

Diversity and Geographic Distribution of Anti-cancer Higher Fungi in Korea

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ABSTRACT

Many higher fungi were collected at Korea from 1976 to 1998. They were identified and surveyed on resources with many reference books. According to the results, fungal fungi were 40 families, 90 genera and 215 species. Among them, anti-cancer resources used in Korea were *Ganoderma lucidum*, *Phellinus linteus*, *Agaricus brazei* and *Cordyceps militaris*. Three species exception *Agaricus brazei* were distributed in Korea. All these are cultivated in Korea.

Key words : Fungal diversity, geographic distribution

INTRODUCTION

Today the number of species of livingthings on earth is approximately 150million species. There are more species which are endangered by environmental pollution and ecology destruction than newly dedcted species. It could bring on the destruction of all species on earth.

So it is very important to build a genetic data base of livingthings. Fungi are decomposers, thesefore aid material flow and give lots of benefits to the ecosystem. At the same time they has a harmful effect.

Fungi have an important role as decomposers in nature. Particularly higher fungi have been used as food, pharmacy and forest resources. Recently fungi have anti-cancer ingredients was proven. So many people are studying it for disease therapy and prevention.

In Korea four species among the fungi are well known as anticancer substances-*Ganoderma lucidum*, *Agaricus blazei*, *Phellinus linteus* and *Cordyceps militaris*.

This research is for the diversity of various anti-cancer mushrooms and pharmacy mushrooms and their geographic disribution.

METHODS AND MATERIALS

1. Research Period : Collected and Identified most in Korean National Park From 1976 to 1998.
2. Identification : At first take a photography in the collecting field, after that, identification through the microscopy and biochemistry experment in Lab.
3. Anti-cancers identification : Pharmacy and anti-cancer fungi were identified by Mao(1992) & Ying(1987).
4. Geographical distribution ; Geographical distri-

bution was done by Imazeki & Hongo, Cho(1998, 1997, 1995a, 1995b, 1994, 1993, 1992), Cho & Kim(1995), Choe et al(1994), Cho & Ryoo(1991), Cho & Park(1990).

RESULTS

1. Diversity of anti-cancer : 40families, 90genera and 215species.
2. Used species in Korea : *Ganoderma lucidum*, *Phellinus linteus*, *Agaricus blazei* and *Cordyceps militaris*.
3. Speccies, Utilization and Geographic Distribution of Higher Fungi

Pleurotaceae

Lentinus edodes(Berk) Sing.

Utiliz. : Drug. Distr. : Korea, South-east Asia and New Zealand.

L. lepideus(Fr.:Fr.)

Utiliz. : Anti-cancer Distr. : Korea(Mt.Jiri, Mt. Kaya) and world

Panus rudis Fr.

Utiliz. : Dnti-cancer. Distr. : Korea(Mt. Songni, Mt.Pangtae) and world

Pleurotus cornucopiae var. *citrinopileatus*(Sing.) Ohira

Utiliz. : Drug. Distr. : Korea(Mt. Songni), Japan and China.

P. spodoleucus(Fr.) Qu'el.

Utiliz. : Anti-cancer. Distr. : Korea and world.

P. ostreatus(Jacq.:Fr.) Qu'el.

Utiliz. : Anti-cancer. Distr. : Korea, Europ and North America.

Schizophylaceae

Schizophyllum commune Fr.

Utiliz. : Anti-cancer and drug. Distr. : Korea and world

Tricholomataceae

Armillariella mella(Aahl.:Fr.) Karst.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt.Palwang, Mt.Moak) and world.

A. tabescens(Fr.) Sing.

Utiliz. : Anti-cancer Distr. : Korea(Mt.Palwang) and North hemisphere.

Clitocybe clavipes(Pers.:Fr.) Kummer

Utiliz. : Anti-cancer Distr. : Korea(Mt.Palwang) and North temperate of Northern hemisphere.

C. fragrans(With.:Fr.) Kummer

Utiliz. : Anti-cancer Distr. : Korea(Mt.Jiri, Mt. Kaya, Mt.Pangtae), North temperate of northern hemisphere.

C. geotropa(Bull.:Fr.) Qu'el

Utiliz. : Anti-cancer Distr. : Korea(Mt.Sundal) and Northern hemisphere.

