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Effects of Different pH Levels of Medium on Growth and Rooting of Single Nodes Resulted from Potato Meristem Culture

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Abstract

Solid MS medium with 0.25 mg/l GA_3, 0.01 mg/l NAA 2.0 mg/l calcium pantothenate, 30 g/l sucrose and 7 g/l showed significant differences between different pH levels in respect of its ability to induction of rooting and shooting in plantlets produced from the single nodes of two cultivar potato (*Solanum tuberosum* L.) varieties after subjecting them with thermotherapy. Overall pH 5.5 was the best for all the traits. Low and high levels of pH from 5.5 were found to reduce the growth and rooting of single nodes. The reduction was more pronounced at low levels than high levels of pH.

Introduction

In modern world, demand for potato is increasing rapidly. During the past 20 years, potato production has increased more than two times in advanced countries due to increasing acreage and yield (Midmore 1992). Average yield of potato is still lower than potato yield potential in advanced countries (FAO 1991, FAO/CIP 1995). Potato production is limited due to some important factors such as unavailability of compatible varieties and the disease free plant material particularly in outlying regions not connected with dependable transport.

There is insufficient information about the effect of pH on explant growth in vitro. It seems that pH in the range of 5 - 6.5 supports growth, because lower pH (less than 4.5) and higher pH (more than 7) generally stop growth and development of plantlets (Pierik 1997).

Gulsen and Domanoglu (1991) studied the effect of different levels of sucrose, agar and pH on multiplication rate and shoot quality of Quince Tree on modified MS medium with 3.0 mg/l BA, 0.1 mg/l IAA and 0.1 mg/l GA_3. They

obtained best shoot multiplication and development in the medium containing 30 g/l sucrose and 5 g/l agar at pH 5.5.

Materials and Methods

Marfona potato cultivar was planted in pots containing soil and fine sand under greenhouse conditions. When they grew enough, apical buds were removed from growing lateral buds and produced more branches. Then these plants were moved to thermotherapy room and they were kept under 7500 lux light intensity under 16 hrs photoperiod at 37_C and relative moisture of 60 - 65 %.

The pots were removed to laboratory for meristem isolation after 4 - 5 weeks. Lateral buds were used for meristem isolation under complete asceptic conditions in laboratory. Isolated meristems were placed on filter paper bridge in liquid modified MS medium with GA_3 (0.25 mg/l), calcium pantothenate (2 mg/l) and sucrose (30 g/l) were applied at this stage.

Plantlets resulting from meristems were micropropagated in the solid medium by using single node cutting culture. The experimental tubes containing 25 ml of modified solid medium (MS) with 0.25 mg/l GA_3, 0.01 mg/l NAA, 30 g/l sucrose and 7 g/l agar were used. The plantlets were grown at 25_C under 16 hrs photoperiod with 2000 lux light intensity for one month.

The experimental design was completely randomized design with five replications. Treatments comprised five different pH levels (4.5, 5, 5.5, 6 and 6.5) in modified solid MS medium.

pH was regulated by weak HCl and NaOH after adding all medium components except agar and calcium pantothenate. The latter was filter sterilized before it was added to the culture medium inside a laminar flow.

Apical buds and roots of plantlets from the previous stage were removed and each plantlet was divided into 4 - 8 cuttings. Each single node cutting was placed in the medium in each experimental tube. After providing all treatments, the samples were moved to growth chamber at 25_C, 2000 lux light intensity and 16 h photoperiod. Then the effects of different pH levels were investigated on root number, plantlet length, node number and root length and the best pH level was selected.

Results and Discussion

It was observed that there were significant differences between pH levels for all traits (root number, plantlet length, nodule number and large root length). Results reported here reveal that overall the pH level 5.5 is better than all other pH levels for plantlet length, node number and large shoot length. At pH 5.5

plantlet length (7.8 cm), node number (8.6), root number (10.44) increased accompanied by greater root length (13.2 cm) (Table 1).

Lower pH levels (4.5 and 5) decreased growth and rooting more than higher pH levels (6 and 6.5). At 4.5 pH level the plantlet length (4.8 cm), nodule number (4.6), root number (3.8) and large root length (7.38 cm) were the lowest (Table 1).

Table 1. Comparison of different trait means at different pH levels.

pH levels	Plantlet length (cm)	Nodule number	Root number	Largest root length (cm)
4.5	4.84 d	4.6 d	3.8 d	7.38 d
5.0	6.52 b	5.4 cd	7.2 c	11.00 bc
5.5	7.82 a	8.6 a	10.4 a	13.28 a
6.0	6.80 b	7.2 b	9.2 b	11.92 a
6.5	5.62 c	6.2 bc	7.2 c	10.26 c

Means followed by similar letters in each column are not significantly different at 5% level according to Duncans Multiple Range Test.

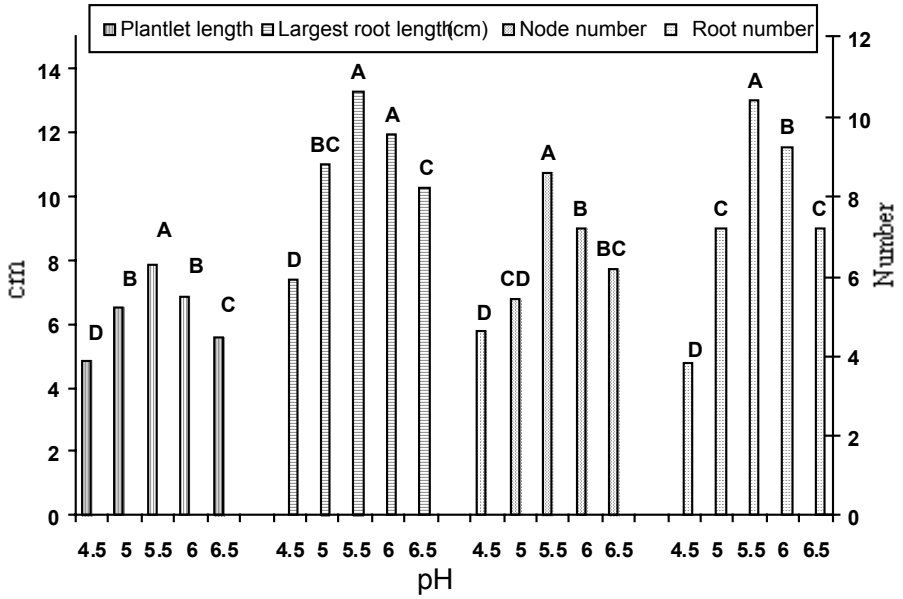

Fig. **1**. Effect of different pH levels on plantlet length, largest root length, node number and root number.

There was no significant difference between pH levels of 5 and 6 for plantlet length. Differences between node and root number were not significant at 5 and 6.5 pH levels (Fig. 1). There was no significant difference between pH

levels of 5.5 and 6 and between 5 and 6 for greater root length. Other treatments had significant differences with each other at 1% level (Fig. 1).

The results of the present study showed that only lower pH levels (4.5 and 5) decreased single node rooting and growth.

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