

## Dictyostelid Cellular Slime Molds in Mt. Surak

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### 수락산의 딕티오행 세포성 점균

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#### ABSTRACT

Five dictyostelid cellular slime molds were found in forests of *Pinus densiflora* and *Quercus mongolica* in Mt. Surak, Uijeongbu, Kyunggi-do, South Korea. Isolates were *Polysphondylium pallidum*, *Dictyostelium firmibasis*, *D. crassicaule*, *P. tenuissimum* and *D. valenstemmum*. Dominant species was *P. pallidum*. This species had occurred widely in South Korea as well as in the world. Especially, new dictyostelid, *D. valenstemmum* Shim et Chang, was found in the fermentation layer of *P. densiflora* and *Q. mongolica* mixed-forest soils. *D. firmibasis* had not been described until now and found in the mountain forests.

*Key words*: Dictyostelid cellular slime molds, Mt. Surak, *Polysphondylium pallidum*, *Dictyostelium firmibasis*, *D. valenstemmum*

#### INTRODUCTION

Dictyostelid cellular slime molds were found in usually the leaf litter decomposing zone of forests and the excrement of animals (Hagiwara 1989, Raper 1984, Hong and Chang 1990, Shim *et al.* 1996). In addition, they were isolated from tundra, desert, cave and alpine zones (Benson and Mahoney 1977, Landolt 1992, Cavender 1980, Hagiwara 1990, 1992, 1993, Stephenson *et al.* 1997). Kwon and Chang (1996) and Shim and Chang (1997) reported the occurrence of dictyostelids in streamsides and littoral zones in South Korea.

The distribution of dictyostelids was due to the soil

microenvironmental conditions such as moisture, organics, pH, temperature, soil quality, biotic factors such as prey and inter-species interaction, and altitudes (Stephenson 1988, Chang and Hong 1991, Eisenberg *et al.* 1988, Kanda 1982, Ketachm *et al.* 1988, Kuserk 1980, Shim and Chang 1996). Hong *et al.* (1992) reported that dictyostelids were present in the forests at below altitude 1500m in Mt. Halla. Shim and Chang (1996) suggested that cellular slime molds be more affected by forest types than altitudes and climates. Choi and Chang (1996) investigated the effects of extracts from *Torreya* fruits on dictyostelid cellular slime molds. Hong and Chang (1996) reported that in soil condition such as lower pH and low level of moisture content and organics, diversity was

affected by bacteria and other microorganisms of soil.

In the point of forest types and altitudes, the present investigation was to isolate the dictyostelid sellular slime molds and to report the occuence and distribution of them in Mt. Surak, Uijeongbu, Kyunggi-do, South Korea.

## MATERIALS AND METHODS

In Mt. Surak, Uijeonbu-shi, Kyunggi-do, South Korea, soil samples were collected from the litter of decaying leaves, humus and fermentation layers. Altitudes, vegetation, vegetation zones, soil moisture, soil pH and amounts of organic matter are given in Table 1. Isolation of dictyostelids was performed according to clonal isolation technique. Inoculation of dictyostelids was at the center of cross streaks made with a suspension of bacteria and incubated at 20~25°C. Characteristics obserbed were aggregation patterns, color of sorophore and sori, tips and bases of

sorophore, spore size, polar granule present or absent and sorophore formation. To identify and classify them was based on the dichotomy systems od Raper (1984), Hagiwara (1989) and Hong and Chang (1992). Data for each species at each site were represented as not only sample frequency and density but relative density, site frequency, average frequency and importance value.

Five taxa were classified from twenty soil samples collected at five sites. Dictyostelids isolated were *Poysphondylium pallidum*, *Dictyostelium firmibasis*, *D. crassicaule*, *P. tenuissimum* and *D. valenstemmum*. Dominat species was *P. pallidum* (Table 2). This species had occurred widely in South Korea as well as in the world (Hagiwara *et al.* 1992, Chang *et al.* 1996a, 1996b, Shim 1998).

