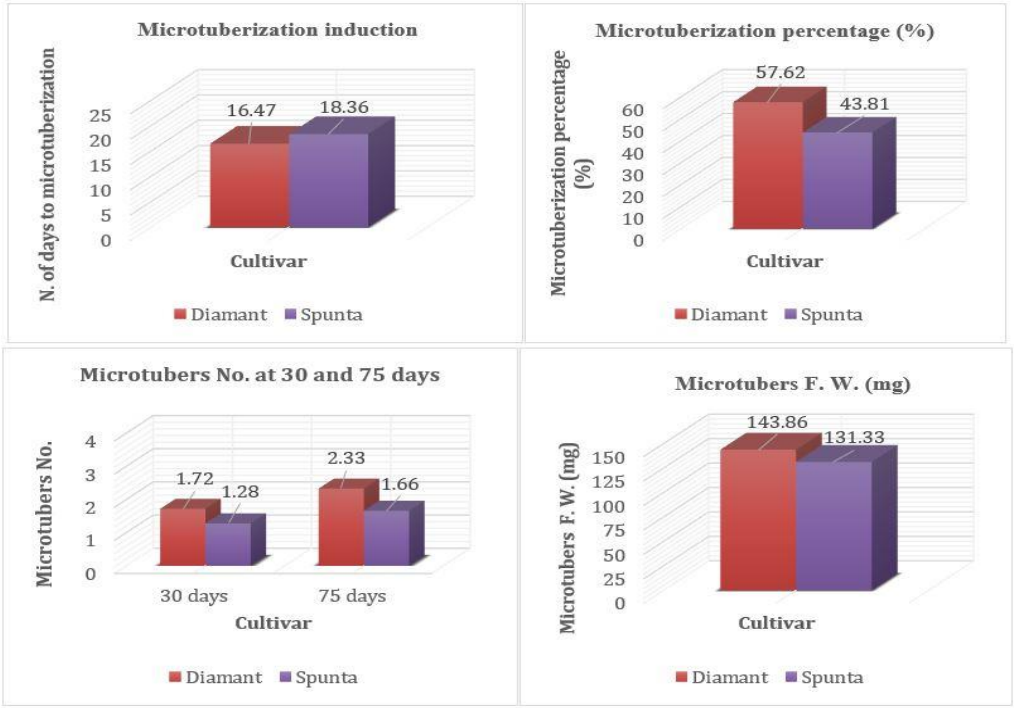
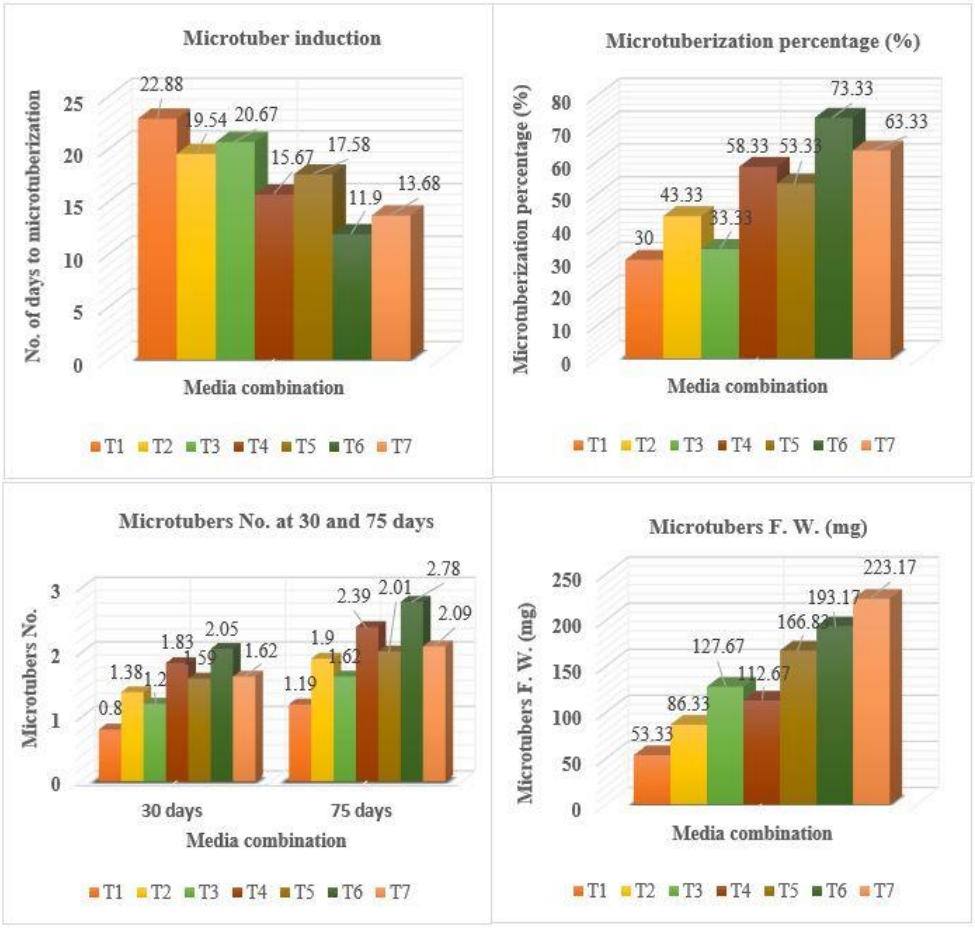


