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EFFECT OF GROWTH REGULATORS ON MERISTEM CULTURE OF POTATO CV. KUFRI CHIPS SONA

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ABSTRACT

Khanam MHA, Chowdhury MNA, Islam MJ, Khatun MJ, Hussain MA (2013) Effect of growth regulators on meristem culture of potato cv. Kufri Chips Sona. *Int. J. Sustain. Crop Prod.* 8(1), 22-24.

The experiment was conducted at the Biotechnology Laboratory, A. H. Z. Biotech Limited, Vadra, Rajshahi, Bangladesh during December 2010 to April 2011 to find out a suitable growth regulator combination and concentration of GA_3 and NAA with Murashige and Skoog (MS) medium for regeneration of potato cv. Kufri Chips Sona. The treatments were different concentration of GA_3 (0.15, 0.25, 0.35 & 0.45 mg/l) + NAA (0.01, 0.02, 0.03, & 0.04 mg/l). It was found that the highest (53%) explants survived and produced shoots on the combination of GA_3 @ 0.25 mg/l + NAA @ 0.02 mg/l. The highest (8.80 cm) shoots lengths were recorded with combination of GA_3 @ 0.25 mg/l + NAA @ 0.02 mg /l. In respect of node number it was observed that the maximum (8.73) number of node was recorded from GA_3 @ 0.25 mg/l + NAA @ 0.02 mg /l. The highest root length (9.60 cm) was recorded in the treatment of GA_3 @ 0.25 mg/l + NAA @ 0.02 mg /l. The explants treated with GA_3 @ 0.25 mg/l + NAA @ 0.02 mg /l gave the highest fresh shoot and root weight (0.738 & 0.350 g, respectively). It is concluded that the combination of GA_3 @ 0.25 + NAA @ 0.02 mg/l performed better for shoot and root regeneration and multiplication of potato cv. Kufri Chips Sona.

Key words: *potato, regeneration, growth regulator (GA_3 & NAA), meristem tip*

INTRODUCTION

The potato (*Solanum tuberosum* L.) is the fourth ranked world crop which had 20 million hectare planting area in the world in 2005 and produced nearly 325 million tons annually (FAO 2007). It is the most widely cultivated food crop after wheat, rice and maize (Anonymous 2000). It originates from the western hemisphere and the Andes mountain range in southern America (Woolf 1986). The A. H. Z. Biotech Limited collected some variety from India for quality potato chip production. Among them Kufri Chips Sona the good in respect of keeping quality, yield and dry matter. Micro propagation is the alternative to conventional propagation of potatoes (Chandra and Birhman, 1994). *In vitro* propagation methods using meristem tips, nodal cuttings and micro tubers are more reliable for maintaining genetic integrity of the multiplied clones since de-differentiation and the subsequent organogenesis/embryo genesis with the accompanying genetic changes have been reported (Wang and Hu, 1982). Meristem culture provides a reproducible and economically viable method for producing pathogen free plants. As meristem tips are free from viruses, elimation and generation of virus free plants are possible through meristem culture (Jha and Ghosh, 2005). Through several workers have reported the use of MS medium without hormones during proliferation stage (Gopal *et al.* 1980; Aburkhes *et al.* 1984; Rosell *et al.* 1987) but the growth was slow and it took 3-4 weeks to grow 30-50 high shoots (Hussey and Stacey, 1981). Improvement has been made possible by addition of growth regulators to the medium. Gas stimulated development of nodal cutting on MS but at high concentration it produce narrow and elongated shoot (Novak *et al.* 1980) depending on genotypes. Longest main shoot and highest node numbers are reported to be obtained in medium containing NAA and BAP (Yousef *et al.* 1997). Pennazio and Vecchiate (1976) used MS medium supplemented with GA and NAA for proliferating meristem tip. The experiment was undertaken to find out the effect of different hormonal combinations and concentration of GA_3 (0.15, 0.25, 0.35 & 0.45 mg/l) + NAA (0.01, 0.02, 0.03 & 0.04 mg/l) with MS medium on *in vitro* shoot regeneration of potato cv. Kufri Chips Sona using meristem tips.

