

## The Chromosome Number of Fungi( I )

\*MIN, Byung-Re and Yong-Keel CHOI

(\*Sookmyung Women's University and Dept. of Biology, Hanyang University)

### ABSTRACT

The chromosome number of fungi and the related references for 398 species have been compiled in accordance with Ainsworth's taxonomic system and, more or less, with the conventional phylogenetic order.

### INTRODUCTION

The fungal chromosome and nuclear behavior have been studied for the past 80 years by many mycologists. It is known that over 40,000 species of fungi have been identified taxonomically and that new species of fungi are reported up to the present. However, about 400 species of fungi at most have been elucidated in terms of their chromosome number. This meagre knowledge available on chromosome number of fungi may be attributed to the following facts; First, the size of fungal cell are characteristically too small to count chromosome number in cell. Secondly, it is difficult to seize the phase of nuclear division in life cycle of fungi. Thirdly, some of fungi have multinucleated hyphae so that it is unable, occasionally, to distinguish the chromosomal distribution in the cell of nuclear division. Lastly, it is generally recognized that the meiotic division of higher organism is a convenient period in which to count chromosome number. In fungus cell, however, the meiotic phase is not only difficult to seize but very short in duration. Furthermore, vegeta-

tive hyphae of fungi are mostly haploid.

Recently, some mycologists have studied the chromosome number of fungi by using the electron microscope, as indirect method counting the number of synaptonemal complexes(SCs) per nucleus. And the other mycologists are counting the chromosome number of fungi through the experiments of chromosome linkage of gene marker as indirect method. The list of chromosome number in this paper was made out of the results of classical method and of modern technique. Therefore, the list of chromosome number of fungi is based on the publication of the last 80 years. The newest information after 1980 will be added to and/or corrected in this list.

A difficult problem has been to determine which system of classification to adopt. The authors have finally chosen the "General Purpose Classification" proposed by Ainsworth, which is an adequate system for the purpose of providing a frame work of reference. The taxonomic frame work has been on volume IV A and IV B of Ainsworth, Sparrow & Sussman's *The Fungi: An Advanced treatise* (Academic press, 1973).

## LIST OF CHROMOSOME NUMBER OF FUNGI

Species	n	2n	Reference No.
Division I. MYXOMYCOTA			
Class ACASIOMYCETES			
Subclass DICTYOSTELIDAE			
Order DICTYOSTELIALES			
<i>Dictyostelium mucoroides</i>	7		268
Class MYXOMYCETES			
Subclass MYXOGASTROMYCETIDAE AND STEMONITOMYCETIDAE			
<i>Didymium difforme</i>	2		229
<i>D. nigripes</i>		16	223, 248
<i>D. nigripes var. eunigripes</i>	24 or 25		248
<i>D. iridis</i>	6-16		132
<i>D. xanthopus</i>	80		248
<i>Physarum polycephalum</i>	8		76
	80(probably polyploidy)		70
	ca.90( " )		209, 210
	10(inferred from a diploid number of 20)		75
<i>Dictydium cancellatum</i>	25±2		209
<i>Echinostelium minutum</i>		124	a-2
<i>Fuligo septica</i>	87±3		209
<i>Lamproderma arcyryonema</i>	53±2		"
<i>Physarella oblonga</i>	50±3		"
<i>Tubifera microsperma</i>	60±3		"
<i>Reticularia lycoperdon</i>		8	271
<i>Clastoderma debaryanum</i>	8-10		155
<i>Badhamia utricularis</i>		16	109
<i>Comatricha nigra</i>	ca.30		249
<i>Hemitrichia vesparium Machr.</i>	ca.90		175
<i>Perichaena vermicularis</i>	25+2	50+4	211
	(amoeba)	(plasmodium)	
Subclass CERATIOMYXOMYCETIDAE			
<i>Ceratiomyxa</i>	8		68, 110
<i>C. fruticulosa Machr.</i>	8		272
Class HYDROMYXOMYCETES			
Class PLASMODIOPHOROMYCETES			
Order PLASMODIOPHORALES			
<i>Ligniera junci</i>		16(maximum)	32
<i>Plasmodiophora brassicae</i>	8		138 143
"	5		238
<i>P. bicaudata J. Feldmann</i>	8	16	59
<i>Sorodiscus radicolus Cook</i>	2	4	33
<i>S. heterantherae</i> Ostenfeld & Perterson	4-6		264
<i>S. callitrichis</i> Lagerheim & Winge	4	8	274

Species	n	2n	Reference No.
<i>Sorosphaera veronicae</i>	-	16	143
"	4	8	261
"	4	-	157
"	33		87
<i>Spongospora subterranea</i> (Wallr)	4	8	105
<i>S. lagerheim</i>	8	16	94
<i>Tetramyxa parasitica</i> Goebel		8	144
<i>T. elaeagni</i> Yendo & Takase	6	12	281
<i>T. rhizophaga</i> Lihnell	4		131
Division II.EUMYCOTA(=EUMYCETES)			
Subdivision MASTIGOMYCOTINA			
Class CHYTRIDIOMYCETES			
Order BLASTOCLADIALES			
<i>Allomyces kniepii</i>	6		237
<i>A. javanicus</i> var. <i>javanicus</i>	13-21		267
<i>A. arbuscula</i>	6		89
<i>A. arbusculus</i>	7		55
"	8		54
<i>A. javanicus</i> var. <i>macrogynus</i>	14		54-55
"	28(polyploidy?)		267
<i>A. cystogenus</i>	7		55
Order CHYTRIDIALES			
<i>Cladochytrium replicatum</i>	6-9		115
<i>Rhizophydium coronum</i>	6-8		86
<i>Synchytrium fulgens</i>	5		125
Order MONOBLEPHARIDALES			
Class HYPHOCHYTRIDIOMYCETES			
Order HYPHOCHYTRIALES			
Class OOMYCETES			
Order SAPEROLEGNIALES			
Family SAPROLEGNIACEAE			
<i>Achlya ambisexualis</i>	3		14
<i>A. debaryana</i>	11		140
<i>A. klebsiana</i>	24		62
<i>A. prolifera</i>	11		140
<i>A. racemosa</i>	4-6		25
<i>A. conspicua</i>	4		162
<i>A. flagellata</i>	4		162-277
<i>A. bisexualis</i>	8 or more		181
<i>A. colorata</i>	3		283
<i>A. recurva</i>	4		283
<i>A. megasperma</i>	5		283
<i>A. sp.</i>	ca.8		215

Species	n	2n	Reference No.
<i>Brevilegnia diclina</i>	4-8		34
<i>Isoachlya intermedia</i>	6		283
<i>Olpidiopsis achlyae</i>	6		154
<i>Saprolegnia ferax</i>	7 or more		101
"	24		62
<i>S. mitxa</i>	11		140
<i>S. monoica</i>	11		140
<i>S. thureti</i>	11		140
<i>S. litoralis</i>	7		283
<i>Thraustotheca clavata</i>	11		225
"	5		222
<i>T. primoachlya</i>	5		283
<i>Leptolegnia caudata</i>	8		35
Order PERONOSPORALES			
<i>Albugo bliti</i>	12		239
<i>A. candida</i>	12		239
<i>A. tragopogonis</i>	12		239
<i>A. portulacae</i>	12		239
"	8		233
<i>Cystopus(Albugo) evolvuli</i>	16		236
<i>Peronospora effusa</i>	6-8		239
<i>Phythium deliense</i>	4-8		212
<i>Phytophthora cactorum</i>	ca.9		215
<i>P. himalayensis</i>	3		164
<i>Rhysototheca viticola</i>	14-16		6, 21
<i>Sclerospora graminicola</i>	14		151
Subdivision ZYGOMYCOTINA			
Class ZYGOMYCETES			
Order MUCORALES			
Family MUCORACEAE			
<i>Mucor hiemalis</i>	not identified		150 187, 189①
<i>Mucor fragilis</i>	no identified		189-①
<i>Phycomyces blakesleeana</i>	not identified		64
"	14		61
<i>Rhizopus nigricans</i>	16		61
Order ENTOMOPHTHORALES			
<i>Entomophthora sphaerosperma</i>		12(?)	221
Subdivision ASCOMYCOTINA (=ASCOMYCETES)			
Class HEMIASCOMYCETES			
Order ENDOMYCETALES			
Family ENDOMYCETACEAE			
<i>Ascoidea rubescens</i>	2		245
<i>Eremascus albus</i>	6		43

Species	n	2n	Reference No.
Family SACCHAROMYCETACEAE			
<i>Candida</i> ( <i>Torula</i> ) <i>utilis</i>		4	166
<i>Eremothecium ashbii</i>	ca.8		74
<i>Saccharomyces cerevisiae</i>	2	4	11. 41. 42. 275
"	16		90
"	17		163
<i>Schizosaccharomyces pombe</i>	2		4
"	6		36
"	3		189-②
<i>Lipomyces lipofer</i>	6		188
<i>Zygosaccharomyces priorianus</i>	3	6	130
Order TAPHRINALES			
<i>Taphrine deformans</i>	4	8	92, 145
Class PLECTOMYCETES			
Order ERYSHIPHALES			
<i>Microsphaera quercina</i>	4		182, 183
<i>Sphaerotheca fuliginea</i>	8		104
<i>Phyllactinia corylea</i>	8		92
"	10		31
<i>Perisporium funiculatum</i>	4		16
Order EUROTIALES			
Family EUROTIACEAE			
<i>Emericella nidulance</i>	8		53, 114
<i>Eurotium glaucus</i> Link	2		254
<i>Aspergillus niger</i> Van Tieghem	2		254
<i>Penicillium lanosum</i>	2		52
<i>P. expansum</i>	4-5		128
<i>P. cyclopium</i>	6 or 7		184
<i>P. crustaceum</i>	4		224
Family GYMNOASCACEAE			
<i>Arthroderma benhamiae</i>	4		262. 263
(= <i>Trichophyton mentogrophytes</i> )			
<i>A. flavescens</i>	4		263
<i>A. simii</i>	4		263
<i>A. uncinatum</i>	4		263
( <i>Trichopyton ajelloi</i> )			
<i>A. gertleri</i> Böhme	4		263
(= <i>Trichophyton vanbreuseghemii</i> )	5		95
<i>Nannizzia incurvata</i>	4		263
(= <i>Microsporum gypseum</i> )			
<i>N. gypsea</i>	4		263
(= <i>Microsproum gypseum</i> )			
<i>N. fulva</i>	4		263
( <i>Microsoporum fulvm</i> )			