Fig. 1. Effect of potato cultivars Diamant and Spunta on microtuberization

Kin + 9% sucrose resulted to the highest microtuber weight (223.17mg) and came to the second rank for the other parameters. With regard to medium without kinetin, MS medium supplemented with 6% sucrose was the best compared to 3 or 9% sucrose in all studied characters except microtubers weight which obtained by 9% sucrose.



T_1: 3% sucrose
T_2: 6% sucrose
T_3: 9% sucrose
T_4: 2mgl^{-1} Kin + 6% sucrose
T_5: 2mgl^{-1} Kin + 9% sucrose
T_6: 3mgl^{-1} Kin + 6% sucrose
T_7: 3mgl^{-1} Kin + 9% sucrose

Fig. 2. Effect of media composition on potato microtuberization

In this concern, it is known that cytokinins play a main role in the stimulation of cell proliferation, where during induction stage of tuberization cell division, enlargement and growth may be indeed in local activation of cytokinins (Aksenova *et al.*, 2009 and Sota, 2020). In addition, Aksenova *et al.* (2012) and Astarini *et al.* (2021) confirmed that during initiation cytokinins, i.e. kinetin can activate the starch synthase, due to accumulation of starch and promoting tuber development. Moreover, Prat (2004) and Ali *et al.* (2018) demonstrated that kinetin act a principal role by regulating gene expression during the transport and

Table 1. Effect of the interaction between the two potato cultivars Diamant and Spunta as well as media composition on microtuberization

Treatment		No. of days to microtuberization	Microtuberization percentage (%)	No. of microtubers / explant at		Aver. of microtubers F. W. (mg)
Cultivar	Media			30 days	75 days	
Diamant	T_1	21.92 ab	33.33 ef	0.93 gh	1.35 ef	63.33 fg
	T_2	20.17 abc	53.33bcde	1.50 cdef	2.25 bcd	90.00 fg
	T_3	17.67abc	40.00 def	1.33 efg	1.83 cdef	131.67 cdef
	T_4	14.89 abc	63.33 abc	2.18 ab	2.78 ab	120.33 def
	T_5	16.61 abc	60.00 abcd	1.89 abc	2.30 bcd	171.33 abcde
	T_6	11.00 c	80.00 a	2.34 a	3.23 a	199.33 abc
	T_7	13.05 bc	73.33 ab	1.83 bcd	2.58 abc	231.00 a
Spunta	T_1	23.83 a	26.67 f	0.67 h	1.03 f	43.33 g
	T_2	18.91 abc	33.33 ef	1.25 fg	1.56 def	82.67 fg
	T_3	23.67 a	26.67 f	1.07 fgh	1.40 ef	123.67 def
	T_4	16.44 abc	53.33 bcde	149 cdef	2.00 bcde	105.00 efg
	T_5	18.54 abc	46.67 cdef	1.29 efg	1.72 def	162.33 bcde
	T_6	12.80 bc	66.67 abc	1.76 bcde	2.33 bcd	187.00 abcd
	T_7	14.30 abc	53.33 bcde	1.41 def	1.59 def	215.33 ab

