rpc00001

Nicotiana tabacum BY-2 cell suspension culture

Components

- Domestic delivery: A 50-mL plastic conical centrifuge tube, containing cell suspension
- Overseas delivery: A 250-mL plastic Erlenmeyer flask, containing cells placed on semi-solid medium

Notice

- Subculture the cells to fresh medium immediately after arrival [Notes I, II].
- Do not store the cell culture in a refrigerator and a freezer.
- Maintain aseptic conditions of the cell culture, and work in a laminar flow cabinet.

Method

- Culture medium: mLS medium, 0.2 mg/L 2,4-D, pH 5.8 (medium no. 1) [Materials III]
- Culture conditions: 27°C, dark, 130 rpm [Methods II]
- Subculture: 7-day intervals [Methods I]

Citation of cell line

When results obtained by using this cell line are published in a scientific journal, it should be cited in the following manner: "*Nicotiana tabacum* BY-2 cell line (rpc00001) was provided by the RIKEN BRC through the National BioResource Project of the MEXT, Japan."

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Introduction

Tobacco BY-2 cell line is a fast-growing and highly-homogeneous cell line, and used for a broad range of plant studies around the world (Nagata *et al*. 2006). A suspension culture was established from a callus induced from a seedling of *Nicotiana tabacum* L. cultivar Bright Yellow 2 (Nagata *et al*. 1992). The BY-2 cells are grown in a modified Linsmaier and Skoog (mLS) medium supplemented with 0.2 mg/L 2,4-dichlorophenoxyacetic acid (2,4-D), pH 5.8. Our BY-2 cell culture has been maintained in the dark at 27℃ with rotary shaking at 130 rpm and subcultured at 7-day intervals (Figure 1, 2).

Materials

Chemicals and stock solutions

(All stock solutions are stored at 4℃)

A) MS salt mix

Murashige and Skoog Plant Salt Mixture, FUJIFILM Wako Pure Chemical Corporation (#392-00591)

B) Sucrose

C) BY2_P

KH_2PO_4	80 mg/mL

D) LS_VT_modified

Thiamine·HCl	0.4 mg/mL
myo-Inositol	40 mg/mL

E) 2,4-D (0.2 mg/mL)

2,4-D sodium monohydrate	0.236 mg/mL

(2,4-Dichlorophenoxy)acetic acid sodium salt monohydrate, Sigma-Aldrich (D6679)

F) KOH (1 N)

Glassware

A) Erlenmeyer flask (300 mL), capped with two layers of aluminum foil

B) Pipette (10 mL; large tip opening) and a bulb, sterilized by autoclaving at 121℃ for 20 min

Preparation of mLS medium (medium no. 1)

1. Dissolve the following chemicals in approximately 800 mL of distilled water.

MS salt mix	1 bag (1 L)
Sucrose	30 g

2. Add following stock solutions, and fill up to approximately 950 mL with distilled water.

BY2_P	2.5 mL
LS_VT_modified	2.5 mL
2,4-D (0.2 mg/mL)	1 mL

3. Adjust the pH of the solution to 5.8 with KOH (1 N), and fill up to 1 L with distilled water.

4. Pour 95 mL of the medium into a 300-mL flask.

5. Autoclave the flask at 121℃ for 20 min.

Methods

1. Agitate a 7-day-old culture well and transfer 1–1.2 mL of cell suspension to 95 mL of fresh mLS medium with a pipette.

2. Incubate cell cultures on a rotary shaker at 130 rpm under the dark condition at 27℃.

Notes

- For domestic customers: We send BY-2 cell suspension in a 50-mL disposable conical centrifuge tube. The cells should be transferred to fresh mLS medium immediately after arrival.

- For overseas customers: We send BY-2 cells placed on semi-solid mLS medium in a 250-mL disposable Erlenmeyer flask. The cells should be transferred to fresh mLS medium immediately after arrival. Collect the cells from the semi-solid medium with a spatula and transfer them to Erlenmeyer flasks containing fresh liquid medium.

