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New Dictyostelid in Mt. Surak, Korea; *Dictyostelium valenstemmum* sp. nov.

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한국산 세포성 점균의 신종; *Dictyostelium valenstemmum* sp. nov.

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ABSTRACT

One new cellular slime mold, *Dictyostelium valenstemmum* sp. n. Shim *et* Chang, is isolated from the fermentation layer of soils in the cool temperate forests of Surak mountain, Korea. This species has the sori and sorophore yellow-pigmented, and sparse or irregular branches. And it is characterized by tall and robust sorocarps, well-form basal disks, mucoroides-type aggregations and large spores. This species has sorophores gradually tapering from bases to tips, simple capitate sorophore tips and conical bases. When prostrates on the plates, it has sparsely clavate bases. Spores are considerably large, 6.8~9.9×3.4~5.1㎛(avg. 8.5×4.1㎛), L/W index 1.84~2.43(avg. 2.07) without polar granules.

Key words: *Dictyostelium valenstemmum*, Cool temperate forests, Surak mountain.

INTRODUCTION

More than sixty dictyostelid cellular slime molds were isolated from soils of forests and fields, and dung of animals in the world(Hagiwara, 1989; Raper, 1984; Vadell *et al.*, 1995). Cellular slime molds predate bacteria as prey. They is abundant in humus and fermentation layers of forests with rich organic matter. Bacteria grow to decompose the organic matter. However, celluar slime mold are not always in decaying plant material. In Korea about thirty species occurred in most forests and fields. Hong and Chang(1990, 1992a, 1993), Hong *et al.*(1992d, e), Chang *et al.*(1996a, b), and Shim and Chang(1996) investigated on these organisms in relation to soil organic matter content and latitudes.

Since Choi and Kim(1981) reported cellular slime molds firstly, in Korea, Hong and Chang(1992a, 1993) described the polar granule positive and negative dictyostelids in Mt. Halla, Korea. Hong and Chang(1992b, c) reported two new dictyostelids, *Dictyostelium flavidum* and *D. floridum*.

D. discoideum well-known taxon was described as having a pale white to pale yellowish sori and well-developed basal disks(Raper, 1984; Hagiwara, 1989). *D. flavidum* firstly found in Korea, has well-developed basal disks, pale yellowish sori and pale stream. *D. firmibasis* resembles *D. flavidum* such aspects as well-developed basal disks, large spore, negative polar granules, gigantic sorophores and plane tips. But they have no yellow pigmented sori. *D. valnestemmum* has resemblance of *D. flavidum* and *D. firmibasis,* whereas it has yellowish sori and sorophores as well as well-developed basal disks and large spores. It was taller than *D. discoideum*.

The characteristics of *D. valnestemmum* as large spores, yellow pigmented sori and sorophores, large basal disks and irregular branches were different from those of other dictyostelids.