MATERIALS AND METHODS

The experiment was conducted at the Biotechnology Laboratory, A. H. Z Biotech Limited, Vadra, Rajshahi, Bangladesh during the period from December 2010 to April 2011. The meristem tips were used in this study. For obtaining meristem tips, potato of Kufri Chips Sona were planted on A. H. Z. Biotech Limited field laboratory at Vadra, Rajshahi, for collecting explants. Shoot tips were collected from actively growing twigs and washed under running tap water. Then the shoot tips were disinfected with 0.1% mercuric chloride solution containing approximately 0.02% tween-20 [polyoxuethelen (20) sorbitan, oleate] for 2 minute inside the running laminar air flow cabinet. Treated explants were washed 4-5 times with sterile distilled water to remove the effect of sterilizing agent. Shoot apical meristem consisting of the apical dome with one to two leaf primorida was isolated using sterile hypodermic needle and scalpel under a dissecting microscope (Alam *et al.* 2010). To avoid dehydration, isolated meristems (0.3-0.5 mm) were transferred quickly on the filter paper bridge in test tubes containing sterilized liquid MS medium (Murashige and Skoog, 1962) supplemented with different

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concentrations of GA_3 and NAA (Fig. 1a). After 4-5 weeks, the developed meristems were subcultured on semi-solid medium with different levels of plant growth regulator for next 4-6 weeks for shoot elongation. The recorded data were on explants producing shoots (%), shoot length (cm), number of node per shoot, root length (cm), fresh weight of root (g) and shoot (g). The experiment was designed in single factor CRD with 5 replications. Results were analyzed using MSTAT-C statistical package.

RESULT AND DISCUSSION

It was found that explants producing shoot significantly varied due to the different concentration of GA_3, and NAA (Table 1). The combination of GA_3 @ 0.25 mg/l + NAA @ 0.02 mg/l showed best results in respect of explants producing shoots (%), shoot length (cm), number of node per shoot, root length (cm), fresh weight of root (g) and shoot (g). The highest explants survived (53%) and produced shoots on the combination of GA_3 @ 0.25 mg/l + NAA @ 0.02 mg/l and the lowest (35%) was found on GA_3 @ 0.15 mg/l + NAA @ 0.01 mg/l. Shoot length influenced significantly due to the effect of GA_3 and NAA. The highest (8.80 cm) shoots length were recorded with combination of GA_3 @ 0.25 mg/l + NAA @ 0.02 mg/l followed by 0.15 mg/l GA_3 + NAA @ 0.01 mg/ (7.30 cm) which was statistically significant (Fig. 1b-c and Table 1).

Table 1. Effect of different hormonal combination and concentration on explants producing shoots, shoot length and node number after 40-45 days of culture

Treatments GA_3 **+ NAA (mg/l)**	**Explants Producing Shoots (%)**	**Shoot Length (cm)**	**Node Number**
0.15 + 0.01	35	7.30	6.10
0.25 + 0.02	53	8.80	8.73
0.35 + 0.03	43	6.80	5.30
0.45 + 0.04	46	5.20	4.40
LSD (p≥0.05)	4.86	2.234	2.64
CV (%)	5.49	10.82	11.57

Fig. 1a. Development of isolated apical meristem on filter paper bridge in liquid MS medium

Fig. 1b. Shoot with primary leaf development after sub culturing in the semi solid medium

Fig. 1c. Development of complete plantlet with root on different hormonal combination of GA_3 @ 0.25 + NAA @ 0.02 mg/l

In case of node number, it was observed that the maximum (8.73) number of node was recorded in GA_3 @ 0.25 mg/l + NAA @ 0.02 mg/l followed by GA_3 @ 0.15 mg/l + NAA @ 0.01 mg/l (6.10) (Table 2). The combination of GA_3 @ 0.35 and 0.45 mg/l + NAA @ 0.03 & 0.04 mg/l having higher concentration of NAA responded the least shoot height and number of nodes. This could be attributed to the fact that higher concentration of NAA inhibit root and shoot growth (Pennazio and Vecchiati, 1976). The highest root length (9.60 cm) was recorded in GA_3 @ 0.25 mg/l + NAA @ 0.02 mg/l followed by 0.15 mg/l GA_3 + NAA @ 0.01 mg/(8.40cm) but it was the lowest (7.00 cm) in GA_3 @ 0.45 mg/l + NAA @ 0.04 mg/l. On the other hand, same results were found in case of fresh weight of shoot and fresh weight of root. It was observed that GA_3 @ 0.25 mg/l + NAA @ 0.02 mg/l gave the highest fresh shoot and root weight (0.738 & 0.350 g, respectively).

Table 2. Effect of different hormonal combination and concentration on root length, shoot weight and root weight after 40-45 days of culture

Treatments GA_3 + NAA(mg/l)	Root Length (cm)	Fresh wt. of Shoot (g)	Fresh wt. of Root (g)
0.15 + 0.01	8.40	0.512	0.281
0.25 + 0.02	9.60	0.738	0.350
0.35 + 0.03	7.20	0.467	0.260
0.45 + 0.04	7.00	0.480	0.258
LSD (p≥0.05)	1.24	0.089	0.199
CV (%)	2.15	7.72	2.47

CONCLUSION

From the above study it is occluded that the combination of GA_3 + NAA (@ 0.25 & 0.02 mg/l respectively is the best for shoot and root regeneration and multiplication of potato cv. Kufri Chips Sona in comparison to the others combination of GA_3 + NAA with MS medium.

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