Species	n	2n	Reference No.
<i>N. grubyia</i>	4		263
( <i>Microsporum vanbreuseghemii</i> )			
Class PYRENOMYCETES			
Order HYPOCREALES			
Family NECTRIACEAE			
<i>Nectria peziza</i>	5		51
<i>N. episphaer f. coccophila</i>	7		99-②
<i>N. flava</i>	4		69
<i>N. gliocladioides</i>	4		83
<i>Didymocrea sadasavanii</i>	9		122
<i>Calonectria rigidiuscula</i>	7		99②
<i>Neuronectria peziza</i>	5(?)		84
<i>Sphaerostilbe aurantiicola</i>	2(?)		139
Family HYPOCREACEAE			
<i>Hypocrea citrina</i>	5		24
<i>Hypomyces lactifluorum</i>	5(?)		85
<i>H. solani</i>	4		50
"	6		98
<i>H. solani f. cucurbitae</i>	4		50. 99①
Family CLAVICIPITACEAE			
<i>Cordyceps militaris</i>	2		246
<i>C. agariciformis</i>	2		112
<i>Claviceps phalaridis</i>	5-6		243
Order SPHAERIALES			
Family SORDARIACEAE			
<i>Coniochaeta ligniaria</i>	6		191
<i>Bombardia lunata</i>	7		57
<i>Gelasinospora calospora</i>	7		136
<i>G. tetrasperma</i>	7		57
<i>Neurospora tetrasperma</i>	6		29. 37. 44
"	7		45. 57
<i>N. terricola</i>	7		168
<i>N. sitophila</i>	7		44. 57
<i>N. crassa</i>	7	44. 149. 175. 228. 230. 246. 260	
<i>Podosordaria leporina</i>	7		19. 203. 206
(= <i>Poronia leporina</i> )			
<i>Poronia punctata</i>	7		200. 206
<i>P. oedipus</i>	7		200. 206
<i>Sordaria fimicola</i>	8		92
"	7		26
<i>S. brevicollis</i>	7		67
<i>S. macrospora</i>	7		57
<i>S. humana</i>	7		240

Species	n	2n	Reference No.
<i>Triangularia backusii</i>	6 or 7		107
Family XYLARIACEAE			
<i>Achaetomiella virescens</i>	6		a-1
<i>Hypoxyton serpens</i>	7		204
<i>H. rubiginosum</i>	5		199
<i>H. microplacum</i>	6 or 7		201
<i>H. punctulatum</i>	4		196
<i>H. grendadense</i> var. <i>mcrospora</i>	4		194
<i>H. cohaerens</i>	5		202
<i>H. deustum</i>	4		195
<i>H. multiforme</i>	4		193
<i>H. pruinatum</i>	5		190
<i>H. fuscum</i>	4		192
<i>Rosellinia limomispora</i>	6		91
<i>R. mammiformis</i>	6		206, 207
<i>R. aquila</i>	6		206, 207
<i>R. buxi</i>	7		206, 208
<i>Xylaria polymorpha</i> (from Minn.)	8		198, 206
<i>X. polymorpha</i> (from England)	7		206, 205
<i>X. curta</i>	8 or 9		197, 206
Family MELANOSPORACEAE			
<i>Ascotricha guamensis</i>	7		180
<i>A. bothrychoides</i>	6		73
<i>Chaetomium cochliodes</i>	7		23
<i>C. kunzeanum</i>	8		73
Family OPHIOSTOMATACEAE			
<i>Ceretocystis (Ceratostomella) piece</i>	4		13
<i>C. autographa</i>	4		13
<i>C. fagacearum</i>	4		2
<i>Ophiostoma fimbriata</i>	3		78
Family GNOMONIACEAE			
<i>Chromocrea spinulosa</i>	8		146
<i>Dermatocarpon aquaticum</i>	8		234
<i>Gnomonia ulmea</i>	4		177
<i>Glomerella cingulata</i>	4		265
"	7		57
Order PSEUDOSPHERIALES			
Family PLEOSPORACEAE			
<i>Venturia inaequalis</i>	4-6		10
"	7		38, 113
<i>V. pirina</i>	7		39
Class DISCOMYCETES			
Order HELOTIALES			

Species	n	2n	Reference No.
Family DERMATEACEAE			
<i>Pseudopeziza modicaginis</i>	4		183
Family HYALOSCYPHACEAE			
<i>Arachnopeziza aurelia</i>	4		183
Family SCLEROTRINIACEAE			
<i>Botryotinia fuckeliana</i>	4		117
<i>Monilinia fructicola</i>	4		96
<i>Leotia lubrica</i>	8		92
<i>Sclerotinia tuberosa</i>	8		167
<i>S. trifoliorum</i>	8		63
"	6		19
Family GEOGLOSSACEAE			
<i>Cudonia circinnans</i>	6		92
<i>Geoglossum hirsutum</i>	4		47
<i>Mitrula phalloides</i>	4		48
<i>Spathularia flavita</i> ( <i>S. clavata</i> )	6		92
<i>S. flavida</i>	4		46
Family HELOTIACEAE			
<i>Bulgaria inquinans</i> ( <i>Phaeobulgaria i.</i> )	6		92
<i>Calycella citrina</i> ( <i>Helotium citrinum</i> )	6		92
<i>Trybliidiella clavispora</i>	4		165
Order PHACIDIALES			
Family HYPODERMATACEAE			
<i>Coccomyces hiemalis</i>	4		9
Order PEZIZALES			
Family ASCOBOLACEAE			
<i>Ascobolus sterocrarius</i>	16		18.57
<i>A. magnificus</i>	8		279
<i>A. immersus</i>	12		282
"	18		129
<i>Ascophanus granulatus</i>		16(brachymeiosis)	79
<i>A. aurora</i>	4(brachymeiosis)		80
<i>Pyronema omphalodes</i>	12		100. 159. 270
<i>P. confluens</i> (= <i>P. omphalodes</i> )	6		92
Family HUMARIACEAE			
<i>Aleuria wisconsinensis</i>	8		3
<i>A. rutilans</i>	16		269
<i>A. micropus</i> ( <i>Peziza m.</i> )	8		92
<i>A. vesiculosa</i> ( <i>Peziza v.</i> )	8		92
<i>Anthrocobia melaloma</i> ( <i>Patella m.</i> )	6		92
<i>Ciliaria hirta</i> ( <i>Patella h.</i> )	6		92
<i>C. scutellata</i> ( <i>Patella s.</i> )	6		92
<i>Humaria leucoloma</i>	8		92



Species	n	2n	Reference No.
"	6		178
<i>H. tetraspora</i>	6		179
<i>Lachnea hemisphaerica</i> ( <i>Patella albida</i> )	8		92
<i>Lamprospora leiocarpa</i>	4		176
<i>Melastiza miniata</i> ( <i>M. charteri</i> )	4		92
<i>Patella scutellata</i>	4		47
<i>P. melaloma</i>	4		77, 173, 174
<i>P. stercorea</i>	4		183
<i>Pulvinula constellatio</i>	6		92
(= <i>Lamprospora constellatio</i> )			
<i>Pulvinula convexella</i>	6		92
(= <i>Lamprospora haemastigma</i> )			
<i>Sepultaria sumnerii</i> ( <i>S. arenicola</i> )	8		92
Family PEZIZACEAE			
<i>Galactinia saniosa</i> ( <i>Peziza saniosa</i> )	8		92
<i>Otidea onotica</i> ( <i>Scodellina leporina</i> )	8		92
<i>O. vitellina</i> ( <i>Scodellina vitellina</i> )	8		92
<i>Peziza praetervisa</i>	8		176
<i>P. vesiculosa</i>	8		160
<i>P. succosa</i>	4		183
<i>P. subumbrina</i>	4		147
<i>P. aurantia</i> ( <i>Aleuria a.</i> )	6		92
<i>Pustularia ochracea</i> ( <i>Peziza ochracea</i> )	6		92
Family MORCHELLACEAE			
<i>Disciotis venosa</i> ( <i>Peziza venosa</i> )	6		92
<i>Morchella deliciosa</i>	12	24(brachymeiosis)	253
Family HELVELLACEAE			
<i>Acetabula vulgaris</i> ( <i>Paxina acetabulum</i> )	6		92
<i>Helvella atra</i>	6		92
<i>H. crispa</i>	6		92
<i>H. lacunosa</i>	6		92
<i>Lachnea macropus</i> ( <i>Paxina hispida</i> )	8		92
Order PHACIDIALES			
<i>Lophodermella morbida</i>	8 or 9		241
<i>Rhytisma punctatum</i>	5		278
Order LECANORALES			
<i>Acarospora fuscata</i>	3		1
<i>Anaptychia ciliaris</i>	4		38
<i>Cladonia cristatella</i>	4		1
<i>Collema tenax</i>	5-6		8
<i>Dermatocarpon minutum</i>	4		38
<i>D. cinereum</i>	8		161
<i>D. fluviatile</i>	6-8		161