MATERIALS AND METHODS

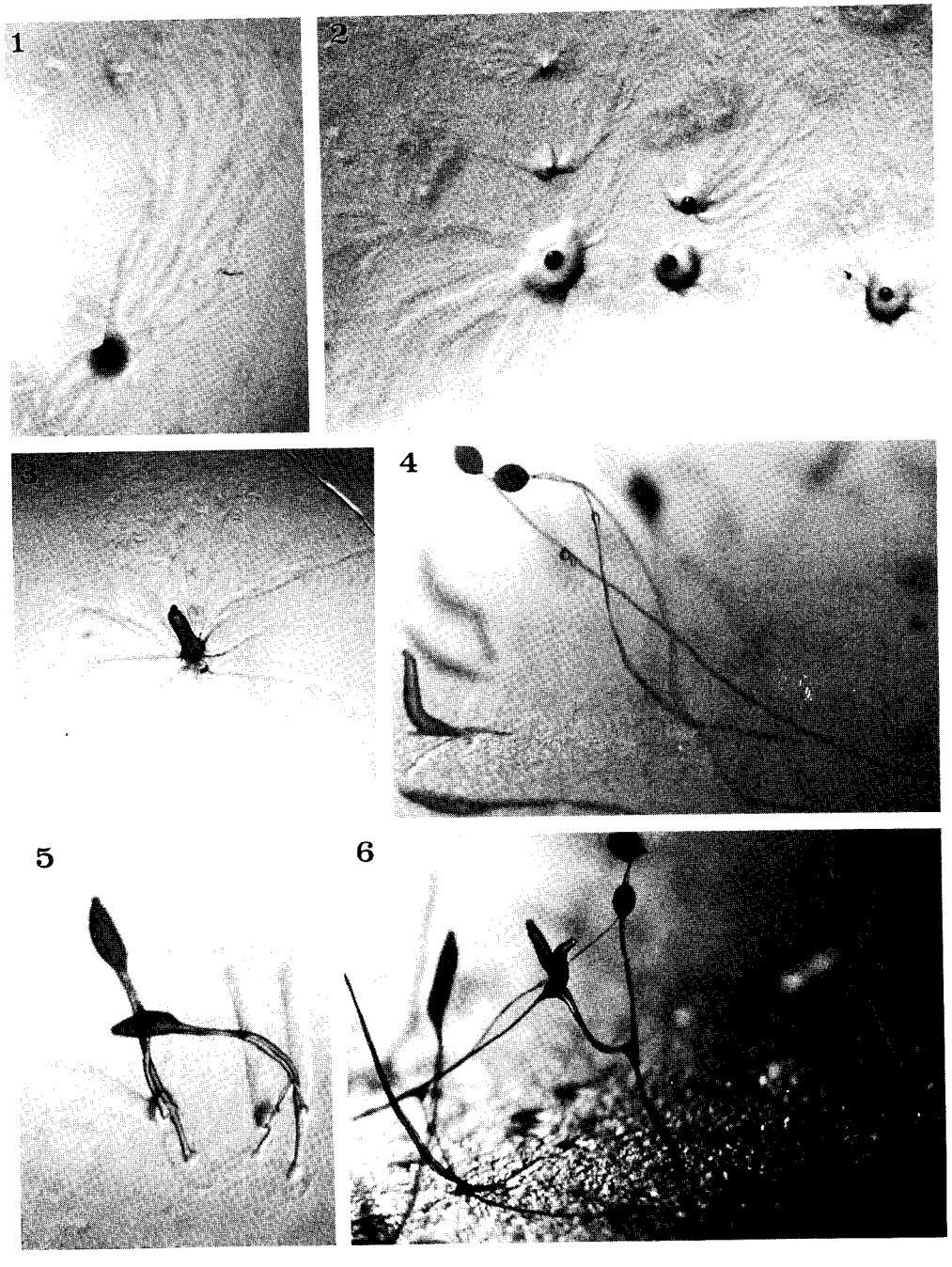
Dictyostelids isolated from soils of Mt. Surak were inoculated on the weak nutrient(0.1% lactose-peptone) and non-nutrient agar plates with *Escherichia coli*(Cavender, 1976; Hagiwara, 1989). Innoculation of dictyostelids was at the center of cross streaks made with a suspension of bacteria and incubated at 18~25℃.

Observed characteristics were aggregation patterns, color of sorophores and sori, sorophores tips and bases, spores and sorophore formations and so on. Characteristics of dictyostelids were photographed with Olympus Vanox microscope and Seoul Selopt stereo-microscope. Measurements of bases, tips, spores, sori and sorophores, etc. were with microscopes.