C. gibba(Pers.:Fr.) Kummer

Utiliz. : Anti-cancer Distr. : Korea(Mt.Odae, Mt. Palwang, Mt.Pangtae, Mt.Kaya, Mt.Songni, Pyonsan Peninsula) and Northern hemisphere.

Flammulina velutipes(Curt.:Fr.) Sing.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt. Soback, Mt.Moak) and Temperate-subfrigid.

Laccaria amethystea(Bull.) Murr.

Utiliz. : Anti-cancer Distr. : Korea(Mt.Songni, Mt. Kaya, Mt.Chiri, Mt.Wolchul, Mt.Pangtae, Mt.Palwang), North temperate of Northern hemisphere.

L. laccata(Scop.:Fr.) Berk. & Br.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt. Jiri, Mt.Soback, Mt.Wolchul, Mt.Pangtae, Mt.Balwang), Japan, China, Mior Asia, Europe, North America, Australia and Africa.

L. proxima(Boud.) Pat.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Wolchul, Mt.Palwang) and Japan.

L. tortilis(Bolt.) S.F.Gray

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt.Kaya, Mt.Songni, Pyonsan Peninsula), Northern hemisphere.

Lampteromyces japonicus(Kawam.) Sing.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Jiri, Kwangneung), Japan and the far east.

Lepista nuda(Bull.:Fr.) Cooke

Utiliz. : Anti-cancer. Distr. : Korea(Mt. Songni) and Northern hemisphere.

Leucopaxillus giganteus(Sow.:Fr.) Sing.

Utiliz. : Anti-cancer. Distr. : Korea, North temperate of Northern hemisphere.

Lyophyllum cinerascens Kont. et Maubl

Utiliz. : Anti-cancer. Distr. : Korea and Japan.
L. semitale(Fr.) Kuhn.
 Utiliz. : Anti-cancer and drug. Distr. : Korea, Japan, China and Eurpoe.
Marasmiellus ramelis(Bull.:Fr.)
 Utiliz. : Anti-cancer. Distr. : Korea(Mt.Jiri, Mt.Soback, Mt.Pangtae, Mt.Palwang) and Europe.
Marasmius androsaceus(L.:Fr.) Fr.
 Utiliz. : Anti-cancer. Distr. : Korea and tropical zone.
M. oreades(Bolt.:Fr.)
 Utiliz. : Anti-cancer. Distr. : Korea(Pyonsanpenisula, Mt.Songni, Mt.Soback, Dadohaehaesang(Kuojiku) National Park) and Northern hemisphere.
Mycena alcalina(Fr.) Kummer
 Utiliz. : Anti-cancer. Distr. : Korea(Mt. Odae, Mt. Soback, Mt.Chiri) and world.
M. galericulata(Scop.:Fr.) S.F.Gray
 Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Dadohaehaesang(Kuojiku) National Park, Mt.Pangtae, Mt. Jiri, Pyonsan Peninsula) and world.
M. haematopoda(Pers.:Fr.) Kummer
 Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt. Wohchul, Mt.Soback) and world
M. pura(Pers.:Fr.) Kummer
 Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt. Wolchul, Mt.Pangtae, Mt.Chiri, Mt. kaya) and world.
Oudemansiella mucida(Schrad.:Fr.) Hohn
 Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt.Kaya), Temperate of Northern hemisphere
O. platyphylla(Fr.) Sing.
 Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Dadohaehaesang(Kumojiku) National Park, Mt.Wolchul, Mt.Pangtae, Mt.Jiri, Mt.Kaya) and North temperate of Northern hemisphere.
O. radicata(Relhen.:Fr.) Qu'el.
 Utiliz. : Anti-cancer and drug. Distr. : Korea(Pyohsan Peninsula) and Northern hemisphere
Phnellus stycticus(Bull.:Fr.) Karst.
 Utiliz. : Anti-cancer and drug. Distr. : Korea and world
P. serotinus(Pers.:Fr.) Kuhn.
 Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt.Odae) and world.
Tricholoma albobrunneum(Pers.:Fr.) Kummer