One new dictyostelid cellular slime molds was isolated in the fermentation layer of *P. densiflora* and *Q. mongolica* mixed-forest soils at 450m above sea level. It was named *Dictyostelium valenstemmum* Sh-

**Table 1.** Plant community, altitude, pH, water content, and organic matter amount of soil samples in Mt. Surak

	Sur 1	Sur 2	Sur 3	Sur 4	Sur 5
Altitude(m)	550	550	450	400	250
Plant community	<i>Pinus densiflora</i>	<i>Quercus mongolica</i>	<i>Pinus densiflora</i> <i>Quercus mongolica</i>	<i>Pinus densiflora</i>	<i>Pinus densiflora</i>
pH	4.97	4.68	5.16	4.63	4.25
Water content(%)	32.0	39.9	45.2	41.2	34.8
Organic matter(%)	31.5	39.8	65.2	52.0	34.4

**Table 2.** Dictyostelid cellular slime molds in Mt. Surak

Species	Site		Sur 1		Sur 2		Sur 3		Sur 4		Sur 5		RD <sup>2</sup>	SF	AF	IV
	F <sup>1</sup>	D	F	D	F	D	F	D	F	D	F	D				
<i>P. pallidum</i>	100	61	50	100	100	72	50	100	75	100	82	100	75	113		
<i>D. firmibasis</i>	50	26	—	—	—	—	—	—	—	—	7	20	10	15		
<i>D. crassicaule</i>	50	13	—	—	—	—	—	—	—	—	4	20	10	13		
<i>P. tenuissimum</i>	—	—	—	—	25	26	—	—	—	—	6	20	5	12		
<i>D. valenstemmum</i>	—	—	—	—	25	2	—	—	—	—	1	20	5	9		
Total clones(No. /g)	6,025		1,225		5,314		550		8,800							

<sup>1</sup> F(Sample frequency, %) = (samples number of species occurrence / total number of samples) × 100

D(Density, %) = (number of clones of a species / total number of clones of all species) × 100

<sup>2</sup> RD(Relative density, %) = (number of clones of a species / total number of clones) × 100

SF(Site frequency, %) = (number of sites that a speices occurred / total number of sites) × 100

AF(Average frequency, %) = sum of sample frequency of a species / total number of sites