- In order to maintain BY-2 cell suspension cultures stably, it is essential to transfer an adequate amount of cells to fresh mLS medium in every subculture. The amount of cells may vary from one lab to another, because proliferation of BY-2 cells is affected by culture conditions, such as a room temperature, rotation speed of a rotary shaker, and aeration condition of the culture.

- A low growth rate of BY-2 cells is sometimes caused by poor aeration (Kumagai-Sano *et al*. 2007). In order to obtain good aeration of a suspension culture, a silicone sponge plug may be used instead of the aluminum foil cap (*e.g.*, cap-type Silicosen; Shin-Etsu Polymer, Tokyo, Japan; https://www.shinpoly.co.jp/en/product/product/medical/plugs.html).

References

Kumagai-Sano F, Hayashi T, Sano T, Hasezawa S (2007) Cell cycle synchronization of tobacco BY-2 cells. Nature Protocols 1: 2621–2627. DOI: 10.1038/nprot.2006.381

Nagata T, Matsuoka K, Inze D (eds) (2006) Biotechnology in Agriculture and Forestry 58, Tobacco BY-2 cells: From cellular dynamics to omics. Springer-Verlag Berlin Heidelberg. DOI: 10.1007/3-540-32674-x

Nagata T, Nemoto Y, Hasezawa S (1992) Tobacco BY-2 cell line as the "HeLa" cell in the cell biology of higher plants. International Review of Cytology 132: 1–30. DOI: 10.1016/S0074-7696(08)62452-3

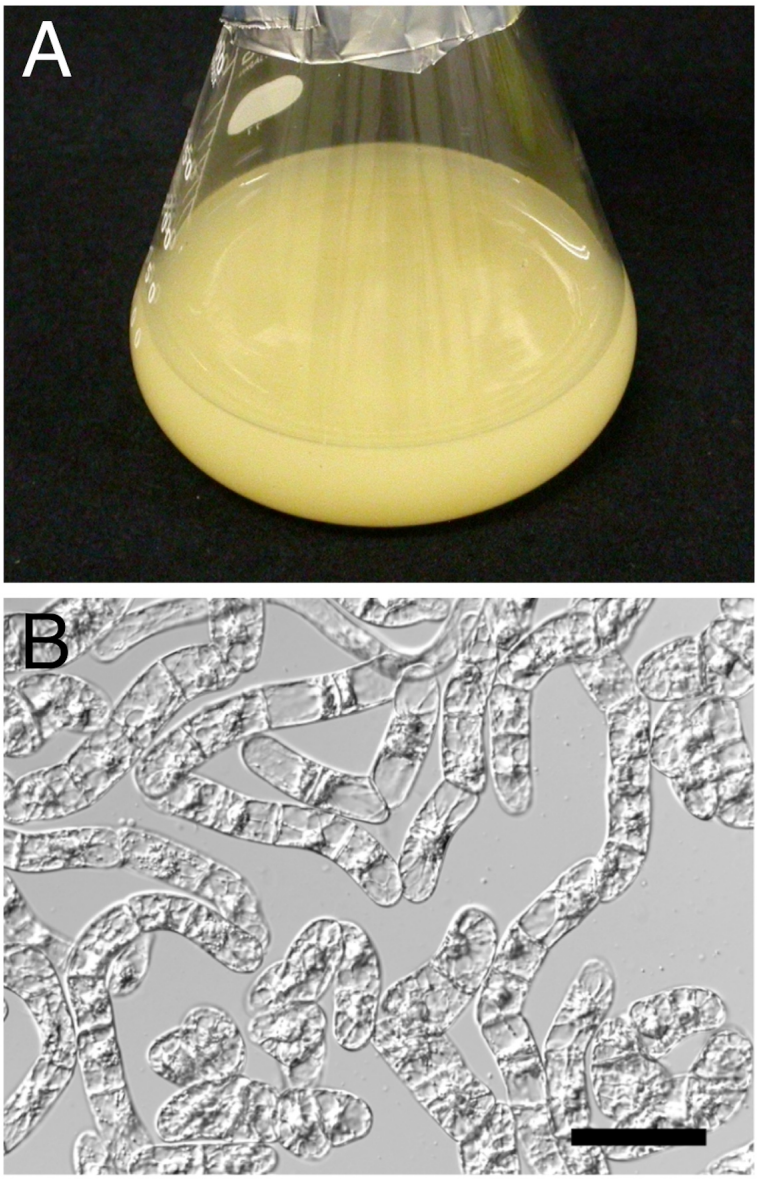

Figure 1. *Nicotiana tabacum* BY-2 cell suspension culture

A: Seven-day-old cell suspension culture.