Species	n	2n	Reference No.
<i>D. lachneum</i>	8		161
<i>Lecidea crustulata</i>	2		1
<i>Lecanora dispersa</i>	3		1
<i>Peltigera canina</i>	2-4		142, 158
<i>P. canina</i> var. <i>rufescens</i>	2		158
<i>P. horizontalis</i>	2		158
<i>P. polydactyla</i>	2		158
<i>Pertusaria pertusa</i>	5		56
<i>P. pustulata</i>	7		56
<i>Sarcogyne</i> sp.	3		1
Order TUBERALES			
<i>Stephensia shanori</i>	25±1		240
Class LABOULBENIOMYCETES			
Order LABOULBENIALES			
Class LOCULOASMOYCETES			
Order PLEOSPORALES			
<i>Cochliobolus sativus</i>	7-8		106
Order CAPNODIALES			
Order HYSTERIALES			
Order MICROTHYRIALES(=HEMISPHAERIALES)			
<i>Stigmatia geranii</i>	4		103
Order MYRIANGIALES			
<i>Myriangium duriacii</i>	4		156
<i>M. curtisii</i>	4		156
Subdivision BASIDIOMYCOTINA			
Class HYMENOMYCETES			
Subclass HOLOBASIDIOMYCETIDAE			
Order AGARICALES			
Family AGARICACEAE			
<i>Agaricus campestris</i> var. <i>cultivee</i>	4		215
<i>Agaricus campestris</i> Fr. var. <i>bisporus</i>	4		217, 218
"	9		30
<i>A. campestris</i> Fr. var. <i>tetrasporus</i>	12		58, 108
<i>Camarophyllus virgineus</i>	4		15
<i>Exobasidium discoideum</i>	2 or more		118
<i>Hygrocybe conica</i>	2		141, 65
<i>H. ceracea</i>	2		141
<i>H. agathosmos</i>	2		141
<i>H. lucorum</i>	2		141
<i>H. constans</i>	2(probably)		123
<i>Lentinus variabilis</i>	2 or more		124
<i>Leptotus bryophilus</i>	2		141
<i>Lepiota acutesquamosa</i>	6		71

Species	n	2n	Reference No.
<i>L. lenticularis</i>	4		82
<i>Uredinee ochropsora</i>	10 or more		231
<i>Volvariella volvacea</i>	9		27
Family COPRINACEAE			
<i>Coprinus ephemerus f. bisporus</i>	8-10		219
<i>C. artrammentarius</i>	4		247. 255
"	6		148
"	16		137
<i>Coprinus hendersonii</i>	2(?)		28
<i>C. lagopus</i>	2(?)		28
"	12		137
<i>C. tomentosus</i>	2(?)		28
<i>C. comatus</i>	14		137
<i>C. miraceus</i>	12		137
<i>C. radiatus</i>	2		141
<i>C. micaceus</i> B.	4		252
<i>Collybia radicata</i> Relh	4		255
<i>C. velutipes</i> H. Karst	4		255
<i>Inocybe rimosa</i> (Bull) Fr.	4		255
<i>Mycena haematopoda</i> Pers.	6		252
<i>M. galericulata</i> Scop	4		255
<i>Psathyrella disseminata</i>	2		141
"	4		255
<i>Psalliota perrara</i>	2		97
Family TRICHOLOMATACEAE			
<i>Cantharellus cibarius</i>	ca.2		111
<i>C. cinereus</i>	2		141
<i>Cantharellus minor</i> Peck	6		255
<i>Clitocybe laceata</i> (Scop.) Fr.	6		255
<i>Cortinarius cinnamomeus</i> L.	4		252
<i>Tricholoma melaleucum</i> Pers.	4		255
<i>T. rutilans</i> Schaeff	2		252
Family RUSSULACEAE			
<i>Lactarius vellereus</i>	4		214
<i>Lactaria deliciosa</i>	2		141
<i>L. vellerea</i> Fr. Schröt	6		255
<i>Lactarius akaitsu</i> Tanaka	6		255
<i>Cortinellus shitake</i> P.Henn	6		255
<i>Russula subfoetens</i> W.G.Sm.	4		252
<i>R. fragilis</i> (Pers.) Fr.	4		255
<i>R. fragilis var. nivea</i> (Pers.) Cook	6		255
<i>R. virescens</i> Fr.	4		255
<i>Russula emetica</i>	4		185. 255

Species	n	2n	Reference No.
<i>Pleurotus ostreatus</i> Jacq.	4		252
Family STROPHARIACEAE			
<i>Hypholoma fasciculare</i> (Huds)Fr.	2		252
<i>H. appendiculatum</i>	2		141
"	6		255
<i>H. perplexum</i>	8 or more		169
<i>Pholiota</i> sp.	2		252
<i>P. lucifera</i>	2		141
<i>P. praecox</i>	6-8		251
<i>Paxillus involutus</i>	2		141
Family AMANITACEAE			
<i>Amanita caesarea</i>	4		186
<i>A. fulva</i>	8		175
<i>A. pantherina</i>	2		141
<i>A. muscaria</i>	6-8		250
<i>Armillaria mellea</i>	4		119
<i>A. mucida</i>	at least 4		120
<i>Clitocybe aurantiaca</i>	2		141
<i>Mycena galericulata</i>	2		141
"	4		251
Order APHYLLOPHORALES			
Family SCHIZOPHYLLACEAE			
<i>Schizophyllum commune</i>	3		49
Family CONIOPHORACEAE			
<i>Coniophora puteana</i>	4		116
<i>C. arida</i>	4		116
Family POLYPORACEAE			
<i>Boletus edulis</i> Bull.	6		255
<i>B. luridus</i> (Schaeff.)Fr.	4		255
<i>B. luteus</i> L.	4		255
<i>Fistulina hepatica</i> (Huds)Fr.	4		255
<i>Fomes annosus</i>	8		273
<i>Polyporus squamosus</i> (Huds)Fr.	4		255
<i>Polystictus cinnabarius</i> (Jacq.)Fr.	4		255
<i>Strobilomyces strobilaceus</i> (Scog.) Berk.	4		255
Family CLAVARIACEAE			
<i>Clavaria botrytis</i> Pers.	4		255
<i>C. cristata</i> (Holmsk)Pers.	4		255
<i>C. inaequalis</i> (Müll) Quel.	4		255
<i>C. purpurea</i> Fr.	4		255
<i>C. vermicularis</i> Scop.	4		255
<i>C. mucida</i> Pers.	4		255
Family THELEPHORACEAE			

Species	n	2n	Referece No.
<i>Craterellus cornucopioides</i> Pers.	4		255
Subclass DHRAGMOBA SIDIOMYCETIDAE			
Order TREMELLALES			
Family AURICULARIACEAE			
<i>Helicogloea lagerheimi</i>	5		12
Family TREMELLACEAE			
<i>Protodontia uda</i>	4		266
<i>Sebacina clacea</i>	8		276
<i>Tremellodon gelatinosum</i>	4		81
<i>Tremellodendron candidum</i>	4		266
Family DACRYMYCETACEAE			
<i>Dacryopinax</i> ( <i>Guepinia</i> ) <i>spathularia</i>	2 or more		20
<i>Exidia recisa</i>	8		66
Order TULASNELLALES			
Family TULASNELLACEAE			
<i>Ceratobasidium praticolum praticolum</i> Olive	6		213
<i>C. flavescens</i>	6		60
<i>Pellicularia kolerogo</i>	6		60
<i>Unidentified basidiomycete</i>	4		259
Class GASTEROMYCETES			
Order LYCOPERDALES			
Family LYCOPERDACEAE			
<i>Calvatia candita</i>	2		22
<i>Lycoperdon piriforme</i>	6		93
<i>L. gemmatum</i> Batsch	2		255
<i>Lasiosphaera fenzlii</i> Reichardt	4		255
Family GEASTRACEAE			
<i>Geastrum hygrometricum</i>	2		255
<i>Geastrum fimbriatum</i>	2		22
Family TULOSTOMATAACEAE			
<i>Tylostoma mammosum</i>	4		72
Order NIDULARIALES			
Family NIDULARIACEAE			
<i>Cyathus stercoreus</i>	12		134, 135
Order SPHAEROBOLUS			
Family SPHAEROBOLACEAE			
<i>Sphaerobolus tubulosus</i>	3 or 4		133
Order SCLERODERMATALES			
Family SCLERODERMATAACEAE			
<i>Pisolithus tinctorius</i>	4		127
<i>Scleroderma lycoperdoides</i>	2		126
Class TELIOMYCETES			
Order USTILAGINALES			