Values having the same alphabetical letter (s) in each column did not significantly at 0.05 level.
T_1: 3% sucrose T_2: 6% sucrose T_3: 9% sucrose
T_4: 2 mgl^{-1} Kin + 6% sucrose T_5: 2 mgl^{-1} Kin + 9% sucrose T_6: 3 mgl^{-1} Kin + 6% sucrose
T_7: 3 mgl^{-1} Kin + 9% sucrose

accumulate the assimilates towards the stolons of potato. Also, Simko (1993) and Momena (2014) stated that the effect of Kin on microtuber formation may be referring to its relation with ethylene biosynthesis.

Sucrose concentrations are commonly used at range between 6 - 10 %. In this respect, kumar e*t al.* (2015), Ali *et al.* (2018), Vural *et al.* (2018) and Astarini *et al.* (2021) indicated that sucrose at the concentration of 6% in MS medium was the best for microtuberization. Moreover, there were different studies demonstrated that 8-10% sucrose concentration had a significant effect for microtuber formation (Emaraa *et al.*, 2017, Hossain *et al.*, 2017and Khalil *et al.*, 2017).

Sucrose is essential under high concentration for tuberization, it serves as energy source or osmatic potent agent (Motallebi - Azar *et al.*, 2013 and Al-Hussaini *et a.l*, 2015). Visser *et al.*, (1994) and Podwyszyeska (2012) explained the relationship between microtuberization and sucrose, by causing various physiological, biochemical and morphological changes due to transform sucrose to starch during the developing of microtubers with increased cell division and

enlargement of the stolon end followed by higher accumulation of starch and protein as the effect of genes expression which involved in starch and protein biosynthesis.

With regard to the combined effect between varieties and medium constituents, data in Table 1. show different responses between the two cultivars and medium treatments on microtuberization. Results seemed generally that sucrose concentrations (3, 6 and 9%) without kin resulted the longest period for microtuber induction and the lowest values for all tested parameters, especially the concentration 3% sucrose with the two cultivars compared to the other treatments.

Data show also that MS medium contain 2 or 3 mgl^{-1} Kin with 6 or 9% sucrose had enhanced effect of potato microtuber formation in both varieties. In this respect, cultured explants of Diamant cv. in medium supplemented with 3 mgl^{-1} Kin + 6% sucrose was the favorite treatment, whereas resulted to the least number of days to microtuber initiation (11.00 day) and highest values of microtuberization% (80.00 %), No. of microtubers at 30 and 75 days (2.34 and 3.23 microtubers / explant, respectively). Meanwhile, the maximum weight of microtubers by the treatment of 3 mgl^{-1} Kin + 9% sucrose (231.00 mg). In this concern, Spunta took the same trend with the treatments, but came in the second rank after Diamant cv. for the response to the applications.

These results are in agreement with those reported by Nasiruddin *et al.* (2013), Momena *et al.* (2014), Al- Ahmar *et al.* (2016) and Astarini *et al.* (2021) who concluded that potato microtuberization should be encouraged by media contain cytokinin, i.e. Kin with high level of sucrose (6 - 9%).