Utiliz. : Anti-cancer. Distr. : Korea and Temperate of Northern hemisphere
T. album(Schaeff.:Fr.) Qu'el.
 Utiliz. : Anti-cancer. Distr. : Korea and Japan
T. flavovirens(Pers.:Fr.) Lund
 Utiliz. : Anti-cancer. Distr. : Korea and Northern hemisphere
T. matsutake(S.Ito. et Imai) Sing.
 Utiliz. : Anti-cancer, drug. Distr. : Korea(Mt.Pangtae, Mt.Sundal, Mt.Chiri), Japan, Formosa and China.
T. muscarium Kawam.
 Utiliz. : Anti-cancer. Distr. : Korea and Japan
T. robustum(Alb. et Schw.:Fr.) Ricken
 Utiliz. : Anti-cancer. Distr. : Korea, North temperate of Northern hemisphere.
T. ustale(Fr.:Fr.) Kummer
 Utiliz. : Anti-cancer. Distr. : Korea and Temperate of Northern hemisphere
T. vaccinum(Pers.:Fr.) Qu'el.
 Utiliz. : Anti-cancer and drug. Distr. : Korea and North temperate of Northern hemisphere.

Amanitaceae

Amanita agglutinata(Berk. et Curt) Llord
 Utiliz. : Anti-cancer. Distr. : Korea, China, Japan, Russia and North America.
A. hemibapha var. *hemibapha*
 Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt.Jiri, Mt., Dadohaehaesang (Kumojiku) National Park, Mt. Wolchul, Mt.Soback, Mt.Songri, Mt.Pangtae, Mt.Kaya), Japan, China, North America.
A. ceciliae(Berk. & Br.) Bas
 Utiliz. : Anti-cancer and drug. Distr. : Korea and Temperate of Northern hemisphere
A. muscaria(L.:Fr.) Hooker
 Utiliz. : Anti-cancer and drug. Distr. : Korea and North temperate of Northern hemisphere.
A. pantherina(DC.:Fr.) Krombh.
 Utiliz. : Anti-cancer and drug. Distr. : Korea (Dadohaehaesang(Kumojiku) National Park, Pyonsan Peninsula, Mt.Kaya, Mt.Songni), North temperate of Northern hemisphere.
A. phalloides(Fr.) Link
 Utiliz. : Anti-cancer. Distr. : Korea(Mt.Wolchul,

Mt.Kaya), Japan, China, Europe, North America and Africa.

Lapiotaceae

Macrolepiota procera(Scop.:Fr.) Gray

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Moak, Mt. Palwang, Dadohaehaesang (Kumojiku) National Park) and world

Pluteaceae

Volvariella volvacea(Boll.:Fr.) Sing.

Utiliz. : Anti-cancer and drug. Distr. : Korea and Japan.

Agricaceae

Agaricus arvensis Schaeff.:Fr.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt. Palwang, Dadohaehaesang (Kumojiku) National Park, Mt Pangtae, Mt.Chiri, Mt.Kaya) and world

A. bisporus(Lange) Sing.

Utiliz. : Anti-cancer and drug. Distr. : Korea and Temperate of Northern hemisphere.

A. campestris L.:Fr.

Utiliz. : Anti-cancer and drug. Distr. : Korea (Dadohaehaesang(Kumojiku) National Park, Mt.Chiri, Pyonsan Peninsula) and world

A. placomyces Peck

Utiliz. : Anti-cancer. Distr. : Korea, Japan, China and North America.

A. subrufescens Peck

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Kaya) and Japan.

A. subrutilescens(Kauffm.) Hots. et Stuntz

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Balwang, Mt.Jiri, Mt.Soback, Pyonsan Peninsula), Japan and North America.

Coprinaceae

Coprinus atramentarius(Bull.:Fr.) Fr.

Utiliz. : Anti-cancer and drug. Distr. : Korea and world

C. comatus(Muller.:Fr.) Pers.

Utiliz. : Anti-cancer and drug. Distr. : Korea and world

C. friesii Quéf.

Utiliz. : Anti-cancer. Distr. : Korea (Dadohaehaesang(Kumojiku) National Park, Mt.Pangtae, Mt.Soback), Japan, China and Europe.

C. micaceus(Bull.:Fr.) Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Pangtae, Mt.Soback) and world.

C. plicatilis(Curt.:Fr.) Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Pangtae) and Japan.

C. radians(Desm.:Fr.)Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Wolchul) and Northern hemisphere.

Bobitiaceae

Agrocybe cylindracea(DC.:Fr.) Maire

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt. Soback) and world

A. paludosa(Lange) Kuhn. et Romagn.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Pangtae), Japan and North America

A. praecox(Fr.) Fayod

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Pangtae, Mt.Chiri, Pyonsan Peninsula) and world

Strophariaceae

Stropharia rugosoannulata Farlow in Murr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Pangtae), Japan and North America

Naematoloma fasciculare(Hudson:Fr.) Karst.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Balwang, Mt.Jiri, Mt.Moak, Mt.Sundal, Mt.Kaya, Pyonsan Peninsula), and world

N. sublateritium(Fr.) Karst.

Utiliz. : Anti-cancer. Distr. : Korea, North temperate of Northern hemisphere.