Species	n	2n	Reference No.
Family USTILAGINACEAE			
<i>Ustilago crameri</i>	2		258
<i>U. hordei</i>	2		256
<i>Ustilago violacea</i>	10-12		40
Family TILLETIACEAE			
<i>Tilletiatritici</i>	2		257
"	4		280
Order UREDINALES			
Family PUCCINIACEAE			
<i>Gymnosporangium juniperi-virginianae</i>	2		232
<i>G. clavipes</i>	8		17
<i>Puccinia sorghi</i>	4		220
<i>P. malvacearum</i>	5		5
"	4		220
<i>P. graminis</i>	6		152
<i>P. ruelliae</i>	5		227
<i>P. spp.</i>	3-6		153
<i>Ravenelia taslimii</i> Mundk	8		226
<i>R. breyniae</i> Sydow	6		226
<i>R. hobsoni</i> Cke	5		226
<i>R. emblicae</i> Sydow	5		226
<i>Thekopsora hydrangeae</i>	4		170
<i>Uromyces aloes</i>	6		235
<i>U. fabae</i>	4		220
<i>U. hyperici</i>	4		220
Family COLEOSPORIACEAE			
<i>Coleosporium tussilaginis</i>	8-10		7
<i>C. sidae</i>	8		216
<i>C. helianthi</i>	8		171
<i>C. sonchi-arvensis</i>	6-10		102
<i>C. vernoniae</i>	8		172
Family MELAMPSORACEAE			
<i>Melampsora biglowii</i>	4		220
Subdivision DEUTEROMYCOTINA			
Form-class DEUTEROMYCETES			
Form-Subclass HYPHOMYCETIDAE			
Form-oder MONILIALES			
<i>Aspergillus albus</i> Wilhelm	2		254
<i>A. aureus</i> Barkely	2		254
<i>A. awamori</i> Nakazawa	2		254
<i>A. clavatus</i> Desm	2		254
<i>A. fumigatus</i> Fresenius	2		254
<i>A. giganteus</i> Wehmer	2		254

Species	n	2n	Reference No.
<i>A. gymosardae</i> Yukawa	2		254
<i>A. ochraceus</i> Wilhelm	2		254
<i>A. ostianus</i> Wehmer	2		254
<i>A. varians</i> Wehmer	2		254
<i>Fusarium oxysporum</i>	4		2
<i>Giberella lateritium</i>	6		99—②
<i>G. roseum</i>	6		99—②
<i>Helminthosporium turcium</i>	aneuploidy		121

### REFERENCES

- Ahmadjian, V. 1966. Symbiosis. Academic Press vol.1; 35-97
- Aist, J.R. 1969. The mitotic apparatus in fungi : *Ceratocystis fagacearum* and *Fusarium oxysporum*, *J. Cell. Biol.* **40** : 120-135
- Aldinger, L. 1936. Cytological phenomena in *Aleuria* sp. *Am. J. Bot.* **23** : 639-644
- Ali, A.M.M. 1967. *Can. J. Genet. Cytol.* **9** : 473
- Allen, Ruth F. 1933. A cytological study of the teliospores, promycelia, and sporidia in *Puccinia malvacearum*. *Phytopath.* **23** : 572-586
- Arens, K. 1929. Untersuchungen über Keimung und Zytologie der Oosporen von *Plasmopara viticola*. *Jahrb. Wiss. Bot* **70** : 57-92
- Ashworth, Dorothy. 1934. Development and cytology of the uredo and teleutosorus in *Coleosporium tussilaginis*. *La Cellule* **43** : 187-200
- Bachmann, F.M. 1913. *Arch. Zellforsch* **10** : 369
- Backus, M.P. 1933. The development of the ascus and the occurrence of giant ascospores in *Coccomyces hiemalis*. *Bull. Torrey Bot. Club* **60** : 611-632
- Backus, E.J. and G.W. Keitt. 1940. Some nuclear phenomena in *Venturia inaequalis*. *Bull. Torrey Bot. Club* **67** : 765-770
- Badian, T. 1937. Sur la cytologie des levures. *Bull. Int. Acad. Polon. Sci. et Letters* **5B** : 61-87
- Baker, Gladys E. 1936. A study of the genus *Helicogloea*. *Ann. Missouri Bot. Gard.* **23** : 69-128
- Bakshi, B.K. 1951. Development of perithecia and reproductive structures in two species of *Ceratocystis*. *Ann. Bot (n.s.)* **15** : 51-61
- Barksdale, A.W. 1968. Meiosis in the antheridium of *Achyla ambisexualis* E 87. *J. Elisha Mitchell Sci. Soc.* **84** : 187-194
- Bauch, R. 1926. Untersuchungen über zweisporige Hymenomyeten. I. Haploide parthenogenesis bei *Camarophyllus virgineus*. *Zeits. Bot.* **18** : 337-387.
- Beatus, R. 1938. Entwicklungsgeschichtliche und zytologische untersuchungen an Ascomyceten. I. *Perisporium funiculatum* Preuss. *Jahrb. Wiss. Bot.* **87** : 301-323.
- Berliner, Martha D. and L.S. Olive 1953. Meiosis and cytological effects of certain antibiotics in *Gymnosporangium clavipes*. *Science* **117** : 652-653
- Björling, K. 1941. Zur Kenntnis der Kernverhältnisse in Ascus von *Ascobolus stercorarius*. *Kungl. Fysiogr. Sällsk.; Lund Fürth* **11** : 46-62
- Björling, K. 1951. Über die Entwicklungsgeschichte, Variabilität und Pathogenität von *Sclerotinia trifoliorum* Eriks. *Phytopath. Zeit* **18** : 129-156
- Bodman, M.C. 1938. Morphology and cytology of *Guepinia spathularia*. *Mycologia* **30** : 635-652
- Bosc, M. 1964. Sur la structure des noyaux et meiosis de *Plasmopara viticola* (Berk. & Curt.) Berl. la de Toni. *Compt. Rend. Acad. Sci. (Paris)* **223** : 584-586
- Brandza, M. and T. Solacolu. 1937. Sur le developpement et la maturation de quelques

- Gasteromycetes. Le Botaniste* 28 : 203—227
23. Brewer, D., and J.M. Duncan. 1968. *Can. J. Bot.* 46 : 773
  24. Canham, S.C. 1969. Taxonomy and morphology of *Hypocrea citrina*. *Mycologia* 61 : 315—331
  25. Carlson, Margery C. 1929. Gametogenesis and fertilization in *Achlya racemosa*. *Ann. Bot.* 43 : 111—117.
  26. Carr, A.J.H. and L.S. Olive. 1958. Genetics of *Sordaria fimicola*. II. Cytology. *Am. J. Bot.* 45 : 142—150
  27. Chang, S.T., and K.Y. Ling. 1970. *Am. J. Bot.* 57 : 165.
  28. Chow, C.H. 1934. Contribution à l'étude du développement des *Coprins*. *Le Botaniste* 26 : 89—234
  29. Colson, Barbara. 1934. The cytology and morphology of *Neurospora tetrasperma* Dodge. *Ann. Bot.* 48 : 211—224
  30. \_\_\_\_\_. 1935. The cytology of the mushroom, *Psalliota compestris*. *Quel. Bot.* 49 : 1—18.
  31. \_\_\_\_\_. 1938. The cytology and development of *Phyllactinia corylea* Lev. *Ann. Bot. (n.s.)* 2 : 381—401
  32. Cook, W.R.J. 1928. The method of nuclear division in the *Plasmodiophorales*. *Ann. Bot.* 42 : 347—377
  33. \_\_\_\_\_. 1931. The life history of *Sorodiscus radicolus* sp. nov. *Ann. Myc.* 29 : 313—324
  34. Cooper, G.O. 1929b. Cytological studies on the sporangium development and gametogenesis in *Brevilegnia diclina* Harvey. *Trans. wis Acad. Sci Arts & Lett.* 24 : 309—322.
  35. Couch, J.N. 1932. The development of the sexual organs in *Leptolegnia caudata*. *Am. J. Bot.* 19 : 584—599
  36. Cunha, M.F. da. 1970. *Genet. Res.* 16 : 127
  37. Cutler, V.M. 1964. The chromosomes of *Neurospora tetrasperma*. *Mycologia* 38 : 693—698
  38. Dangeard, P.A. 1903. *Botaniste* 9 : 35
  39. Day, P.R., D.M. Boone, and G.W. Keitt. 1956. *Venturia inaequalis* (Cke.) Wint. XI. The chromosome number. *Am. J. Bot.* 43 : 835—838
  40. Day, A.W., and J.K. Jones. 1969. *Genet. Res.* 14 : 195
  41. DeLamater, E.D. 1949a. The nuclear cytology of *Saccharomyces cerevisiae* and other fungi. *Am. J. Bot.* 36 : 808
  42. \_\_\_\_\_. 1950. The nuclear cytology of the vegetative diplophase of *Saccharomyces cerevisiae*. *Jour. Bact.* 69 : 321—332
  43. DeLamater, E.D., Yaverbaum S., and Schwartz L. 1952. Nuclear cytology of the fungus *Ereascus albus*. *Science* 115 : 481
  44. Dowding, E.S., and Weijer J. 1960. Mitosis in *Neurospora*. *Nature* 88 : 338
  45. \_\_\_\_\_. 1966. The chromosomes in *Neurospora* hyphae. *Can. J. Bot.* 44 : 1121—1125
  46. Eftimiu, Panca. 1929b. Sur la karyokinèse de *Spathularia flavida*. *Revue Pers. Compt. Rend. Acad. Sci. (Paris)* 188 : 267—269
  47. \_\_\_\_\_. 1929c. Remarques sur la karyokinèse de *Quelques ascomycètes*. *Le Botaniste* 20 : 228—237
  48. \_\_\_\_\_. 1933. Observations sur la karyokinèse de *Mitrula phalloides* (Bull.) Sacc. *Notationes Biol. (Bucharest)* 1 : 1—6
  49. Ehrlich, H.G. and E.S. McDonough. 1949. The nuclear history in the basidia and basidiospores of *Schizophyllum commune* Fris. *Am. J. Bot.* 36 : 360—363
  50. El-Ani, A.S. 1956. Ascus development and nuclear behavior in *Hypomyces solani* f. *cucurbitae*. *Am. J. Bot.* 43 : 769—778.
  51. \_\_\_\_\_. 1959. Chromosome number in the *Hypocreales*. I. Nuclear division in the ascus of *Nectria peziza*. *Am. J. Bot.* 46 : 412—417
  52. Elisei, F.G. 1939. Osservazioni sul nucleo dei *Penicillium*. *Atti Ist. Bot. Univ. Pavia*. IV : 11 : 13—21
  53. Elliott, C.G. 1960. The cytology of *Aspergillus nidulans*. *Genet. Res.* 1 : 462—476
  54. Emerson, Ralph. 1949. Cytogenetic and cytotaxonomic studies in the water mould, *Allomyces*. *Am. J. Bot.* 36 : 809
  55. Emerson, R., and Wilson, C.M. 1949. The significance of meiosis in *Allomyces*. *Science* 110 : 86—110.
  56. Erbsch, F.H. 1969. *Bryologist* 72 : 178.
  57. Esser, K., and R. Kuenen. 1967. Genetics of