Effect of photoperiod condition, cultivars and their combined:

There were significant differences between the two potato varieties Diamant and Spunta, regarding to number of days to tuberization and microtuber number after 30 and 75 days, meanwhile, the other parameters, i.e. tuberization % and the average microtubers fresh weight had no significant effect between them as shown in Fig. 3. Diamant cv. recorded the least time for microtuberization (11.17) and number of microtubers/ explant after 30 and 75 days (1.93 and 2,90, respectively) compared with the other cultivar (Spunta cv). The differential response between the two studied varieties in microtuberization is probably due to genetic variation exist in potato germplasm. Nistor *et al.* (2010) reported that there are various interactions between *in vitro* potato tuberization conditions, but it seems that genetically specified was the most of them. The variation in microtuber formation among different cultivars was observed by Abd Elaleem *et al.* (2015), Al- Hussaini *et al.* (2015), Al- Ahmar *et al.* (2016), Ali *et al.* (2018) and Astarini *et al.* (2021), who concluded that genetic origin of a clone was the most important factor which play a main role in microtuber formation under *in vitro* conditions.

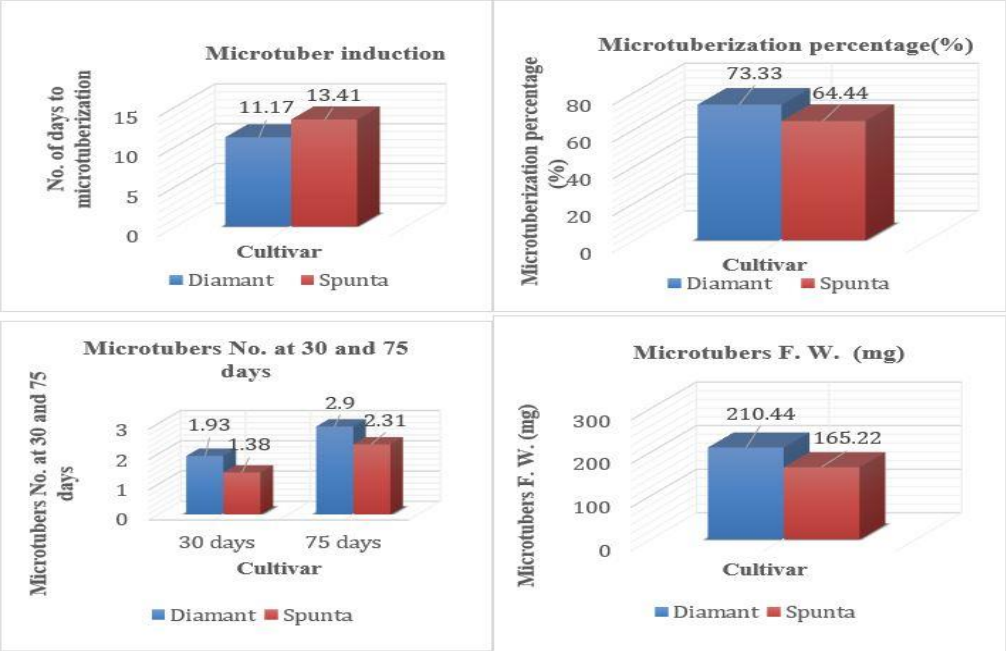


Fig. 3. Effect of potato cultivars Diamant and Spunta on mcirotuberization

Light, *i.e.* photoperiod considered as one of the most important environmental factors in relation to *in vitro* microtuberization. In this respect, data presented in Fig.4. revealed that photoperiod incubation conditions, *i.e.* 16h / 8h and 8h / 16h (light / dark), as well as darkness for tuberisation caused marked significant effects on the number of day to tuberization and number of microtubers produced after 30 and 75 days. Furthermore, there were no significant effect between the two treatments 8h / 16h (light / dark) and darkness for mirotuberization% and average of microtubers fresh weight. In this concern, the shortest period for microtuber induction (8.85 days) and maximum tuberization% (80.00%) were showed by darkness condition, meanwhile the highest number of microtubers/explant produced after 30 and 75 days (2.01 and 3.12, respectively) as well as maximum average of microtubers fresh weight (207.08 mg) by short day (8h light) compared with the other day length treatment (16h / 8h, light / dark).

