Annals of Sri Lanka Department of Agriculture 2015. 17: 114-116

SOLUTION pH ALTERATION ON INDUCTION OF TUBER INITIATION IN HYDROPONICALLY GROWN POTATOES *

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INTRODUCTION

Pre basic seed production of potatoes is one of important process to maintain the quality of potato seeds. Advanced technologies such as hydroponics and aeroponics have been introduced to the seed production system of the Department of Agriculture recently to maintain the quality standards and high productivity rather than conventional geoponic system. Tuberization of potatoes in such a system can be promoted by applying stress conditions in mist culture such as N deficiency and interruption of mist for 12 hours (Waylen *et al.*, 1994) and induce rapid tuberization under N deficiency in hydroponics (Krauss and Marschner, 1982). Stress created by low pH in hydroponics has been used to induce potato tuberization and there is a possibility to use the similar phenomenon to promote pre basic seed potato production in local conditions. The objective of this study was to increasing pre basic seed production by intermittent pH reduction and to find out the optimum intermittent pH level to maximize number of tubers per plant grown in hydroponics.

MATERIALS AND METHODS

The experiment was conducted at Regional Agriculture Research and Development Centre, Bandarawela from 2013 to 2014. Simple laboratory experiment was conducted to identify pH and Electrical Conductivity (EC) changes with different concentrations of selected Albert's solutions prepared in pipe borne water. Tissue culturally generated rooted stem cuttings of potato var. Granola were used as planting materials and experiment conducted under poly green house condition. An observational study in year 2013 and two times

* *See "Tropical Agriculturist" Volume 164 for details.*

repeated replicated experiment was conducted in year 2014. Exposure to four levels of intermittent pH (3.0, 3.5, 4.0, 4.5) for 8 hours at 4 and 6 weeks after planting (WAP), keeping constant pH (5.5) as the control. Solution pH was lowered by applying 0.1M H_2SO_4 and raised by applying 0.1M KOH. Data were collected on plant height, number of stolons and number of tubers per plants at 3, 5, 8 and 12 weeks after planting.

RESULTS AND DISCUSSION

Initial pH and EC of the pipe borne water were 6.99 and 0.01 mS cm^{-1} respectively. With gradual increments of application of Albert's solution by 0.5 g L^{-1}, pH showed a negative correlation (R^2=0.959) and EC showed a positive correlation (R^2=0.996) with increasing solution concentration. Observational study revealed no changes in plant height before imposing the pH treatments. However other pH alterations (3.5, 4.0 and 4.5) showed neutral or positive changes of the growth parameters. Height of the plants was not changed with respective treatments but number of stolon and tubers were increased with pH alterations, compared to the constant pH. Above important characters, such as number of stolons and tubers per plant were superior in intermittent pH 3.5 (Tables 1 and 2).

Table 2. Time course response of average number of stolons to intermittent pH.

Treatment (pH)	Number of stolons/plant			
	3 WAP	5 WAP	8 WAP	12 WAP
Control 5.5	2.33a	31.33c	42.00b	46.33d
Intermittent pH 3.0	2.66a	42.66b	38.66b	47.00dc
Intermittent pH 3.5	2.66a	51.33a	52.00a	58.00a
Intermittent pH 4.0	2.33a	46.66b	45.66ab	54.33ab
Intermittent pH 4.5	3.66a	42.66b	44.66ab	51.33bc
CV	*12.33*	*5.36*	*9.23*	*4.54*
Mean	*2.73*	*42.93*	*44.60*	*51.4*

Note: Means followed by the same letter in each column are not significantly different at p=0.05

In replicated experiment plant height was not significant in early stages of the crop. The heights plant height was recorded in intermittent pH 3.5 and the lowest was recorded in intermittent pH 3.0 at 12 WAP. Number of stolon were significantly differ after first application of intermittent pH and results showed

significant increment of stolons with pH alterations (3.5) compare to constant pH. Maximum number of tubers (38.6) was recorded in pH 3.5 and it was 110% of the control. This experiment revealed the possibility of doubling the system productivity only with pH alterations and intermittent pH 3.5 for 8 hours at 4 and 6 WAP was the best treatment to obtain maximum number of pre basic seed potatoes in hydroponics systems.

Table 2. Time course response of average number of tubers to intermittent pH.

Treatment (pH)	Number of tubers/plant		
	5 WAP	8 WAP	12 WAP
Control 5.5	3.0b	12.66c	18.00c
Intermittent pH 3.0	4.0ab	12.00c	17.00c
Intermittent pH 3.5	5.0a	23.33a	38.66a
Intermittent pH 4.0	3.6ab	20.00b	26.33b
Intermittent pH 4.5	2.3b	18.66b	28.33b
CV	*14.79*	*9.96*	*7.82*
Mean	*3.6*	*17.33*	*25.66*

Note: Means followed by the same letter in each column are not significantly different at p=0.05

CONCLUSIONS

pH and EC values of Albert's solution showed higher relationship with its concentration. Results proved that intermittent reduction of nutrient solution pH can significantly promote tuber initiation of hydroponically grown potatoes, with increasing the productivity twice high. Intermittent pH 3.5 for 8 hours at 4 and 6 WAP was the best pH alteration to obtain maximum number of pre basic seed potatoes in hydroponics systems.

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