- Fungi. J. Springer, New York.
58. Evans, H.J. 1956. Chromosomes of the cultivated mushroom. *Nature* **178** : 1005—1006
  59. Feldmann, G. 1956. Developement d'une *Plasmodiophora* marine; *Plasmodiophora bicaudata* J.Feldm., parasite du *Zostera nana* Roth. *Rev. Gen. Bot.* **63** : 390—421
  60. Finely, D.E. 1970. Somatic mitosis in *Ceratobasidium-flavescens* and *Pellicularia koleroga*. *Mycologia*. **62** : 474—485.
  61. Flanagan, P.W. 1969. Nuclear divisions in the vegetative hyphae of *Rhizopus nigricans* and *Phycomyces blakesleeanus*. *Can. J. Bot.* **47** : 2055—2059
  62. \_\_\_\_\_. 1970. Meiosis and mitosis in Saprolegniaceae. *Can. J. Bot.* **48** : 2069—2079
  63. Frandsen, K.J. 1946. Studier over *Sclerotinia trifoliorum* Eriksson. 220pp
  64. Franke W.W. and Patricia Reau. 1973. The mitotic apparatus of a Zygomycete, *Phycomyces blakesleeanus*. *Arch. Mikrobiol.* **90** : 121—129
  65. Fries, R. 1911. Über die cytologischen Verhältnisse bei der Sporenbildung von *Nidularia*. *Zs f. Bot.* **3**
  66. Furtado, J.S. 1969. Basidial cytology of *Exidia recisa*. *Mycologia* **61** : 415—418
  67. \_\_\_\_\_. 1970. Ascal cytology of *Sordaria brevicolis*. *Mycologia* **62** : 453—461.
  68. Gilbert, H.C. 1935. Critical events in the life history of *Ceratiomyxa*. *Am. J. Bot.* **22** : 52—74
  69. Gilles, A. 1974. Evolution nucléaire et développement du périthèce chez *Nectria flava*. *La Cellule* **51** : 371—400
  70. Gray, W.D. and C.J. Alexopoulos. 1968. Biology of the Myxomycetes. Ronald Press, New York.
  71. Greis, H. 1937a. Entwicklungsgeschichtliche Untersuchungen an Basidiomyceten. I. Zur Entwicklungsgeschichte von *Lepiota acutesquamosa* Weinm. *Jahrb. Wiss. Bot.* **84** : 448—482.
  72. \_\_\_\_\_. 1937b. Entwicklungsgeschichtliche Untersuchungen an Basidiomyceten II. Fruchtkörperbildung und Basidienentwicklung von *Tylostoma mammosum* Fries. *Jahrb. Wiss. Bot.* **84** : 517—552
  73. \_\_\_\_\_. 1947. Befruchtungsvorgänge in der Gattung *chaetomium*. *Jahrb. Wiss. Bot.* **90** : 233—254
  74. Guilliermond, A. 1936a. L. *Eremothecium ash bii*, nouveau champignon parasite des capsules du cotonnier. *Rev. de Myc.* **1** : 115—156.
  75. Guttes, E. et al. 1961. *Develop. Biol.* **3** : 558
  76. \_\_\_\_\_. 1971. Unpublished. Univ. Texas, Dallas.
  77. Gwynne-Vaughan, H.C.I. 1937. Contribution to the study of *Lachnea melaloma*. *Ann. Bot. (n.s.)* **1** : 99—105
  78. Gwynne-Vaughan, H.C.I. and Q.U. Broadhead. 1936. Contributions to the study of *Ceratostomella fimbriata*. *Ann. Bot.* **50** : 747—758
  79. Gwynne-Vaughan, H.C.I. and H.S. Williamson. 1930. Contributions to the study of *Humaria granulata*. *Quel. Ann. Bot.* **44** : 127—145
  80. \_\_\_\_\_. 1934. The cytology and development of *Ascophanus aurora*. *Ann. Bot.* **48** : 261—272
  81. Hagerup, O. 1944. Basidiens cytologie hos *Tremellodon gelatinosum* (Scop.) Pers. *Friesia* **3** : 46—51
  82. \_\_\_\_\_. 1945. Basidiens cytologie hos *Lepiota* (Limacella) *lenticularis* Lasch. *Friesia* **3** : 96—100.
  83. Hanlin, R.T. 1961. Studies in the genus *Nectria*. II. Morphology of *Nectria gliocladioides*. *Am. J. Bot.* **48** : 900—908.
  84. \_\_\_\_\_. 1963a. Morphology of *Neuronectria peziza*. *Am. J. Bot.* **50** : 56—66.
  85. \_\_\_\_\_. 1963b. Morphology of *Hypomyces lactifluorum*. *Bot. Gaz.* **124** : 395—404.
  86. Hanson, Anne M. 1945. A morphological, developmental, and cytological study of four saprophytic Chytrids. II. *Rhizophydium coronum* Hanson. *Am. J. Bot.* **32** : 478—487.
  87. Harris, S.E., J.P. Braselton, and C.E. Miller. 1980. Chromosomal number of *Sorosphaera veronicae* (Plasmodiophoromycetes) based on ultrastructural analysis of synaptonemal complexes. *Mycologia* **77** : 916—925.
  88. Hartley, M.J. & Williams, P.G. 1971. Genotypic variation within a phenotype as a possible basis for somatic hybridization in rust fungi.

- Can. J. Bot.* **49** : 1085—1087.
89. Hatch, W.R. 1935. Gametogenesis in *Allomyces arbuscula*. *Ann. Bot.* **49** : 623—649
  90. Hawthorne, D.C. and R.K. Mortimer. 1968. *Genetics* **60** : 735
  91. Hayman, D.S. 1964. *Rosellinia limoniispora* : Nuclear changes in the developing ascus. *Can. J. Bot.* **42** : 13—21
  92. Heim, Mme, Pcanca. 1952. Observations sur le noyau des Ascomycetes. *Rev. de Mycol.* **17** : 3—38
  93. Heim, P. 1954. *Rev. Mycol.* **19** : 201
  94. ———. 1960. Evolution du Spongospora parasite des racines du Cresson. *Rev. Mycol.* **25** : 3—12
  95. Hejtmanek, M., and Hejmankova-Uhrova. 1968. Vegetative nuclei and differentiation of chromosomes in *Trichopyhton vanbreuseghemii*. *Folia Microbiol.* **13** : 410—413
  96. Heuberger, J.W. 1934. Fruit-rotting Sclerotinias IV. A cytological study of *Sclerotinia fructicola* (Wint.) Rehm. *Univ. Md. Agr. Exp. Sta. Bull.* **371** : 167—189
  97. Hirmer, M. 1920. Zur Kenntnis der Vierkernigkeit der Autobasidiomyceten I. *Zeits Bot.* **12**
  98. Hirsch, Hilde E. 1947. Cytological phenomena and sex in *Hyphomyces solani* f. *cucurbitae*. *Proc. Nat. Acad. Sci.* **33** : 268—270
  - 99—①. ———. 1949. The cytogenetics of sex in *Hypomyces solani* f. *cucurbitae*. *Am. J. Bot.* **36** : 113—121
  - 99—②. Hirsh H.E., Willam C. Snyder H.N. Hansen 1949. Chromosome numbers in the Hypocreaceae. *Mycologia* **41** : 411—415
  100. ———. 1950. No brachmeiosis in *Pyronema confluens*. *Mycologia* **42** : 301—305
  101. Höhnk, W. 1935. Zur Cytologie der Oogon und Entwicklung bei *Saprolegnia ferax* (Grüith) Thuret. *Naturwiss. Ver. Bremen* **29** : 308—323
  102. Holden, R.J. and R.A. Harper. 1902. Nuclear divisions and nuclear fusion in *Coleosporium sonchi-arvensis* Lev. *Trans. Wisconsin Acad. Sci.* **14** : 63—82
  103. Holm, L. 1952. Étude du développement de *Stigmatea geranii*. *La cellule* **54** : 265—302
  104. Homma, Y. 1934. A life-cycle of *Sphaerotheca fuliginea* (Schlect.) Pollacci, parasitic on *Taraxacum ceratophorum* DC. *Trans Sapporo Nat. Hist. Soc.* **13** : 173—178
  105. Horne, A.S. 1930. Nuclear division in the *Plasmodiophorales*. *Ann. Bot.* **44** : 188—230.
  106. Hrushovetz, S.B. 1956. Cytological studies of Ascus development in *Cochliobolus sativus*. *Can. J. Bot.* 641—651
  107. Huang, L.H. 1976. Cytology of *Triangularia backusii*. *Mycologia* **68** : 984—993
  108. Hughes, D.T. 1961. Chromosome of the wild mushroom. *Nature* **190** : 285—286
  109. John, E. 1933. Myxomycetenstudien: 15. Somatische und generative Kernteilungen. *Ber. Deut. Bot. Ges.* **51** : 377—385
  110. ———. 1936. Myxomycetenstudien: 16. Die Kernphasen und die Zahl der Chromosomen. *Ber. Deut. Bot. Ges.* **54** : 517—528
  111. Juel, H.O. 1916.
  112. Jenkins, W.A. 1934. The development of *Cordyceps agariciformia*. *Mycologia* **26** : 220—243.
  113. Julien, J.B. 1958. Cytological studies of *Venturia inaequalis*. *Can. J. Bot.* **36** : 607—613
  114. Käfer, E. 1958. An 8-chromosome map of *Aspergillus nidulans*. *Advan. Gen. et.* **9** : 105—145
  115. Karling, J.S. 1937. The cytology of the Chytridiales with special reference to *Cladobotryum replicatum*. *Mem. Torrey Bot. Club.* **19** : 1—92
  116. Kemper, W. 1937. Zur Morphologie und Zytologie der Gattung Coniophora, insbesondere des sogenannten Kellerschwamms. *Zentralbl. Bakt* **97** : 100—124.
  117. Kharbush, S.S. 1927a. Evolution nucléaire du *Sclerotinia fuckeliana* de Bary. *Bull. Soc. Bot. France* **74** : 257—262
  118. ———. 1929. Étude sur le phénomène de la réduction chromatique chez les Exobasidiées. *Bull. Soc. Bot. France* **76** : 560—568
  119. Kniep, H. 1911. Über das Auftreten von Basidien im einkernigen Mycel von *Armillaria mellea* FL DAN. *Zeits Bot.* **3**
  120. Kniep, H. 1916.
  121. Knox-Davies, P.S. and J.G. Dickson. 1960. Cytology of *Helminthosporium turcicum* and its ascigerous stage, *Trichometasphaeria tur-*