These results are similar to those of Dobránszki *et al.* (1999) who confirmed that the suitable combination between light and dark conditions with short days can accelerate the induction, number and development of *in vitro* potato microtubers.

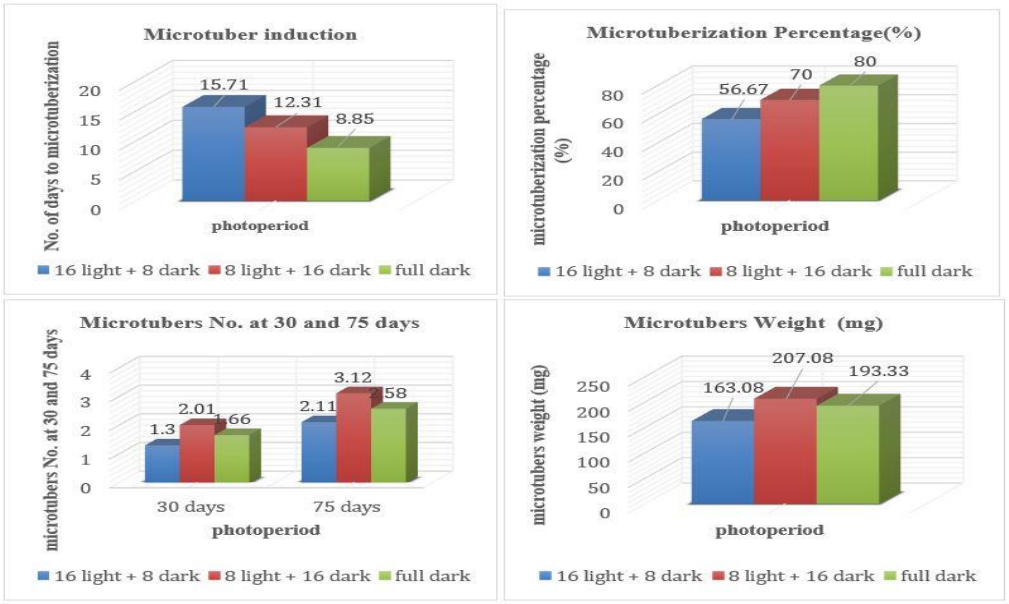


Fig. 4. Effect of the photoperiod treatments on potato microtuberization

Also, Yu *et al.* (2000) and Alix *et al.* (2001) stated that the superiority method for microtuber production have used a combination of sucrose at high concentration (6- 9%) in the medium and short days (8h photoperiod) or incubation in darkness to cause the good initiation and development of *in vitro* microtubers. Furthermore, Al- Ahmar *et al.*, 2016, Ali *et al.*, 2018, Astarini *et al.*, 2021 and Homsuwan *et al.*, 2021, achieved the same results in this concern.

The modification of photoperiod as environmental factor is so important (Rahman *et al.*, 2013), incubation explants in darkness after light duration due to increase the tuberization by enhancing the synthesis of tuberonic acid (very similar in its chemical constituents to jasmonic acid) which it plays an important role for microtuberization during *in vitro* condition (Al-Hussaini *et al.*, 2015, Alisdair and Willmitzer, 2001).