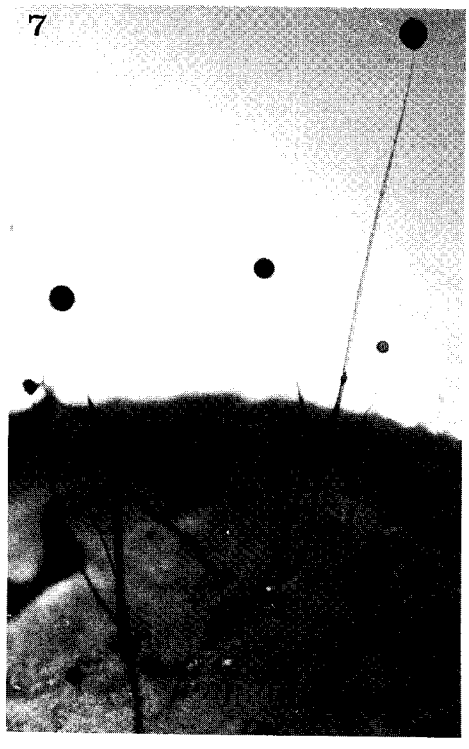
RESULTS

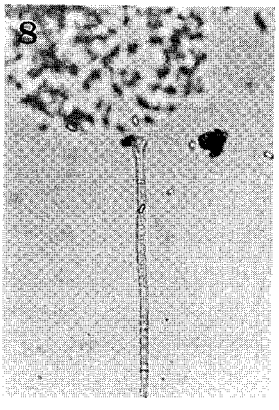
1. Description

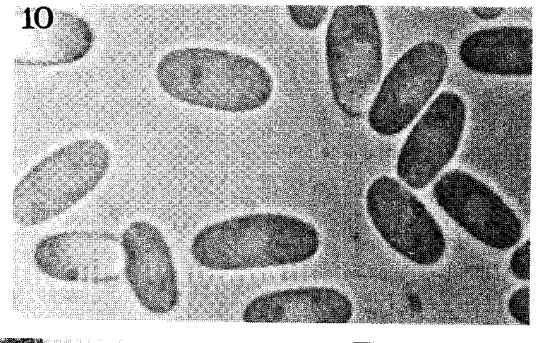
Dictyostelium valenstemmum sp. n. Shim *et* Chang. Cultum ad 20~25℃ in 0.1% lactose-peptone *et* non-nutricio agaro plates cum *Escherichia coli,* sorocarpiis solitaris vel gregarii, phototropicics, robustis, exigue vel inaequaliter ramosi; soris et sorophoreis flavicolore ominio; aggregationes mucoroides-typice; sorophoreis 3.4~8.4mm longis, interdum 1~1.5cm(non saepe 2cm), duobus vel pluribus pedunculis adhaerentibus postquam tum dividi ramosi, prope apicem 4.8~8.4㎛(~13.2㎛) crassis, apicibus aliquantum capitatis, prope basem 38~86㎛ crassis, basi typice bene formatis discs vel conus; soris globosis vel citiriformes, flavo luteolo clore, 120~300㎛ in diam; sporis ellipticase, 6.8~9.9×3.4~5.1㎛(mediae 8.5×4.1㎛), index longitudinis per latitudinem 1.84~2.43(mediae 2.07), sine

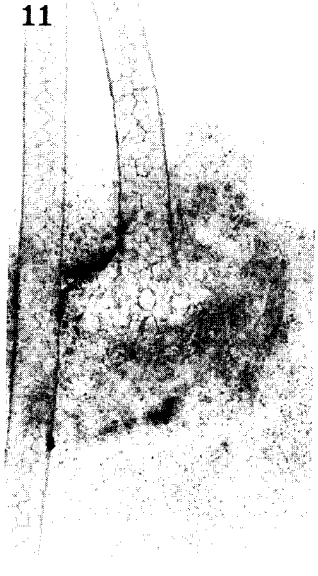


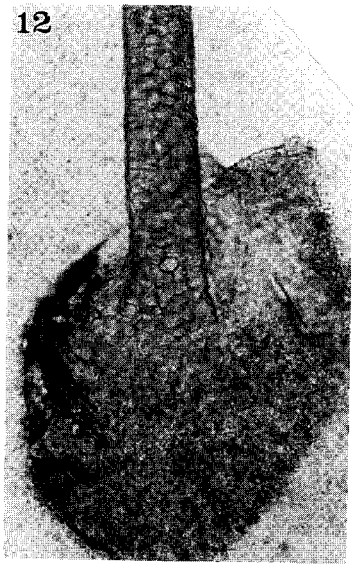
Figs. 1-20. *Dictyostelium valenstemmum* Shim *et* Chang.
1. Early stage of aggregation(×20)
2. Late stage of aggregation(×30)
3. Rising sorogen(×20)
4. Migration of sorogens and sorophores(×30)
5. Sorogens producing adherent stalks(×30)
6. Branching of sorophores(×30)