- cica. *Am. J. Bot.* **47** : 329—339.
122. Kowalski, D.T. 1965. The development and cytology of *Didymocrea sadasavani*. *Mycologia* **57** : 404—416
  123. Kühner. 1926.
  124. Kühner, R. 1928. Notes sur les *Lenthus variabilis* Schulz. *Bull. Trimest. Soc. Myc. France* **44** : 331—335.
  125. Kusano, S. 1930. Cytology of *Synchrtrium fulgens* Schroet. *Jour. Coll. Agr. Imp. Univ. Tokyo* **10** : 347—388.
  126. Lander, Caroline. 1933. Spore formation in *Scleroderma lycoperdoides*. *Bot. Gaz.* **95** : 330—337.
  127. \_\_\_\_\_. 1935. Cavity-development and spore-formation in *Pisolithus tinctorius*. *Jour. Elisha Mitchell Sci. Soc.* **51** : 173—181
  128. Lanne, M.M. 1967. The nuclear division in *Penicillium expansum*. *Can. J. Genet. Cytol.* **9** : 342—351
  129. Li, H.W. et al 1967. *Acad. Sinica Bot. Bull.* **8** : 111
  130. Lietz, Klaus. 1951. Beitrag zur Hefecytologie. *Arch. Mikrob.* **16** : 275—302.
  131. Lihnell, D. 1942. *Tetramyxa rhizophaga* Lihnell n.sp., ein parasite in den Wurzel von *Juniperus communis* L. *Symb. Bot. Upsa.* **5** : 1—11
  132. Ling, H., and O'N.R. Collins. 1970. *Am. J. Bot.* **57** : 299
  133. Lorenz, F. 1933. Beiträge zur Entwicklungsgeschichte von *Sphaerobolus*. *Archiv. Protistenk.* **81** : 361—398.
  134. Lu, B.C. 1964. *Chromosoma* **15** : 170.
  135. \_\_\_\_\_. 1964. Polyploidy in the basidiomycets *Cyathus stercoreus*. *Am. J. Bot.* **51** : 343—347.
  136. \_\_\_\_\_. 1967. The course of meiosis and centriole behavior during the ascus development of the ascomycete *Gelasinospora calospora*. *Chromosoma* **22** : 210—226
  137. \_\_\_\_\_. and N.B. Raju 1970. *chromosoma* **29** : 305
  138. Lutman, B.F. 1913. Studies on club root. I. The relation of *Plasmodiophora brassicae* to its host and the structure and growth of its plasmodium. *Vermont Agric. Exp. Sta. Bull.* **175** : 1—27.
  139. Luttrell, E.S. 1944. The morphology of *Sphaerostible aurantiicola* (B.&Br.) Petch. *Bull. Torrey Bot. Club* **71** : 599—619.
  140. \_\_\_\_\_. and H.G. Mäkel. 1928. Zur Cytologie einiger Saprolegniaceen. *Jahrb. Wiss. Bot.* **69** : 517—548.
  141. Maire, R. 1902. Recherches cytologiques et taxonomiques sur les Basidiomycetes. Thèse Lous-el-Saunier.
  142. \_\_\_\_\_. 1904. *C.R. Soc. Biol.* **56** : 822
  143. \_\_\_\_\_. and A. Tison. 1909. La cytologie des *Plasmodiophoracées* et la classe des phytomyxinae. *Ann. Mycol.* **7** : 226—253.
  144. \_\_\_\_\_. 1911. Nouvelles recherches sur les *Plasmodiophoracees*. *Ann. Mycol.* **9** : 226—246
  145. Martin, Ella M. 1940. The morphology and cytology of *Taphrina deformans*. *Am. J. Bot.* **27** : 743—751
  146. Mathieson, M.J. 1952. Ascospore dimorphism and mating type in *Chromocrea spinulosa* (Fuckel) Petch, n. comb. *Ann. Bot. (n.s.)* **16** : 449—466
  147. Matsuura, H., and A. Gondo. 1935. A Karyological study on *Peziza subumarina* Boud., with special reference to a heteromorphic pair of chromosomes. *Jour. Fac. Sic. Hokkaido. Imp. Univ.* **3** : 205—217
  148. McClaren, M. 1967. *Can. J. Bot.* **45** : 215
  149. McClintock, B. 1945. *Neurospora*. I. Preliminary observations of the chromosomes of *Neurospora crassa*. *Am. J. Bot.* **32** : 671—678
  150. McCully, E.K., and C.F. Robinow. 1973. Mitosis in *Mucor hiemalis*. *Arch. Mikrobiol.* **94** : 133—148
  151. McDonough, E.S. 1937. The nuclear history of *Sclerospora graminicola*. *Mycologia* **29** : 151—173
  152. McGinnis, R.C. 1953. Cytological studies of chromosomes of rust fungi. I. The mitotic chromosomes of *Puccinia graminis*. *Can. Bot.* **31** : 522—526
  153. \_\_\_\_\_. 1956. *J. Hered.* **47** : 255.
  154. McLarty, D.A. 1941. Studies in the Woroninaceae. II. The cytology of *Olpidiopsis achlyae* sp. nov. (ad int.). *Bull. Torrey Bot. Club.* **68** : 75

—99

155. McManus, M.A., and L.E. Roth. 1968. Ultrastructure of the somatic nuclear division in the plasmodium of the myxomycete *Clastoderma debaryanum*. *Mycologia* **60** : 426—436
156. Miller, J.H. 1938. Studies in the development of two *Myriangium* species and systematic position of the order Myriangiales. *Mycologia* **30** : 158—181
157. Miller, C.E. 1958. Morphology and cytology of the zoosporangia and cystosori of *Sorosphaera veronicae*. *J. Elisha Mitchell Sci. Soc.* **74** : 49—64
158. Moreau, F., and F. Moreau. 1915. *C.R. Acad. Sci.* **160** : 526
159. Moreau, F., and Mme Moreau. 1930. Le développement du périthèce chez quelques Ascomycètes. *Rev. Gén. Bot.* **42** : 65—98.
160. \_\_\_\_\_. 1931. Existe-t-il une double réduction chez les Ascomycètes? *Rev. Gén. Bot.* **43** : 465—473.
161. \_\_\_\_\_. 1932. *Rev. Gén. Bot.* **44** : 305
162. \_\_\_\_\_. 1935. Les phénomènes cytologiques du développement de l'oeuf et de la fécondation chez les champignons du groupe des *Saprolegniées*. *Compt. Rend Acad. Sci. (Paris)* **201** : 1209—1210
163. Mortimer, R.K., and D.C. Hawthorne. 1969. *The Yeast*. Vol. 386—460
164. Mundkur, B.D. 1949. Morphology and cytology of development of the sex organs of *Phytophthora himalayensis* Dastur. *Bot. Gaz.* **110** : 475—486
165. Muthappa, B.N. 1970. *Mycologia* **62** : 98
166. Naidu, M.B., and V.M. Bakshi. 1946a. The chromosome number in *Torula utilis*. *Current Sci.* **15** : 164
167. Nardi, R. 1930. Observations sur la caryokinèse chez quelques Ascomycètes. *Bull. Trimest. Soc. Myc. France* **46** : 97—126
168. Nelson, A.C. and M.P. Backus. 1968. Ascocarp development in two homothallic *Neurospora*. *Mycologia* **60** : 16—28
169. Nichols, S.P. 1905
170. Olive, L.S. 1943b. Morphology, cytology, and parasitism of *Thekopsora hydrangeae*. *Jour. Elisha Mitchell Sci. Soc.* **59** : 45—67.
171. \_\_\_\_\_. 1942. Nuclear phenomena involved at meiosis *Coleosporium helianthi*. *Jour. Elisha Mitchell Sci. Soc.* **58** : 43—51
172. \_\_\_\_\_. 1949. Karyogamy and meiosis in the rust *Coleosporium vernoniae*. *Am. J. Bot.* **36** : 41—54.
173. \_\_\_\_\_. 1949b. Cytological evidence opposing the theory of brachymeiosis in Ascomycetes. *Science* **110** : 185.
174. \_\_\_\_\_. 1950. A cytological study of ascus development in *Patella melaloma* (Alb. & Schw.) Seaver. *Am. J. Bot.* **37** : 757—763
175. \_\_\_\_\_. 1965. Nuclear behavior during Meiosis. *The Fungi I*. Academic Press. p 143—161
176. Pinto-Lopes, J. 1949. Contribution to the study of the nuclear structure in fungi. *Portug. Acta. Biol., sér A*, **2** : 191—210
177. Pomerleau, R. 1938. Recherches sur le *Gnomonia ulmea* (Schew.) Thüm. *Centr. Inst. Bot. Univ. Montréal No.* 31, 139p.
178. Racovitza, A., and Mme. Racovitza. 1945. Étude caryomorphologique du mycélium et des asques d'*Humaria lucoloma* (Hedw.) Boud. *Acad. Roum. Bull. Sect. Sci.* **28** : 247—263
179. \_\_\_\_\_. 1946. Étude caryologique des asques d'*Humaria tetraspora* (Fuckel) Cooke. *Acad. Roum. Bull. Sect. Sci.* **29** : 332—338.
180. Rao, R.V., and K.G. Mukerji. 1970. Cytology of the ascus in *Ascotricha guamensis*. *Mycologia* **62** : 301—306.
181. Raper, J.R. 1936. Heterothallism and sterility in *Achlya* and observations on the cytology of *Achlya bisexualis*. *Jour. Elisha Mitchell Sci. Soc.* **61** : 74—113
182. Raymond, J. 1933a. Sur la formation du périthèce chez *Microsphaera quercina* (Schw.) Burr. *Compt. Rend. Sci. (Paris)* **196** : 366—369.
183. \_\_\_\_\_. 1934. Contribution à la connaissance cytologique des Ascomycètes. *Le Botanique* **26** : 371—537.
184. Rees, H., and J.L. Jinks. 1952. The mechanism of variation in *Penicillium heterokaryons*.