Pholiota adiposa(Fr.) Kummer

Utiliz. : Anti-cancer. Distr. : Korea and Japan

P. lubrica(Pers.:Fr.) Sing.

Utiliz. : Anti-cancer. Distr. : Korea and Temperate of Northern hemisphere

P. nameko(T. Ito) S. Ito et Imai

Utiliz. : Anti-cancer and drug. Distr. : Korea, Japan and Formosa

P. spumosa(Fr.) Sing.
Utiliz. : Anti-cancer. Distr. : Korea, Japan, Major Asia, North-South America and Africa.

P. terrestris Overholts
Utiliz. : Anti-cancer. Distr. : Korea, Japan and North America.

Cortinariaceae

Cortinarius bovinus Fr.
Utiliz. : Anti-cancer. Distr. : Korea, Japan, Russia, Europe and North America.

C. collinitus(Sow.:Fr.) Fr.
Utiliz. : Anti-cancer. Distr. : Korea, North temperate of Northern hemisphere

C. elatior Fr.
Utiliz. : Anti-cancer. Distr. : Korea, North temperate of Northern hemisphere

C. hemitrichus(Pers.:Fr.) Fr.
Utiliz. : Anti-cancer. Distr. : Korea, Japan, Russia, Europe and North America

C. salor Fr.
Utiliz. : Anti-cancer. Distr. : Korea(Mt. Kaya), Japan, the far east and Europe.

D. torvus(Fr.:Fr.) Fr.
Utiliz. : Anti-cancer. Distr. : Korea, Temperate of Northern hemisphere

C.vibratilis(Fr.) Fr.
Utiliz. : Anti-cancer. Distr. : Korea, North temperate of Northern hemisphere

Gymnopilus aeruginosus(Peck) Sing.
Utiliz. : Anti-cancer. Distr. : Korea(Mt.Moak, Mt.Mudeng), Japan, China and North America.

G. liquiritiae(Pers.:Fr.) Karst.
Utiliz. : Anti-cancer. Distr. : Korea and world.

G. spectabilis(Fr.) Sing.
Utiliz. : Anti-cancer. Distr. : Korea and world.

Inocybe fastigiata(Schaeff.:Fr.) Quéf.
Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt.Soback, Mt.Chiri, Mt.Kaya) and world

Rozites caperata(Pevs.:Fr.) Karst.
Utiliz. : Anti-cancer. Distr. : Korea, Temperate of Northern hemisphere

Entolomataceae

Rhodophyllus ater Hongo

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Wolchul) Japan and China

R. salmoneus(Peck) Sing.
Utiliz. : Anti-cancer. Distr. : Korea(Mt.Palwang, Mt.Kaya), Japan, China, Russia and North America

R. sinuatus(Bull.:Fr.) Sing.
Utiliz. : Anti-cancer. Distr. : Korea, Japan, China, North America and Europe

Paxillacea

Paxillua involutus(Batsch:Fr.) Fr.
Utiliz. : Anti-cancer. Distr. : Korea, North temperate of Northern hemisphere.

Russulaceae

Lactarius camphoratus Fr.
Utiliz. : Anti-cancer. Distr. : Korea(Mt.Kaya), Japan, the far east, China, Europe and North America

L. hatsudake Tanaka
Utiliz. : Anti-cancer. Distr. : Korea(Mt.Wolchul), Japan, China and Europe

L. piperatus(Scop.:Fr.) S. F. Gray
Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt. Palwang, Mt.Wolchul, Mt.Pangtae, Mt.Kaya), and Northern hemisphere

L. subdulcis(Fr.) S. F. Gray
Utiliz. : Anti-cancer. Distr. : Korea and Japan.

L. subvellerus Peck
Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae), Japan and North America.

L. subzonarius Hongo
Utiliz. : Anti-cancer. Distr. : Korea(Mt.Palwang, Mt. Pangtae) and Japan.

L. vellerus(Fr.) Fr.
Utiliz. : Anti-cancer and drug Distr. : Korea (Dadohaehaesang(Kumojiku) National Park, Mt.Pangtae, Mt. Kaya), North temperate of Northern hemisphere

L. volemus(Fr.) Fr.
Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt. Palwang, Dadohaehaesang (Kumojiku) National Park, Mt.Kaya, Mt.Songni), North temperate of Northern hemisphere.