In addition, Dwiati and Anggorowati (2011) observed that *in vitro* potato shoots change its growth direction from upright to lower meristem including the microtuber formation under dark photoperiod and potato considered a short-day plant, so dark condition affect the formation of microtuber. On the other hand, Garcia and Bolaños (2017) noticed that under the photoperiod 16h / 8h (light / dark) number of microtuber was decreased, meanwhile their biomass was increased and greener, but vice versa was occurred in dark where the number was

greater with lower weight and creamy color, they referred these results that dark condition promotes the premature senescence and this the reduction of microluber potential for thickening. Nowak and Asiedu (1992) stated that light may be benefit in tuber induction and bulking where explants take long time for growth.

Interaction between cultivars and photoperiod incubation for tuberization, Table 2. revealed that all photoperiod treatments had a significant effect with the two cultivars Diamant and Spunta at the number of days to tuberization. The earliest microtuberization was obtained by Diamant cv. at (7.97 day) and Spunta at (9.72 day) by the incubation explants under darkness. Moreover, Diamant cv. obtained the highest values of microtubers number at 30 and 75 day (2.53 and 3.73 days, respectively) and fresh weight (215.83 mg) by short day (8h / 16h, light / dark), followed by darkness treatment, which achieved the optimum values of microtuber % (86.67) compared to the photoperiod of 16h / 8h (light / dark).

Table 2. The interaction response of two potato cvs. Diamant and Spunta as well as, photoperiod treatments on *in vitro* microtubrization

Treatment		No. of days to microtuberization	Microtuberization percentage (%)	No. of microtubers/ explant at		Aver. of microtubers F. W. (mg)
Cultivar	Photoperiod			30 days	75 days	
Diamant	16 light + 8 dark	**14.97 ab**	**60.00 b**	**1.417 c**	**2.28bc**	**206.17 a**
	8 light + 16 dark	**10.56 c**	**73.33 ab**	**2.53 a**	**3.73 a**	**215.83a**
	full dark	**7.97 d**	**86.67 a**	**1.85 b**	**2.68 b**	**209.33a**
Spunta	16 light + 8 dark	**16.45 a**	**53.33 b**	**1.177 c**	**1.94 c**	**120.00 b**
	8 light + 16 dark	**14.06 b**	**66.67 ab**	**1.50 bc**	**2.50 b**	**198.33 a**
	full dark	**9.72 c**	**73.33 ab**	**1.47 bc**	**2.47 b**	**177.33 a**

Values having the same alphabetical letter (s) in the same column did not significantly at 0.05 level.

As for Spunta cultivar, incubation cultures under short day 8h / 16h (light /dark) due to the highest number of microtubers (1.50 and 2.50, respectively) after 30 and 75 days with average microtubers weight 198.33mg, but the maximum tuberization % (73.33) at darkness. The differences in response between genotypes and light effect of microtuber production were proven with Al- Hussaini *et al.* (2015), Al- Ahmar *et al.* (2016), Ali *et al.* (2018), Astarini *et al.* (2021) and Homsuwan *et al.* (2021) who illustrated that genotypes appeared various variations under the same incubation conditions for microtuberization.

There have been several published results reported that morphogenetic light effect is participating in microtuberization under *in vitro* conditions and

photoperiod had a permitting rather than regulating influence (Seabrook *et al.*, 1993). In this respect, Abd Elaleem *et al.* (2015) confirmed that potato microtubers induction was dependent on the interaction between some factors, i.e. sucrose concentration, photoperiod (dark), growth regulators and genotype. Also, Isidron *et al.* (2021) demonstrated that the formation of potato tubers considered a complex developmental process that needs the interaction of genetical, environmental and biochemical factors.

CONCLUSION

To can be concluded that MS medium + 3 mgl^{-1} Kin + 6% sucrose under incubation photoperiod 8h / 16h (light / dark) or darkness considered being the most effective treatment for microtuber production under this experiment conditions. Diamant cultivar was the most response for microtuber induction and development with these applications.

Moreover, the investigation suggesting the importance to establish particular protocol for each genotype, whereas the responses were differently.