- Proc. Roy. Soc. (London)* **140** : 100—106
185. Ritchie, D. 1941. A fixation study of *Russula emetica*. *Am. J. Bot.* **28** : 582—583
  186. \_\_\_\_\_. 1948b. Nuclei and cytoplasmic inclusions in basidia of *Amanita*. *Bot. Gaz.* **109** : 521—525.
  187. Robinow, C.F. 1957. The structure and behavior of the nuclei in spores and growing hyphae of Mucorales. *Can. J. Microbiol.* **3** : 771—789
  188. \_\_\_\_\_. 1961. Mitosis in the yeast, *Lipomyces lipofer*. *J. Biophys. Biochem. Cytol.* **9** : 987—892
  - 189—① \_\_\_\_\_. 1962. Some observation on the mode of division of somatic nuclei of Mucor and Allomyces. *Arch. Mikrobiol.* **42** : 369—377
  - 189—② \_\_\_\_\_. 1977. The number of chromosomes in *Schizosaccharomyces pombe*: Light microscopy of stained preparations. *Genetics* **87** : 491—497
  190. Rogers, J.D. 1964. *Hypoxylon pruinaum*: The chromosome number. *Mycologia* **56** : 369—373.
  191. \_\_\_\_\_. 1965a. The conidial stage of *Conichaeta ligniaria*: Morphology and cytology. *Mycologia* **57** : 368—378
  192. \_\_\_\_\_. 1965b. *Hypoxylon fuscum* I. Cytology of the ascus. *Mycologia* **57** : 789—803.
  193. \_\_\_\_\_. 1967a. *Hypoxylon multifforme*; Cytology of the ascus. *Mycologia* **59** : 295—305
  194. \_\_\_\_\_. 1967c. Cytological aspects of the ascospore of *Hypoxylon grenadens* var. *macrospora*. *Can. J. Bot.* **45** : 1166—1168
  195. \_\_\_\_\_. 1968. *Hypoxylon deustum*: The chromosome number. *Mycopathol. Mycol. Appl.* **35** : 249—255
  196. \_\_\_\_\_. 1968c. Nuclear phenomena in the ascospores of *Hypoxylon punctulatum*. *Can. J. Bot.* **46** : 856—866
  197. \_\_\_\_\_. 1968d. *Xylaria curta*: Cytology of the ascus. *Can. J. Bot.* **46** : 1337—1340
  198. \_\_\_\_\_. 1969a. *Xylaria polymorpha*. I. Cytology of a form with small stromata from Minnesota. *Can. J. Bot.* **47** : 1315—1317
  199. \_\_\_\_\_. 1969b. *Hypoxylon rubiginosum*: Cytology of the ascus and surface morphology of the ascospore. *Mycopathol. Mycol. Appl.* **38** : 215—223
  200. \_\_\_\_\_. 1970. Cytology of *Poronia oedipus* and *P. punctata*. *Can. J. Bot.* **48** : 1665—1668
  201. \_\_\_\_\_. 1971. Observations on the asco-geneous system of *Hypoxylon microplacum*. *Can. J. Bot.* **49** : 1075—1078
  202. \_\_\_\_\_. 1972. *Hypoxylon cohaerens*: Cytology of the ascus. *Mycopathol. Mycol. Appl.* **48** : 161—165
  203. \_\_\_\_\_. 1973. Cytology of *Podosordaria leporina*. *Can. J. Bot.* **51** : 791—793
  204. \_\_\_\_\_. 1975a. *Hypoxylon serpens*: Cytology and taxonomic considerations. *Can. J. Bot.* **53** : 52—55.
  205. \_\_\_\_\_. 1975e. *Xylaria polymorpha* II. Cytology of a form with typical robust stromata. *Can. J. Bot.* **53** : 1736—1743
  206. \_\_\_\_\_. 1979. The Xylariaceae: Systematic, biological and evolutionary aspects. *Mycologia* **71** : 1—42
  207. Rogers, J.D., and D.L. Stiers. 1974. Cytology of *Rosellinia mammiformis* and *R. aquila*. *Can. J. Bot.* **52** : 5—10
  208. Roges, J.D., and M.M. Malmgren. 1977. Notes on *Rosellinia buxi* and conditional *Xylaria*. *Can. J. Bot.* **55** : 1051—1055
  209. Ross, J.K. 1961. Further studies on meiosis in the Myxomycetes. *Am. J. Bot.* **48** : 244—248
  210. Ross, I.K. 1966. Chromosome numbers in pure and gross cultures of myxomycetes. *Am. J. Bot.* **53** : 712—718
  211. Ross, J. K. 1967. Growth and development of the myxomycete, *Perichaena vermicularis*. II. Chromosome numbers and nuclear cycles. *Am. J. Bot.* **54** : 1231—1236
  212. Saksena, M.R.K. 1936. Recherches physiologique et cytologique sur quelques espèces du genre *Pythium*. *Rev. Gén. Bot.* **48** : 156—188, 215—252, 273—313
  213. Saksena, H.K. 1961. Nuclear phenomena in the basidium of *Ceratobasidium praticolum* (Kotila) Olive. *Can. J. Bot.* **39** : 717—725
  214. Salmon, Janine. 1937(1938). Étude cytologique

