Faits divers

Formation of aposporous gametophytes from dedifferentiated young sporophyte cells of Laminaria japonica ARESCHOUG (Laminariales, Phaeophyta).

Masahiro Notoya** and Yusho Aruga**

There have been reports on the aposporous formation of male and female gametophytes from the explant tissues in three species of Laminariales. Friese (1980) reported in Laminaria digitata and L. hyperborea that the callus was formed from explants of the blade meristematic zone, and the callus cells developed aposporously to male and female gametophytes, which formed sporophytes by fertilization. Lee (1985) reported similar observations in L. saccharina.

On the other hand, Saga et al. (1978) reported in L. angustata that a single cell from callus-like structure induced in long-term cultivation of the sporophyte directly formed a new sporophyte. Fang et al. (1983) and Yan (1984) reported in Laminaria japonica and Undaria pinnatifida that young sporophytes developed directly from explant tissues. We reported in Ecklonia cava (Notoya and Aruga 1989) and Eisenia bicyclis (Notoya and Aruga 1990) that callus-like cells developed from the explant and they differentiated directly to new sporophytes.

In this paper we report aposporous formation of gametophytes from dedifferentiated cells of young sporophytes of Laminaria japonica under a long period of culture in the laboratory.

A mature sporophyte of Laminaria japonica was collected in Ohma, Shimokita Peninsula, Aomori Prefecture, on October 30, 1988. Next day, zoospores released from the sporophyte were collected in laboratory. They were cultured to obtain gametophytes at 15°C under a photoperiod of 10L:14D, illuminated by cool white fluorescent lamps at about 20 μmol photon m⁻²s⁻¹ in an incubator (Sanyo M-551).

The gametophytes matured and produced sporophytes by fertilization. When young sporophytes became about 1 cm long, blades were separated from stipes. About 30 pieces of the blade were cultured in a bottle with 100 ml culture medium (PESI) under the same conditions for about one and half a year. The culture medium was changed at three- or four-month intervals.

During the culture, the blade cells were partly dead, whereas the living parts became a globular lump (Fig. 1A). Small and large callus-like cells were observed in the lump when it was lightly squashed on the slide glass by cover slip. When it was squashed more intensively, these cells were separated from each other and became small or large single spherical cells (Fig. 1B). These cells were suspended and cultured in Petri dishes with PESI medium. Germination and filamentous uniseriate growth were observed from each cell after a week (Fig. 1C). The narrow or wide filamentous germings were grown in culture (Fig. 1D–F), and these filamentous plants matured to be male or female gametophytes in a month (Fig. 1G & H). After another month in culture, the sporophyte developed on the female gametophyte (Fig. 1D).

Thus, the cells of young sporophytes of Laminaria japonica were dedifferentiated and became easily separated in long-term culture. The culture system was not axenic, and it is not evident whether the sporophyte cells were separated by bacterial enzymes or not. The separated cells developed aposporously into male and
female gametophytes, and sporophytes developed on the female gametophytes. Although the cytological evidence was not observed on the developed gametophytes, the results are the same as those reported by Nakahara and Nakamura (1973) in which isolated single cells from Alaria classifolia sporophyte developed into gametophytes. Fries (1980) and Lee (1985) reported that aposporous gametophytes developed from the tissue of Laminaria spp. They found in long-term cultured tissue that aposporous gametophytes developed in the same way as in this
experiment. In *L. angustata*, however, a single cell from callus-like structure induced from young sporophyte in long-term culture developed directly to sporophyte (SAGA et al. 1978). Therefore, it seems that aposporous gametophyte formation is induced in the case of nutrient depletion, while in sufficient nutrients is induced direct development of the sporophyte.

References

マコンブ幼孢子体の脱分化細胞からの配偶体形成

能登谷正浩・有賀祐壽

要旨：マコンブの幼胞子体を1年半の長期間にわたって15℃、約20μmol photon m⁻² s⁻¹、10L:14Dの条件で培養し続けた結果、胞子体の葉状体が塊状に変化し始めた。この塊状部分をスライドグラス上で軽く押し潰したところ、各細胞は大小の球形細胞となって容易に分離した。分離した細胞を液体培地で培養したところ、それぞれの細胞は発芽して細い糸状または長い糸状の藻体となり、マコンブの雌雄配偶体に似た体を発達した。その後これらの藻体は成熟して卵または精子を形成し、受精が行われて雌配偶体上に胞子体が発達した。