L. hygrophoroides Berk & Curt.
Utiliz. : Anti-cancer. Distr. : Korea(Mt.Pangtae), Japan,

the Far east, China and North-south America

Russula adusta(Fr.) Fr.

Utiliz. : Anti-cancer. Distr. : Korea and China.

R. alutacea(Pers.) Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Songni), Japan, China, Europe and North America.

R. aurata Fr.

Utiliz. : Anti-cancer. Distr. : Korea and Temperate of Northern hemisphere

R. crustosa Peck

Utiliz. : Anti-cancer. Distr. : Korea, Japan and North America

R. cyanoxantha(Schw.) Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Palwang, Dadohaehaesang(Kumojiku) National Park, Mt.Wopchul, Mt.Pangtae, Mt.Soback, Mt.Chiri, Mt.Kaya, Mt.Songni) and Northern hemisphere

R. delica Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Kaya, Mt.Songni) and North temperate of Northern hemisphere.

R. densifolia(Secr.) Gill.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Palwang) and Northern hemisphere

R. emetica(Shaeff.:Fr.) S.F. Gray

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Dadohaehaesang(Kumojiku) National Park, Mt.Wolchul, Mt.Pangtae, Chiri, Mt.Kaya, Mt.songni, Pyonsan Peninsula, Northern hemisphere

R. foetens(Pers.) Fr.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt.Kaya) and Northern hemisphere

R. integra(L.) Fr.

Utiliz. : Anti-cancer. Distr. : Korea and Japan

R. laurocerasi Melzer

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Dadohaehaesang(Kumojiku) National Park, Mt.Pangtae, Mt.Kaya, Mt.Songni, Pyonsan Peninsula), Japan, Europe, North America.

R. lepida Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Palwang, Mt.Kaya, Mt.Songni), Temperate of Northern hemisphere

R. lilacea Quél

Utiliz. : Anti-cancer. Distr. : Korea, Japan, China and

Europe

R. nigricans(Bull.) Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Wolchul, Mt.Pangtae, Mt.Kaya) and Northern hemisphere

R. pseudodelica Lange

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Songni) and Japan.

R. sanguinea Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Kaya, Pyonsan Peninsula), Temperate of Northern hemisphere

R. senecis Imai

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Dadohaehaesang(Kumojiku) National Park, Mt.Wolchul, Mt.Songni), Japan, China, Russia and New Guinea.

R. sororia Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Wolchul, Mt.Pangtae, Mt.Songni), Japan, Europe, North America and Africa.

R. vesca Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Kaya), Temperate of Northern hemisphere.

R. virescens(Schaeff.) Fr.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt.Mudueng, Mt.Wolchul, Mt.Kaya), Temperate of Northern hemisphere

R. xerampelina(Scer.) Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Palwang, Mt.Kaya, Mt.Songni), Northern hemisphere and Australia.

Strobilomycetaceae

Strobilomyces strobilaceus(Scop.:Fr.) Berk.

Utiliz. : Anti-cancer. Distr. : Korea (Dadohaehaesang(Kumojiku) National Park) and Northern hemisphere

Boletaceae

Boletinus cavipes(Opat.) Kalchbr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Chiri) and subfrigid-temperate of Northern hemisphere.

Boletus reticulatus Schaeff.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt.Palwang, Mt.Wolchul, Mt.Pangtae, Mt.Chiri, Mt.Kaya, Pyonsan Peninsula), Japan, China, Europe and Africa.

B. erythropus Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Kaya, Mt.

Wolchul), Japan and North America.

B. pulverulentus Opat.

Utiliz. : Anti-cancer. Distr. : Korea(Pyonsan Peninsula), Japan, Formosa, Europe, North America, Africa and New Guinea

B. regius Krombh.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Kaya, Mt. Wolchul), Japan, China, North America and Europe.

B. rubellus Krombh.

Utiliz. : Anti-cancer. Distr. : Korea, Japan and North America.

B. speciosus Frost

Utiliz. : Anti-cancer. Distr. : Korea, Japan, China, North America and Europe.