B: Morphology of BY-2 cells after 3 day of subculture. BY-2 cells were observed by using a differential interference contrast microscope.
Scale bar = 100 μm

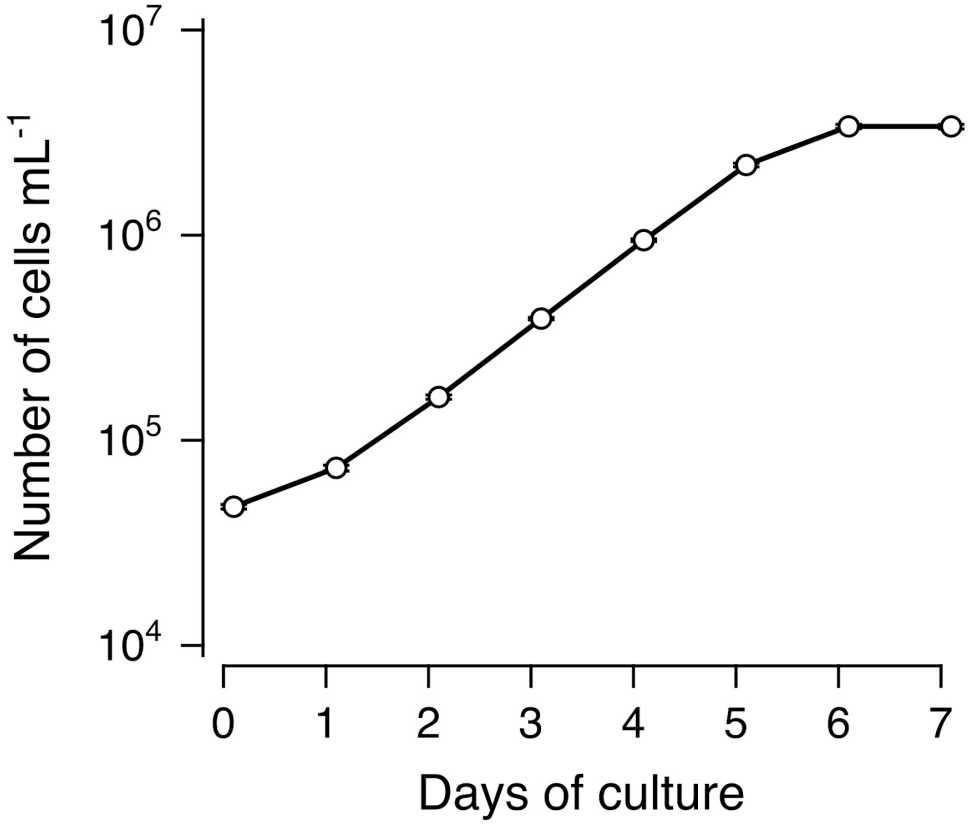

Figure 2. Growth profile of BY-2 cells

Appendix A: Formulation of culture medium

Table A.1. modified Linsmaier and Skoog medium (medium no. 1)

Chemical	Concentration (mg/L)
KNO_3	1900
NH_4NO_3	1650
$CaCl_2 \cdot 2H_2O$	440
$MgSO_4 \cdot 7H_2O$	370
KH_2PO_4	370
H_3BO_3	6.2
$MnSO_4 \cdot 4H_2O$	22.3
$ZnSO_4 \cdot 7H_2O$	8.6
KI	0.83
$Na_2MoO_4 \cdot 2H_2O$	0.25
$CuSO_4 \cdot 5H_2O$	0.025
$CoCl_2 \cdot 6H_2O$	0.025
$FeSO_4 \cdot 7H_2O$	27.8
Na_2-EDTA	37.3
Thiamine·HCl	1
myo-Inositol	100
Sucrose	30000
2,4-D sodium monohydrate	0.236