- des laticiferes des Lactario-Russulés et quelques observations sur les mitoses des basides. *Rev. Cytol. et Cytophysiol. Veg.* **2** : 376—391
215. Sansome, E. 1964. Meiosis in the sex organs of the oömycetes. *Chromosome today*. Vol.1 : 77
216. Sanwal, B.D. 1953. The development of the basidium in *Coleosporium sidae*. *Bull. Torey Bot. Club.* **80** : 205—216
217. Sarazin, A. 1938. Évolution nucléaire de la baside et des basidiospores dans *Agaricus campestris* (var. cultivée). *Compt. Rend. Sci.(France)* **206** : 275—278
218. Sass, J.E. 1928. A cytological study of a bipored form of *Psalliotia campestris*. *Pap. Mich. Acad. Sci.* **9** : 287—298
219. \_\_\_\_\_, 1929. The cytological basis for homothallism and heterothallism in the Agaricaceae. *Am. J. Bot.* **16** : 663—701.
220. Savile, D.B.O. 1939. Nuclear structure and behavior in species of the *Uredinales*. *Am. J. Bot.* **26** : 585—609
221. Sawyer, W.H. 1931. Studies on the morphology and development of an insect-destroying fungus, *Entomophthora sphaerosperma*. *Mycologia* **23** : 411—432
222. Schrader, E. 1938. Die Entwicklung von *Thraustotheca clavata*. *Flora* **32** : 125—150
223. Schünemann, E. 1930. Untersuchungen über die Sexualität der Myxomyceten. *Planta* **9** : 645—673
224. Schürhoff, P. 1907. Über *Penicillium crustaceum* Fries. *Beih. Bot. Clb.* **22** : 294—298
225. Shanor, L. 1937. Observations on the development and cytology of the sexual organs of *Thraustotheca clavata* (De Bary) Humph. *Jour. Elisha Mitchell Sci. Soc.* **53** : 119—136
226. Singh, U.P. 1972. Morphology of chromosomes in *Ravenelia* species. *Mycologia* **64** : 205—207
227. \_\_\_\_\_. 1979. Cytology of *Puccinia ruelliae*. *Mycologia* **71** : 1197—1205
228. Singleton, J.R. 1953. Chromosome morphology and the chromosome cycle in the ascus of *Neurospora crassa*. *Am. J. Bot.* **40** : 124—144
229. Skupienski, F.X. 1927. Sur le cycle évolutif chez une espèce de Myxomycète endospore, *Didymium difforme* Duby. *Etude cytologique Compt. Rend. Acad. Sci.(Paris)* **184** : 1341—1344
230. Somers, C.E., R.P. Wagner, and T.C. Hsu. 1960. Mitosis in vegetative nuclei of *Neurospora crassa*. *Genetics* **45** : 801—810
231. Soong, Tuh-Faung 1939. Beitrag zur cytologie der *Uredinee ochropsora* Sorbi Diet. *Flora* **133** : 345—364
232. Stevens, Edith. 1930. Cytological features of the life history of *Gymnosporangium juniperi-virginianae*. *Bot. Gaz.* **89** : 394—401.
233. Stevens, R.B. 1940. Certain nuclear phenomena in *Albugo portulacae*. *Mycologia* **32** : 46—51
234. \_\_\_\_\_. 1941. Morphology and ontogeny of *Dermatocarpon aquaticum*. *Am. J. Bot.* **28** : 59—69
235. Thirumalachar, M.J. 1946. A cytological study of *Uromyces albes*. *Bot. Gaz.* **108** : 245—254
236. Thirumalachar, M.J., Whitehead, M.D., and Boyle, J.S. 1949. Gametogenesis and oospore formation in *Cystopus(Albugo) evoluli*. *Bot. Gaz.* **110** : 487—491
237. Tischler, G. 1938. Pflanzliche chromosomen-Zahlen. *Tab. Biol.* **16** : 162—218
238. Tommerup, I.C. and D.S. Ingram. 1971. The life cycle of *Plasmodiophora brassicae* Woron in Brassica tissue cultures and intact roots. *New Phytol.* **70** : 327—332
239. Tsang, K.C. 1929. Recherches cytologiques sur la famille des Péronosporés; étude spéciale de la reproduction sexuelle. *Le Botaniste* **21** : 1—93
240. Uecker, F.A. 1967. *Stephensia shanori*: I. Cytology of the ascus and other observations. *Mycologia* **59** : 819—833
241. Uecker, F.A. & Staley, J.M. 1973. Development of the ascocarp and cytology of *Lophodermium la morbida*. *Mycologia* **65** : 1010—1027
242. Uecker, F.A. 1976. Development and cytology of *Sordaria humana*. *Mycologia* **68** : 30—46
243. Uecker, F.A. 1980. Cytology of the ascus of *Claviceps phalaridis*. *Mycologia* **72** : 270—278
244. Valkanov, A. 1931. Zur Karyologie eines Ascomyceten. *Arch. Protistenk.* **74** : 1—4

245. Varitchak, B. 1828. L'évolution nucléaire chez *Ascoidea rubescens* Brefeld. *Compt. Rend. Acad. Sci. (Paris)* **186** : 96—98.
246. Varitchak, B. 1931. Contribution à l'étude du développement des Ascomycètes. *Le Botaniste* **23** : 1—183
247. Vokes, Margaret. 1931. Nuclear division and development of sterigmata in *Coprinus atramentarius*. *Bot. Gaz.* **91** : 194—204
248. Von Stosch, H.A. 1935. Untersuchungen über die Entwicklungsgeschichte der Myxomyceten. Sexualität und Apogamie bei Didymiaceen. *Planta* **28** : 623—656
249. Von Stosch, H.A. 1937. Über den Generationswechsel der Myxomyceten; eine Erwiderung. *Ber. Deut. Bot. Ges.* **55** : 362—369
250. Wager, H. 1893. On nuclear division in the *Hymenomyces*. *Ann. Bot.* **7**
251. Wager, H. 1911.
252. Wakayama, K. 1930a. Contributions to the cytology of fungi. I. Chromosome number in Agaricaceae. *Cytologia* **1** : 369—388
253. Wakayama, K. 1930b. Contributions to the cytology of fungi. II. Cytological studies in *Morchella deliciosa* Fr. *Cytologia* **2** : 27—36
254. Wakayama, K. 1931. Contributions to the cytology of fungi. III. Chromosome number in *Aspergillus*. *Cytologia* **2** : 291—301
255. Wakayama, K. 1932. Contributions to the cytology of fungi. IV. Chromosome number in *Autobasidiomycetes*. *Cytologia* **3** : 260—284
256. Wang, Mlle. D.T. 1932a. Observations cytologiques sur *Ustilago hordei* (Pers.) Kell. & Sw. *Compt. Rend. Sci. Acad. Paris* **195** : 1041—1044.
257. Wang, Mlle. D.T. 1932 b. Quelques observations sur *Ustilago violacea* (Pers.) Fuckel. *Compt. Rend. Acad. Sci. (Paris)* **195** : 1417—1418
258. Wang, G.S. 1943. Studies on cytology of *Ustilago crameri*. *Phytopath.* **33** : 1122—1133
259. Ward, E.W.B. and K.W. Ciurysek. 1961. Somatic mitosis in a *Basidiomycete*. *Can. J. Bot.* **39** : 1497—1503
260. Ward E.W.B. and K.W. Ciurysek 1962. Somatic mitosis in *Neurospora crassa*. *Am. J. Bot.* **49** : 393—399
261. Webb, C.R. 1935. The cytology and life history of *Sorosphaera veronicae*. *Ann. Bot.* **49** : 41—52
262. Weitzman, I. et., al. 1968. Meiosis in *Arthroderma benhamiae* (= *Trichophyton mentagrophytes*). *Sabouraudia* **6** : 232—237
263. Weitzman, I., et. al. 1970. Chromosome numbers in species of *Nannizzia* and *Arthroderma*. *Mycologia* **62** : 89—97
264. Wernham, C.C. 1935. A species of *Sorodiscus* on *Heteranthera*. *Mycologia* **27** : 262—273
265. Wheeler, H.E., L.S. Olive, C.T. Ernest, and C.W. Edgerton 1948. Genetics of *Glomerella*. V. Crozier and ascus development. *Am. J. Bot.* **35** : 722—728
266. Whelden R.M. 1937. Cytological studies in the Tremellaceae IV. Protodontia and Tremelodendron. *Mycologia* **29** : 100—115.
267. Wilson, C.M. 1952. Meiosis in Allomyces. *Bull. Torrey Bot. Club* **79** : 139—159
268. Wilson, C.M. 1952. Sexuality in the Acrasiales. *Proc. Nat. Acad. Sci.* **38** : 659—662
269. Wilson, Irene M. 1937. A contribution to the study of the nuclei of *Peziza rutilans* Fries. *Ann. Bot. (n.s.)* **1** : 655—671
270. Wilson, Irene M. 1952. The ascogenous hyphae of *Pyronema confluens*. *Ann. Bot. (n.s.)* **16** : 321—339
271. Wilson, M., and Elsie J. Cadman. 1928. The life history and cytology of *Reticularia lycoperdon*. *Bull. Trans. Roy. Soc. Edinburgh* **55** : 555—608
272. Wilson C.M. and Ian K. Ross 1955. Meiosis in the *Myxomycetes*. *Am. J. Bot.* **42** : 743—749
273. Wilson, C.M., et al 1967. Nuclear behavior in the basidium of *Fomes annosus*. *Am. J. Bot.* **54** : 1186—1188
274. Winge, O. 1912. Cytological studies in the *Plasmodiophoraceae*. *Ark. Bot.* **12** : 1—29
275. Winge, O 1951. The relation between yeast cytology and genetics : a critique. *Compt. Rend. Tray. Lab. Carlsberg. Sér. Physiol.* **25** : 85—99
276. Wittlake, E.B. 1938. Hymenial organization of *Sebacina calcea*. *Univ. Iowa. Stud. Nat. Hist.*

- 17 : 351—361
277. Wolf, F.T. 1938. Cytological observations on gametogenesis and fertilization in *Achlya flagellata*. *Mycologia* **30** : 456—467.
278. Woo, J.Y., and A.D. Partridge 1969. The life history and cytology of *Rhytisma punctatum* on big leaf maple. *Mycologia* **61** : 1085—1095
279. Wood, John L. 1953. A cytological study of ascus development in *Ascobolus magnificus* Dodge. *Bull. Torrey Bot. Club.* **80** : 1—15
280. Yen, Wen-Yu, 1936. Observations cytologiques sur la sexualité et le développement de *Tilletia tritici* (Bjerk.) Wint. *Compt. Rend. Soc. Biol. France* **121** : 1304—1306
281. Yendo, V. and K. Takase 1932. On the root nodule of *Elaeagnus*. *Bull. Sericult. Silk-Ind. Japan* **4** : 4—5
283. Zickler, D. 1967. Analyse de la méiose du champignon Discomycète *Ascobolus immersus* Pers. *C.R. Acad. Sci.* **265** : 198—201
283. Ziegler, A.W. 1953. Meiosis in the *Saprolegnaceae*. *Am. Jour. Bot.* **40** : 60—65
- a-1. Rai, J.N, A. Saxena and H.J. Chowdhury 1979. Ascus cytology and ascocarp development in *Achaetomiella virescens*. *Cytologia* **44** : 49—57
- a-2. Haskins E.F. 1976. High voltage electron microscopical analysis of chromosomal number in the slime mold. *Echinostelium minutum* de Bary. *Chromosoma* (Berl). **56** : 95—100

※ 알림 : 본학회지 발간비의 일부는 과학기술처의 보조에 의한 것입니다.