Kasetsart J. (Nat. Sci. Suppl.) Vol. 27, : 9-11 (1993)

In Vitro Preservation of Sugarcane Plantlets under Low Temperature

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ABSTRACT

Plantlets of two cultivated sugarcane cultivars, Supan 1 and CO2, cultured on modified Murashige and Skoog supplemented with 1 mg/l 2,4-dichlorophenoxy acetic acid, O.1 mg/l myo-inositol, 0.02mg/l glycine, 20g/l sucrose and 10% by volume of coconut water (CD media) were used. Plantlets were transferred to incubator controlled at 5°C and 15°C under 24 hours light condition for 1 and 2 months. After the storage periods, plantlets were cultured under room temperature for 1 month. Culture under 5°C for 1 month and 15°C for 1 and 2 months could decrease growth of sugarcane plantlets in which all of plantlets could normally regrowth under room temperature. Plantlets of sugarcane cultivar Supan 1 cultured under 5°C for 2 months could regrowth only 50-60% under room temperature.

Keywords: sugarcane, *in vitro* germplasm preservation

INTRODUCTION

Germplasm preservation of sugarcane, a vegetative-propagated crop, can not be kept as seed. Preservation of germplasm in the field may be lost by various plant pests and unfavorable environment. Therefore, *in vitro* preservation is the alternative method for germplasm preservation of sugarcane.

Callus of sugarcane was storaged by using low temperature (Lersrutaiyotin *et al.*, 1992) and daminozide (Visessuwan and Lersrutaiyotin, 1992). Plantlets of sugarcane was also stored by using mannitol, paclobutrazol and mepiquat chloride (Sonthichai *et al.*, 1992). In this experiment, preservation of sugarcane plantlet under low temperature was studied.

MATERIALS AND METHODS

1. Induction of plantlets from sugarcane shoot tips

Shoot tips of sugarcane cultivar Supan 1 and CO2 were dissected from shoots, surface sterized in 10% Clorox solution for 15 minutes and rinsed 3 times with sterized-distilled water. Shoot tips were cut into about 5mm in length and cultured on Murashige and Skoog (MS) media supplemented with 1 mg/l kinetin, 0.5mg/l gibberellic acid (GA3), 1 mg/l indole-3-butylic acid (IBA), 10% by volume of coconut water and 20g/l sucrose at pH 5.8. Then, plantlets were subcultured onto modified Murashige and Skoog media supplemented with 1 mg/l 2,4-dichlorophenoxy acetic acid (2,4,-D), 0.1 mg/l myo-inositol, 0.02 mg/l glycine, 20g/l sucrose and 10% by volume of coconut water (CD media).

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2. Culture plantlets under low temperature

After subcultured for 2 months plantlets were separated and cut to approximately 4 cm in length and not less than 1 g in weight. Length and weight of each plantlet were recorded before transferred to CD media at the beginning of the experiment. Eight plantlets were cultured under each temperature levels and period, namely 5°C for 1 and 2 month, 15°C for 1 and 2 month and 27°C (room temperature). Plantlets, after cultured under low temperature, were cultured under room temperature for 1 month. Length and weight of plantlets were recorded again after the storage periods at low temperature and 1 month reculture under room temperature.

RESULTS AND DISCUSSION

Growth (both weight and height) of sugarcane plantlets cultured under low temperature was lower than growth of sugarcane plantlets cultured under room temperature while growth of plantlets cultured in incubator controlled at 5°C was lower than that at 15°C (Table 1 and 2). Weight of sugarcane plantlets cultivar Supan 1 cultured under 15°C for 1 month and reculture under room temperature for 1 month was higher than weight of sugarcane plantlets of the same

Table 1 Increasing weight (g) of plantlets of sugarcane cultivar Supan 1 and CO2 at various period after starting storage experiment.

Storage condition	Months					
	Supan1			CO2		
	1[1]	2	3	1	2	3
27°C	5.82	23.54	48.10	9.86	29.07	47.03
15°C (1 month)	1.01	8.86		1.13	9.35	
15°C (2 months)		1.17	8.49		2.78	12.68
5°C (1 month)	0.56	2.98		0.33	2.39	
5°C (2 months)		0.75	1.06		0.23	2.40

1 months after started storage experiment

Table 2 Increasing height (cm) of plantlets of sugarcane cultivar Supan 1 and CO2 at various period after starting storage experiment.

Storage condition	Months					
	Supan1			CO2		
	1[1]	2	3	1	2	3
27°C	2.90	8.98	15.63	11.56	18.25	22.75
15°C (1 month)	0.70	3.18		1.80	8.64	
15°C (2 months)		1.09	4.59		3.00	7.88
5°C (1 month)	0.02	0.64		0.30	5.90	
5°C (2 months)		0.00	-0.80		0.00	2.85

1 months after started storage experiment

cultivar cultured under room temperature for 1 month, while those of cultivar CO2 was lower. On the contrary, height of sugarcane plantlets cultivar Supan 1 cultured under 15°C for 1 month and reculture under room temperature for 1 month was lower than height of sugarcane plantlets of the same cultivar cultured under room temperature for 1 month, while those of cultivar CO2 was higher. This would indicate that the recovering of plantlets from culture under 15°C when reculture under room temperature was different for each cultivar.

For culture at 5°C, weight of sugarcane plantlets after storage under 5°C for 1 month and reculture under room temperature for 1 month of cultivar Supan 1 was higher than those of CO2, but weight of sugarcane plantlets after storage under 5°C for 2 months and reculture under room temperature for 1 month of cultivar Supan 1 was lower than those of cultivar CO2. Plantlets of sugarcane cultivar Supan 1 may tolerate the low temperature (5°C) in the lower level than those of cultivar CO2. The susceptibility of sugarcane cultivar Supan 1 was observed in which leaves of some plantlets dried and only 50% of shoot tips survived and could regrowth resulting in the minus value of the height of sugarcane plantlets cultivar Supan 1 when cultured under room temperature. All of plantlets kept under 5°C for 1 month and 15°C for 1 and 2 month could survive.

After culture for 3 months, weight and height of sugarcane plantlets having low temperature storage period were lower than those without low temperature storage period. Weight of sugarcane plantlets storaged at 15°C was about 20% of those without low temperature storage period, while weight of sugarcane plantlets having low temperature storage period at 5°C was about 5% of those without low temperature storage period. Height of sugarcane plantlets having low temperature storage period at 15°C was about 25-35% of those without low temperature storage period, while weight of sugarcane plantlets having low temperature storage period at 5°C was about 10% of those without low temperature storage period in CO2 and less than 5% in Supan 1. Therefore, culture sugarcane plantlet under low temperature decreased weight and height at a reasonable level for the purpose of germplasm preservation.

CONCLUSION

Sugarcane plantlets could be storaged under 15°C for 2 months and 5°C for 1 month with normal regrowth under room temperature. Culture sugarcane plantlets under 5°C for 2 months killed some plantlets of certain cultivars.

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