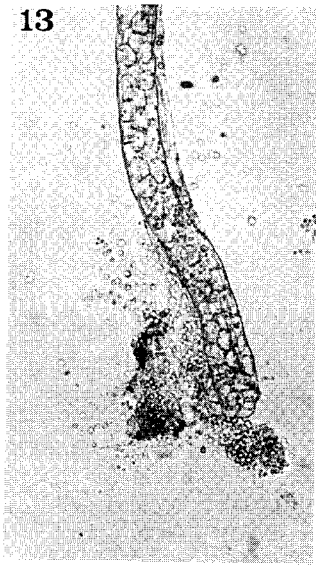




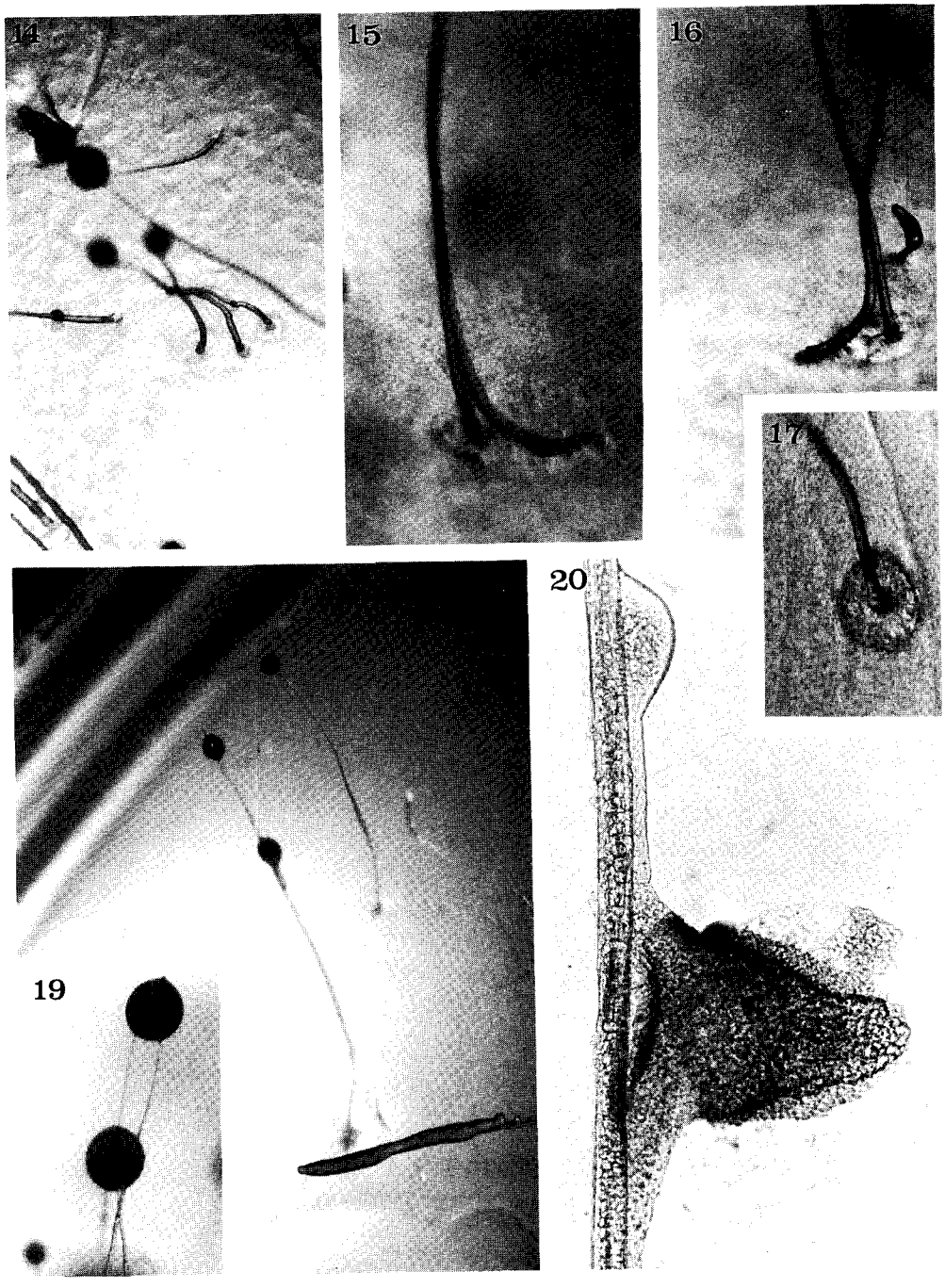








7. Sorocarps(×30) 8. Capitate tip of sorophore(×176) 9. Tip of sorophore(×352)
10. Spores(×1760) 11-12. Conical types of basis(×176) 13. Clavate type of basis(×176)



14. Adherent sorophores(×30)
15-17. Basal areas of sorophores(×60)
18. Secondary sorus below the apical sorus(×30)
19. Fused sori(×60)
20. Slime mass climbing of sorophores(×176)

granulis polaribus.

Holotypus-Stirpes typicae SKC-sur1 e solo Mt. Surak, Uijeongbu, Kyunggi-do, Korea.

Cultivated at 20~25℃ on 0.1% lactose-peptone and non-nutrient agar plates with *Escherichia coli*; sorocarps solitary or gregarious, phototrophic, robust, sparsely or irregularly branch, sometimes prostrate, and erect and semi-erect with supporter; sori and sorophore yellow in darkness. Aggregates mound in form with mucoroides-type stream (Figs. 1~3). Sorogens without stalk-free migration, not often with stalk-free migration (Fig. 4). Sorophore tapering from base to apex, 3.4~8.4mm in length, if prostrate somtimes 1~1.5cm(scarcely 2cm more) and two or more stalks often adherent, sometimes two or three fused sorogens diverge branches in course of rising(Figs. 5~7, 14~15); tips usually capitate-simple, sometimes obtuse-simple and scarcely compound, a level 50㎛ below the top 4.8~8.4㎛(~13.2㎛) in diam(Figs. 8~9) and tips of branches simple acuminate or capiate; basal disks usually conical, if prostrate sometimes clavate or round, 97~131㎛ in diam with the thickest part, 38~86㎛ in diam at a level 100㎛ above the bottom(Figs. 11~13). Sori globose to cirtiform yellow, hardly faint-brownish yellow, apical sori 120~240㎛ in diam, somtimes 300㎛ more and lateral sori about 75㎛ in diam. The second sorus was below the apical sorus(Fig. 18). Spore elliptical, 6.8~9.9×3.4~5.1㎛ (avg. 8.5×4.1㎛), L/W index 1.84~2.43(avg. 2.07) without polar granules(Fig. 10).

