Notes

Study on the reproduction of *Gelidium amansii* Lamx.

**MATERIALS AND METHOD**

*Materials*

Wild algae was collected by divers from the Sanggou Bay, Rongcheng County. The mature female gametophyte and tetrasporophyte were selected as mother seaweed, washed with purified seawater and prepared for spore collection.

During the period of late July 1985, carpospores and tetraspores were collected indoor and cultured into creeping seedlings before being transplanted to the open sea area in September. From 22 November 1985 to 12 December 1986, samples were taken monthly for observation.

*Observation method*

Cut a part of the seedling rope that has settlement of carpospores and tetraspores from field raft, washed and cleaned, and loosen into single filaments. Observe with naked eyes or biocular microscope of morphological variations of creeping seedling, upright seedling and rhizoid. Take one section of the seedling rope at random and divide the seedlings to; 6 ~ 0.25 cm in length - seedling; 0.25 cm - small seedling. Observe the germination, growth and reproduction of the creeping branch. All the samples were preserved and sketched.

**RESULTS**

*Spore reproduction*

Spore reproduction consists of two stages of artificial spore collection and seedling culture. The later may be accomplished by indoor culture of creeping seedling and field culture of upright seedling. A plant enters its adult stage after the accomplishment of the later stage.

*Indoor spore seedling culture.* In the period of sporegenesis, collect spores on the vinyl screen and culture creeping seedlings from spores under suitable conditions.

*Field culture of upright seedling.* A creeping seedling, comparatively simple in appearance, is a single bud with few branchlets. After about 30 days of cultivation in the sea area, it grows into a larger upright seedling with plough-shaped point and symmetrical or alternative buds. On the basis of the growth morphology, the upright seedling may be divided into two types of upright and creeping.
Germination reproduction

Germination reproduction which is a biological characteristic of seedling during its growth and reproduction process, refers to the formation of new plant individuals by buds grown out of the base or rhizoid of a seedling. The new individuals are called small seedlings. The discrimination between seedling and small seedling lies in their size and branches. A seedling, about 0.25~6 cm in length which has at least a few branches and a small seedling shorter than 0.25 cm, has only one branch.

There are two types of germination reproduction at the seedling stage.

**Base germination reproduction.** Many buds germinate from the base of a plant and develop into individual seedlings. Seedling in different sizes growing out a base turns into clusters (Fig. 1).

![Diagram](image)

Fig. 1. Sprouts in various size growing on the base of seedling.

**Rhizoid reproduction.** The rhizoid sheaves of a seedling originate from the secondary rhizoid sheaves which consists of colourless and transparent beardlike rhizoids. Buds germinated from the pigment cells in the rhizoid sheaves may grow into small seedlings. The rhizoid sheaves of seedlings and small seedlings may be formed into clusters (Fig. 2).
Fig. 2. Rhizoid sheaves of both seedling and small seedling may be involved together.

Creeping branch reproduction

Creeping branches refer to the horizontal extension of lateral buds of a creeping seedling. These creeping branches grow downward into rhizoid sheaves and upward into upright seedlings. Several upright seedlings may grow out a creeping branch (Fig. 3). With the growth of the seedling, creeping buds grow out of the base or rhizoids develop into creeping branches.

Fig. 3. Extension of the creeping branches may grow up into several upright body, that forms the upright seedling.
The seedlings of carpospore and tetraspore are different. For example, creeping branch buds are
found in the carpospore seedlings but not in the tetraspore seedlings. In the samples collected on August 12, 1986, more creeping branch buds were found in both carpospore and tetraspore seedlings. The carpospore samples collected from 12 September to 12 October, had many creeping branch buds and clusters, the latter accounting for about 12% (Fig. 4). In the samples collected from 12 November to 12 December, carpospore seedlings had many branch buds and clusters, the latter accounting for 42% (Fig. 5); the tetraspore seedling had many creeping branches and clusters too, the latter accounting for 28%.

In conclusion, the extension growth of the creeping branch occurs, though in a small number, at the stage of seedling. In the growth of the algae, the carpospore seedlings produces earlier and more creeping branch buds and larger percentage of creeping clusters. The tetraspore seedlings produce later and less creeping branch buds and smaller percentage of creeping clusters. Generally speaking, however, either carpospore or tetraspore seedlings produce more and more creeping branch buds and increasing creeping clusters and at the end, lead to the creeping reproduction pattern, which provides the basis of multicropping of this algae and the important seedling source.

DISCUSSION AND CONCLUSION

The study shows that Gelidium amansiii reproduces in the following ways; sexual reproduction (carpospore), asexual reproduction (tetraspore), vegetative reproduction (budding and creeping branches at the seedling stage and vegetative germination at the adult stage) and creeping branch reproduction.

The above results show that the algae varies in the reproduction types. Among them, only spore reproduction covers and links up all the types and brings unceasingly, through autorenewability seedlings. G. amansii reproduces in various patterns at its different developmental stages. Starting from the spore reproduction, it reproduces by budding and creeping at the seedling stage and by vegetation germination and creeping at the adult stage. The creeping reproduction provides the basis of multicropping.

The study indicates the following notable points:

1. The creeping branches are different at the seedling and the adult stages. The former, less in number, forms by horizontal extension of the lateral buds and the latter develops from granulation of the rhizoid at the base of the algae. More and more plants grow out of the creeping clusters of the latter and finally have the dominancy in the reproduction pattern.

The experimental results indicate that the creeping branches at the seedling and the adult stages are different in their origin, quantity and efficiency. The carpospore produces more creeping branches than the tetraspore.

2. The basal germination discriminates it from the rhizoidal germination in morphology. The former has strong budding ability by forming expanded projections or crooked rhizoid clusters. It is supposed that the rhizoid budding forms the basal germination reproduction. The rhizoid system of some seedlings produces small plants by extension and rhizoidal germination. The germination reproduction starts from the formation of colourless and transparent parenchyma cells and develops into the pigment
cells and the formation of small projections.

It is possible that both the basal germination and the rhizoidal germination are originate from the rhizoid system. This speculation still waits for further study.

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Received October 25, 1989.
Accepted March 15, 1990.