B. violacefuscus Chiu

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Mudeung, Mt.Chiri), Japan and China.

Gyroporus castaneus(Bull.:Fr.) Quél.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Kaya, Mt. Songni, Mt.Pangtae) and world.

Pulveroboletus ravenelii(Berk. et Curt.) Murr.

Utiliz. : Anti-cancer. Distr. : Korea and North America.

Suillus laricinus(Berk.) O.Kuntze

Utiliz. : Anti-cancer. Distr. : Korea, Japan, China, Russia, Europe and North America.

S. bovinus(L.:Fr.) O.Kuntze

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt. Balwang, Dadohaehaesang (Kumojiku) National Park, Mt.Wolchul, Mt.Pangtae, Mt.Songni, Mt.Soback, Mt. Chiri, Mt.Kaya, Pyonsan Peninsula), Europe, Asia and Australia.

S. granulatus(L.:Fr.) O.Kuntze

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt. Balwang, Mt.Wolchul, Mt.Songni), Temperate of Northern hemisphere, Australia and New Zealand.

S. grevillei(Klotzsch) Sing.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt. Odae, Mt.Palwang, Mt.Wolchul, Mt.Chiri), China, Japan, Russia, urope, North America and Australia.

S. luteus(L.:Fr.) S. F. Gray

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Palwang), Temperate of Northern hemisphere, Australia and New Zealand.

Sparassidaceae

Sparassia cripa Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Kaya. Dadohaehaesang(Kumojiku) National Park, Japan, China, Europe and North America.

Stereaceae

Stereum hirsutum(Willd.:Fr.) S.F.Gray

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt.Palwang) and world.

Ranariaceae

Ramaria apiculata(Fr.) Donk

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Soback, Mt.Palwang), Japan, Russia, North America and Europe.

R. aurea(Schaeff.:Fr.) Quél.

Utiliz. : Anti-cancer. Distr. : Korea, Japan, Europe, Northern America, Australia, North temperate of Asia.

R. botrytis(Pers.:Fr.) Ricken

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt. Kaya, Mt.Pangtae), Japan, Europe and North America.

R. flava(Schaeff.:Fr.) Quél

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Kaya, Mt. Pangtae), Japan and Europe.

R. formosa(Pers.:Fr.) Quél

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Soback, Mt.Chiri, Mt.Songni, Mt.Pangtae) and world.

Clavariaceae

Clavaria zollinger Lev.

Utiliz. : Anti-cancer. Distr. : Korea and Japan

Cantharellaceae

Cantharellus cibarius Fr.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt. Worchul, Mt.Moak, Pyonsan Peninsula, Mt.Songni) and world.

C.minor Peck

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt. Balwang, Dadohaehaesang(Kumojiku) National Park, Mt.Wolchul, Mt.Pangtae, Mt.Soback, Mt.Songni, Pyonsan Peninsula), North America and Asia

Hydnaceae

Hericium coralloides(Fr.) S.F.Gray

Utiliz. : Anti-cancer. Distr. : Korea, Japan, Europe and America.

H. erinaceum(Fr.) Pers.

Utiliz. : Anti-cancer and drug. Distr. : Korea, Japan, China, Europe and America.

Sarcodon imbricatus(L.:Fr.) Karst.

Utiliz. : Anti-cancer and drug. Distr. : Korea, Japan, Europe and North America.

Fistulinaceae

Fistulina hepatica(Schaeff.) Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Soback) and world.

Polyporaceae

Bjerkandera adusta(Willd.:Fr.) Karst.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt.Odae, Dadohaehaesang(Kumojiku) National Park, Mt.Pangtae), and world.

Cerrena unicolor(Fr.) Murr.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt. Balwang, Mt.pangtae), Northern hemisphere and Japan.

Coriolus consors(Berk.) Imaz.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.kaya, Mt.Soback, Pyonsan Peninsula), Japan, Asia and Australia.

C. hirsutus(Wulf.:Fr.) Quéf.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt.Chiri, Mt.Pangtae) and world.

C. versicolor(L.:Fr.) Quéf.

Utiliz. : Anti-cancer and drug. Distr. : Korea and world

Cryptoporus volutus(Peck) Shear

Utiliz. : Anti-cancer and drug. Distr. : Korea, Japan, China and North America.

Daedaleopsis tricolor(Bull.:Fr.) Bond. et Sing.