Holotypes-Type SKC-sur1 was isolated, 1996 by K. C. Shim and N. K. Chang from the fermentation layers collected in soils of mixed forests with *Pinus densiflora* and *Quercus mongolica* in Surak mountain, Uijeongbu, Kyunggi-do, Korea,

2. Observation

Myxamoebae aggregate to form mound with inflowing sterams(Figs. 1~2). The mounds grow gradually larger due to the myxamoebae centralizing, and mucoroides-type streams appear(Fig. 3). Sorogens and sorophores migrated phototrophically and sometimes prostrate(Fig. 4). Occasionally sorogens adhered two or three stalks and produce one sorophore, and after then diverge branches(Figs. 5~6, 14~15). Somtimes *D. valenstemmum* branches without adhering stalks. When the fused sorophores produce branch, another mass climbs the sorophore(Fig. 20). Sori and sorophores of *D. valenstemmum* are yellow in darkness, and sori grow faint-brownish yellow in a week after innocualtion. However, yellow pigmented sori and sorophores do not appear in light. Sometimes *D. valenstemmum* produce the second sorus below apical sorus, and sori often fused each other(Fig. 18~19). Basal disks are usually conical(Figs. 11~12) and scarecely clavate with prostrating long migrations(Fig. 13). More often than not, sorophores crooked near the bases and typical disks appear on the plates surround the bases of sorocarps(Fig. 17). Upon sori collapsed into the agar plates, spores germinate immediately without migration and produce one sorocarp usually.