IV(Importance value) = (2RD+SF+AF) / 3

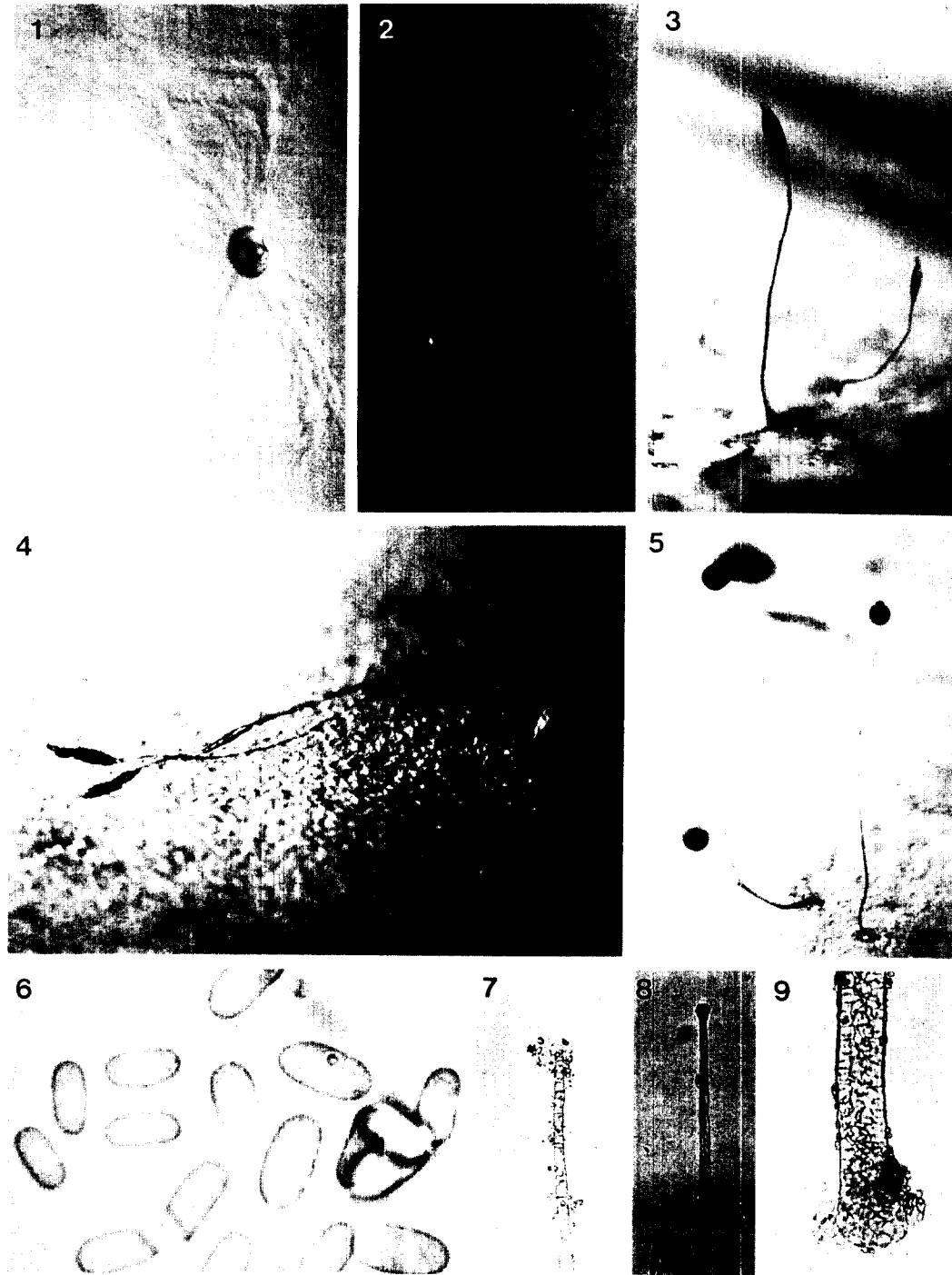


Fig. 1. *Dictyostelium firmibasis*

1. Aggregation stage( $\times 30$ ) 2. Rising sorogen( $\times 30$ ) 3. Stage before sorus formation 4. Migration( $\times 30$ )  
 5. Sorocarps without branches( $\times 30$ ) 6. Spore( $\times 1760$ ) 8. Tips of sorophore( $\times 176$ ) 9. Base of sorophore( $\times 176$ )

im at Chang (Shim and Chang 1996b). *D. firmibasis* had not been described until now but Chang *et al.* (1996a) had already reported that it was found in southern mountain area including Mt. Kaya, Mt. Kyerong, Mt. Naejang and Mt. Dukyu.

***Dictyostelium crassicaule* Hagiwara** (좁고사리팡이)

This dictyostelid that has small sorocarps was characterized by small thick sorophores, capitate tips including the thicker terminal portions and conical bases (Hagiwara 1989, Shim and Chang 1997).

***Dictyostelium firmibasis* Hagiwara** (新稱 장대팡이, Fig. 1)

This species has not been described in other studies. *D. firmibasis* has colorless, solitary, phototrophic and unbranched or sparsely branched sorocarps. They have aggregate-mound and mucoroides type stream. The length of sorophores were 1.5~8.69mm. Conical or round bases were surrounded by conical disks, 10.0~60.0 $\mu$ m in diam at a level 100 $\mu$ m above the bottom and 12.0~90.0 $\mu$ m in diam at the thickest part. Tips were simple-capitate or compound-capitate and 2.0~8.0 $\mu$ m in diam at a level 50 $\mu$ m below the top. Sori were white and globose. Spores without polar granules were hyaline, elliptical, mostly 6.3~9.2 $\times$ 3.0~4.0 $\mu$ m and L/W indice 2.1~2.5.

***Dictyostelium valenstemmum* Shim et Chang** (장대구슬팡이)

This species was characterized by yellowish solitary, robust and irregularly branched sorocarps with supporters, well developed conical disks, and larger yellow-pigmented spores, 6.8~9.9 $\times$ 3.4~5.1 $\mu$ m (L/W index 1.84~2.43) without polar granules (Shim and Chang 1996b).

***Poysphondylium pallidum* Olive** (흰돌려난가지팡이)

This species has 3~10 nodes with 2~6 branches

per whorl, colorless and delicate sorophores.

***Poysphondylium tenuissimum* Brefeld** (긴돌려난가지팡이)

This species was characterized by 3~14 nodes with 3~8 branches per whorl, colorless, delicate and long sorophores.

## 적 요

경기도 의정부시에 위치한 수락산의 소나무림과 신갈나무림의 토양에서 5종의 딕티오형 세포성 점균이 출현하였다. *Polysphondylium pallidum* (흰돌려난가지팡이), *Dictyostelium firmibasis* (장대팡이), *D. crassicaule* (좁고사리팡이), *P. tenuissimum* (긴돌려난가지팡이), *D. valenstemmum* (장대구슬팡이)이었으며, 그 중에서 흰돌려난가지팡이가 우점종으로 나타났다. *D. valenstemmum*는 우리 나라에서 처음으로 발견하였으며, 소나무림과 신갈나무림의 혼합림의 토양에서 분리하였다. *D. firmibasis*는 미기록 종으로 주로 삼림 지역에 서식하는 종이다.

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