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إنتاج درينات بعض أصناف البطاطس معمليا استجابة لتركيب البيئة و ظروف الإضاءة

أمينة محمد وفا - وفاء عادل فكري [١] – علي عبد الحميد حسان [١]- إسماعيل عبد الحافظ خطاب [٢]

١. قسم الإنتاج النباتي – كلية التكنولوجيا و التنمية – جامعة الزقازيق – مصر

٢. قسم الوراثة – كلية الزراعة – جامعة كفر الشيخ – مصر

تم اجراء هذا العمل بالتعاون فيما بين قسم الإنتاج النباتي، كلية التكنولوجيا و التنمية - جامعة الزقازيق و معمل الهندسة الوراثية و زراعة الأنسجة بقسم الوراثة – كلية الزراعة – جامعة كفر الشيخ خلال الفترة من ٢٠٢٠ – ٢٠٢٢ لدراسة قدرة صنفي البطاطس دايمونت و اسبونتا على انتاج الدرينات معمليا. تم ذلك بملاحظة تأثير تركيب بيئة النمو و ذلك بإستخدام توليفات مختلفة من تركيزات الكينيتن و السكروز و كذلك ظروف فترات الإضاءة عند التحضين في تجربتين مستقلتين. تم تقييم هذه التجارب بنظام العشوائي الكامل بالنسبة للتجربة الأولى، فقد تم استخدام أربعة عشر معاملة تتمثل في الآتي صنفين بطاطس (دايمونت

و اسبونتا) و سبع بيئات التركيزات ٣، ٦، ٩% سكروز كلا بمفرده بدون إضافة كينيتن أو التركيزات ٦، ٩% من السكروز كل منهما مع التركيز ٢ أو ٣ ملليجرام/ لتر من الكينيتن مع صنفين من البطاطس . بينما التجربة الثانية تشمل على ست معاملات و تم زراعة المنفصل النباتي (الجزء مكون من عقدتين) لكل صنف على بيئة موراشيوج و سكوج بتركيز ٠,٧٥% و التي تحتوي على التركيزات ٣ ملليجرام/ لتر كينيتن + ٦% سكروز و تم التحضين تحت ظروف ثلاث فترات للإضاءة، ١) ١٦ / ٨ ساعات (إضاءة / إظلام)، ٢) ٨/ ١٦ ساعة (إضاءة / إظلام)، ٣) إظلام تام.

و قد أوضحت النتائج التي تم الحصول عليها أن الصنف دايمونت كان هو الأكثر استجابة للمعاملات مقارنة بالصنف اسبونتا. أدى إمداد بيئة موراشيوج و سكوج بالكينيتن بمعدل ٣ ملليجرام/ لتر + ٦ أو ٩% سكروز إلى تقليل عدد الأيام اللازمة لبداية تكوين الدرينات، وزيادة النسبة المئوية لحدوث تكوين الدرينات، و عدد الدرينات المتكونة بعد ٣٥ يوما و كذلك ٧٥ يوما (أي عند جمع الدرينات) بجانب زيادة متوسط معدل الوزن الطازج للدرينات. و قد حقق الصنف دايمونت أعلى النتائج لكل القراءات التي تم دراستها. و بالإضافة لذلك فقد كان التحضين تحت ظروف الإضاءة، ١٦/٨ ساعة (إضاءة / إظلام) أو الاظلام التام هو الأفضل في النتائج مقارنة بظروف الإضاءة الأخرى و خاصة مع الصنف دايمونت.

التوصية : و بناء على ذلك فإنه يمكن أن نخلص إلى أن زيادة تركيز الكينيتن ببيئة موراشيوج و سكوج (٠.٧٥%) إلى ٣ ملليجرام/ لتر + ٦ أو ٩% سكروز مع التحضين تحت ظروف النهار القصير أو الإظلام التام و خاصة مع الصنف دايمونت يشجع على إنتاج و نمو الدرينات تحت الظروف المعملية و كان تقييم التجربتين بنظام كامل العشوائية.