DISCUSSIONS

One new dictyostelid, *Dictyostelium valenstemmum* sp. n.(SKC-sur1), occurred in the forests of Mt. Surak in Korea. Recognition of this species is based on the dichotomy systems of Raper(1984), Hagiwara(1989) and Hong(1992).

The characteristics of *D. valenstemmum* sp. n.(SKC-sur1) are sori and sorophore with yellow pigament, irregular branches, robust sorocarps, basal disks and lager spore. This species was isolated from the fermentation layer of mixed forest(*Pinus densiflora* and *Quercus mongolica*) soils in Mt. Surak, Kyuonggi-do, Korea.

Golden-yellow dictyostelids, *D. areum* var. *areum, D. areum* var. *luteolum, D. mexicanum, D. aureo-stipes* var. *aureo-stipes, D. aureo-stipes* var. *helvetium* and *D. flavidum* were described (Cavender *et al.*, 1981; Hagiwara, 1989; Hong & Chang, 1992). *D. valenstemmum* was different from *D. aureo-stipes* var. *aureo-stipes* and *D. aureo-stipes* var. *helvetium* in sorocarp length, spore size, polar granules and branches. And in the point of sorophore thickness, spore size and shape, and basal disks, it was not similar to *D. areum* var. *areum* and *D. areum* var. *luteolum*(Cavender *et al.*, 1981; Hong & Chang, 1992). *D. mexicanum* has well-form basal disks, but its sorocarps and spores with polar granules were distinguishable from *D. valenstemmum.*

D. valenstemmum was mostly similar to *D. firmibasis* and *D. flavidum.* But it was distinguished from *D. firmibasis* in irregular branch, and sori and sorophore with yellow or weak yellow-brown. Both *D. valenstemmum* and *D. flavidum* have well-form basal disks, irregular branches, robust sorophores and yellow-pigmented sori. Whereas *D. flavidum* doesn't have conspicuous stream pattern, *D. valenstemmum* has mucoroides-type ones. In addition to, it has apparent yellow-pigmented sorophores. *D. valenstemmum* was distinguishable from *D. flavidum* in the size and dimension(L/W index) of spores. And it has spores the second sori.

적 요

경기도 의정부시에 위치하고 있는 수락산의 소나무(*Pinus densiflora*)와 신갈나무(*Quercus mongolica*)의 혼합림에서 하나의 세포성 점균 신종을 발견하였다. 이 종의 학명은 *Dictyostelium valenstemmum* sp. n. Shim *et* Chang으로 한국명은 '장대구슬팡이'로 명명하였다. 이 종은 포자낭과 자실체의 자루가 노란색을 띄며, 다른 종에 비해 자실체가 크며, 자루가 튼튼하고 기부도 안정된 형태를 하고 있다. 기부에서 정단으로 갈수록 가늘어지며, 드물거나 불규칙한 가지를 가지고 있다. 구슬팡이형의 집합줄기를 보이며, 자루없는 이동은 거의 없으나 아주 드물게 나타나기도 한다. 자실체의 정단은 두상형으로 단일하며, 기부는 원추형으로 아주 두껍다. 그러나 배지를 기어다니다가 자실체를 형성하는 경우에는 간혹 기부가 방망이형을 나타낸다. 포자는 상당히 큰 편으로 크기는 6.8~9.9×3.4~5.1㎛(avg. 8.5×4.1㎛), L/W 계수는 1.84~2.43(avg. 2.07)이며 극낭은 보이지 않는다.

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