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Ecological study for The control of Green Contamination in Korean Show Caves

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Abstract : The chlorophyta and thebryophyta are became extinct by the shutting out the light and low temperature in caves. Whenever they get the conditions, they grow again immediately. It is necessary to keep the illumination distance over 2m and use the indirect light. The effect of lamp light and temperature is very important in the control of green contamination but the water and moisture in caves are essential factors in green contamination in the show caves. It's better to get rid of green alae and mosses at early stage for the control of the increase of green contamination. They must be isolated completely without the dispersion with moist pieces of cloth or sponge. It is necessary to shut out the cave route periodically for the restoration of cave environments and ecosystem. It's better to use the lamp keeping illumination and restricting the ascension of heat for the control of green contamination.
Key Words : plants, illumination, humidity, temperature, Green contamination

Ⅰ. Introduction

The characteristics of cave environments are the state of absence of light, generally the constant and stable of humidity, the temperature, and the water temperature. In food web, the sources of nutrition supply are scarce extremely.

The plants growing by the photosynthesis are absent in the most of cave except the area of cave entrance and the surrounding area of the electric lamps in the show caves.

The only organism adapted in cave environments can inhabit. There are three kind of animals according to their ecological characteristic in caves. They are troglobites like Epanerchodus kimi Murakami et Paik and Pseudocrangonyx asiaticus Ueno, troglophiles like Tachycines sp. and Cybaeus mosanensis Paik et Namkung, trogloxenes like Pholcus crypticolens Boes. et Str. and Triphosa dubitata L.

The environmental factors to adapt to the cave ecosystem are the illumination, the humidity, the temperature, the source of food supply.

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Green contamination appear to the surrounding area of the electric lamps by chlorophyta and bryophyta. Since the most of show caves installed many electric lamps, eucaryotic algae and mosses grow well around the flowstone by the lamps.

Ⅱ. Methods

It was measured and analysed the degree of illumination, temperature and relative humidity, the distance of lamps and contaminated area by green algae and mosses to investigate the degree of green contamination in the surrounding area of lamps. The state of the degree of green contamination was divided from three levels by degree of contamination.

Ⅲ. Result and Discussion

Some 6,500 species of green algae have been identified. In addition to many unicellular members like Chlamydomonas, the phylum contains colonial and multicellular forms. Spirogyra grows as a green filament of cells, each of which leads an independent life. Volvox and Ulva (sea lettuce) probably should be considered multicellular forms. These algae resemble the euglenophytes in their photosynthetic pigments (chlorophyll a and b). However, their cells are encased in a rigid wall of cellulose.

Some 23,000 species of living mosses and liverworts have been identified. These are small, fairly simple plants that are usually found growing in moist place. Most liverworts have a thin, leathery body that

Table 1. The environmental factors and the state of contamination by green algae and mosses.

Sites	Illumination (Lux)	Temperature (℃)	Humidity (%)	Distance (㎝)	Degree of contamination
Sites Ⅰ-2	817	11.9	65.4	66	+
Sites Ⅰ-5	4,620	20.5	68.5	30	++
Sites Ⅰ-7	150	23.0	61.1	200	+
Sites Ⅱ-1	1,060	17.2	67.2	52	++
Sites Ⅱ-2	651	16.1	68.1	1,000	-
Sites Ⅱ-4	42	14.3	84.0	300	+
Sites Ⅱ-5	1,981	14.2	84.0	170	+
Sites Ⅱ-7	15	19.8	66.6	93	++
SitesⅣ-1	251	17.3	70.0	50	+
SitesⅣ-1(On flash)	1,431	19.5	70.0	50	+

-: None contamininated, +: Average, ++:Severe

grows flat upon the supporting medium. still water or moist soil.

Sexual reproduction in mosses can occur only if the sperm cells are able to swim or be splashed from the plant that produces them to the plant where the egg is. The lack of a special water for sexual reproduction are two reasons why the bryophytes are restricted to habitats that, periodically at least, have abundant moisture.

The bryophytes have sometimes been considered the ancestor of the vascular plants. Their simplicity of structure, lack of vascular tissue, and restriction to damp locations do suggest that they are intermediate forms between the algae and the vascular plants.

In either case, the lack of a vascular system and woody tissue and the necessity for surface water in which the sperm can move from antheridia to archegonia have limited the evolutionary potentialities of these organisms.

Since these spores are too small to see, they can't be found and move to other place through the water. Most of mosses grow very well in the show caves because of much running water and moisture if they can get light heat.

The illumination of site Ⅰ-2 was comparatively high and the distance was short(66㎝). The distance of site Ⅰ-5, sites Ⅱ-1 were very short and the illumination was high, the degree of contamination was severe. The degree of contamination of site Ⅰ-7 was not severe. Those of the sites Ⅱ-4, sites Ⅱ-5, sites Ⅳ-1 was not severe by the average distance and light coverage. Green contamination was not in sites Ⅱ-2 by long distance(10m).

The degree of green contamination had relation with the distance and the temperature. The direct light was more severe then the indirect light. The most the areas of green contaminationwere severe by high heat with direct light.

Ⅳ. Conclusion

1) The chlorophyta and the bryophyta are became extinct by the shutting out the light and low temperature in caves. Whenever they get the conditions, they grow again immediately. It is necessary to keep the illumination distance over 2m and use the indirect light.

2) The effect of lamp light and temperature is very important in the control

of green contamination but the water and moisture in caves are essential factors in green contamination in the show caves.

3) It's better to get rid of green alae and mosses at early stage for the control of the increase of green contamination. They must be isolated completely without the dispersion with moist pieces of cloth or sponge.

4) It' better to install the automatic switch system to shut out the light whenever user is absent.

5) It is necessary to shut out the cave route periodically for the restoration of cave environments and ecosystem.

6) It's better to use the lamp keeping illumination and restricting the ascension of heat for the control of green contamination.

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