Utiliz. : Anti-cancer Distr. : Korea(Mt.Chiri, Mt. Moak), Europe, North America and Northern temperate of Asia.

Dendropolyporus umbellata(Fr.) Pilat

Utiliz. : Anti-cancer. Distr. : Korea, Europe, Northern America and North temperate of Asia.

Fomes fomentarius(L.:Fr.) Fr.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt. Balwang, Dadohaehaesang Kumojiku) National Park, Mt.Pangtae, Mt. Chiri), Japan, Europe, North America and Asia.

Fomitella fraxinea(Fr.) Imaz.

Utiliz. : Anti-cancer. Distr. : Korea, Japan, Asia, Europe and North America.

Fomitopsis rosea(A. et S.:Fr.) Karst.

Utiliz. : Anti-cancer, drug Distr. : Korea(Mt.pangtae), Japan, Asia, Europe and North America.

F. pinicola(Swartz.:Fr.) Karst.

Utiliz. : Anti-cancer. Distr. : Korea, North temperate of Asia.

Geleophyllum saepiarium(Wulf.:Fr.) Karst.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt. Odae, Mt.Wolchul, Mt.Songni) and North temperate of Asia.

G. subferrugineum(Berk.) Bond et Sing.

Utiliz. : Anti-cancer. Distr. : Korea and North temperate of Asia.

Grifola frondosa(Dick.:Fr.) S.F.Gray

Utiliz. : Anti-cancer. Distr. : Korea and North temperate of Asia.

Inonotus tabacinus(Mont.) Karst.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Kaya), Asia and North America.

Lenzites betulina(L.:Fr.) Fr.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt.Odae, Mt.Balwang, Mt.Jiri, Dadohaehaesang(Kumojiku) National Park, Mt.Pangtae, Mt.Songni, Pyonsan Peninsula) and world.

Oligoporus tephroleucus(Fr.) Gilb. et Ryv.

Utiliz. : Anti-cancer. Distr. : Korea and world.

Polyporus alveolarius(DC.:Fr.) Bond. et Sing.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Palwang, Mt.Pangtae, Mt.Soback, Pyonsan Peninsula) and world.

P. arcularius(DC.:Fr.) Bond. et Sing.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Palwang, Mt.Pangtae, Mt.Chiri) and world.

Piptoporus betulinus(Bull.:Fr.) Karst.

Utiliz. : Anti-cancer and drug. Distr. : Korea, North temperate of Asia.

Poria cocos(Fr.) Wolf.

Utiliz. : Anti-cancer and drug. Distr. : Korea, Japan

Trametes gibbosa(Pers.:Fr.) Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Pangtae), Japan, Temperate of Northern hemisphere.

Trichaputum obietinum(Fr.) Ryb.

Utiliz. : Anti-cancer and drug Distr. : Korea(Mt.Odae, Mt.Wolchul, Mt.Pangtae, Mt.Soback, Mt.Kaya) and Japan.

T. fusco-violaceus(Fr.) Ryv.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Balwang, Dadohaehaasang(Kumojiku) National Park, Mt.Kaya, Pyonsan Peninsula) and Japan.

Hymenochaetaceae

Phellinus igniarius(L.:Fr.) Quél.

Utiliz. : Anti-cancer and drug. Distr. : Korea and North temperate of Northern hemisphere.

P. pini(Fr.) Murr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Backdu, Mt.Palwang), North temperate of Northern hemisphere.

P. linteus(Berk. et Curt.) Teng

Utiliz. : Anti-cancer. Distr. : Korea, Japan, North America, Philippine and Australia.

P. robustus(Karst.) Bond. et Sing.

Utiliz. : Anti-cancer and drug. Distr. : Korea, North temperate of Northern hemisphere.

P. gilvus(Schw.) Pat.

Utiliz. : Anti-cancer. Distr. : Korea and world.

Phaeolus schweinitzii(Fr.) Pat.

Utiliz. : Anti-cancer. Distr. : Korea, North temperate of Northern hemisphere.

Ganodermataceae

Ganoderma lucidum(Leyss.:Fr.) Karst.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt. Wolchul, Pyonsan Peninsula, Mt.Pangtae, Mt.Kaya, Mt.Songni) and world.

G. tsugae Murr.

Utiliz. : Anti-cancer and drug. Distr. : Korea and Japan.

Elfving applanata(Pers.) Karst.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt. Palwang, Mt.Pangtae, Pyonsan Peninsula) and world.

Meruliaceae

Merulius tremellosus Fr.

Utiliz. : Anti-cancer. Distr. : Korea, Japan and Northern hemisphere.

Auriculariaceae

Auricularia auricula(Hook.) Underw.

Utiliz. : Anti-cancer and drug. Distr. : Korea (Dadohaehaasang(Kumojiku) National Park), Mt.Pangtae, Mt. Chiri, Mt.Songni, Pyonsan Peninsula), Japan, China, North America and Europe.

A. mesenterica(Dick.) Pers.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt.Odae) and world.

A. polytricha(Mont.) Sacc.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt. Songni), Japan, Asia, north-south America and Australia.

Tremellaceae

Tremella foliacea Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Pangtae, Mt.Songni) and world.

T. fuciformis Berk.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt. Pangtae), Japan, China, India, Indonesia, Australia, North-south America.

Phallaceae

Dictyophora indusiata(Vent.:Pers.) Fischer

Utiliz. : Anti-cancer and drug. Distr. : Korea and Japan.

Phallus impudicus L.:Pers.

Utiliz. : Anti-cancer and drug. Distr. : Korea and world.

Clathraceae

Lysurus mokusin(L.:Pers.) Fr.

Utiliz. : Anti-cancer and drug. Distr. : Korea, Japan, China, Australia and North America.

Lycoperdaceae

Calvatia craniiformis(Schw.) Fr.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Kyay, Mt. Wolchul) and world.

Lycoperdon perlatum Pers.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt. Palwang Dadohaehaesang (Kumojiku) National Park, Mt.Pangtae, Mt.Chiri, Mt.Songni) and world.

L. pusillum Batsch:Pers.

Utiliz. : Anti-cancer. Distr. : Korea and world.

L. pyriforme Schaeff.:Pers.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt. Palwang, Mt.Pangtae, Mt.Kaya, Mt.Songni) and world.

L. umbrinum Pers.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Chiri, Pyonsan Peninsula) and world.

Astraeaceae

Astraeus hygrometricus(Pers.) Morgan

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt. Palwang, Dadohaehaesang (Kumojiku) National Park, Mt.Pangtae, Mt.Soback, Mt.Kaya, Mt.Songni, Pyonsan Peninsula) and world.

Geastraceae

Geastrum fimbriatum(Fr.) Fisch.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt.Songni), Japan, Europe, North America and Australia.

G. triplex(Juhgh.) Fisch.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Pangtae, Mt.Chiri, Pyonsan Peninsula) and world.

Sclerodermataceae

Scleroderma bovista Fr.

Utiliz. : Anti-cancer. Distr. : Korea and world.

S. cepa Pers.

Utiliz. : Anti-cancer. Distr. : Korea, Japan, Europe and North America

S. citrinum Pers.

Utiliz. : Anti-cancer and drug. Distr. : Korea(Mt.Kaya, Mt.Pangtae) and world.

S. verrucosum Pers.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Wolchul, Mt.Songni) and world.

Pisolithus tinctorius(Pers.) Coker et Couch

Utiliz. : Anti-cancer. Distr. : Korea and world.

Calostomataceae

Calostoma japonicum P.Henn.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Chiri, Mt.Sonun) and Japan.

Nidulariaceae

Cyathus stercoreus(Schw.) de Toni

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Dadohaehaesang(Kumojiku) National Park and world.

C. striatus Willd.:Pers.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt.Pangtae, Mt.Soback, Mt.Songni), Japan, Northern hemisphere, Africa and North America.

Clavicipitaceae

Cordyceps militaris(Vuill.) Fr.

Utiliz. : Anti-cancer, drug. Distr. : Korea(Mt.Odae, Mt.Naejand, Mt.Wolchul, Mt.Soback, Mt.Chiri, Mt.Songni, Mt.Kaya) and world.

C. sobolifera(Hill) Berk. et Br.

Utiliz. : Anti-cancer. Distr. : Korea, Japan and Europe.

Xylariaceae

Xylaria polymorpha(Pers.) Grev.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Odae, Mt.Kaya, Mt.Pangtae) and world.

Morchellaceae

Morchella crassipes(Vent.) Pers.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Chiri), Japan, Europe and North America.

M. esculenta(L.:Fr.) Pers.

Utiliz. : Anti-cancer. Distr. : Korea(Mt.Chiri), Japan and Europe.

DISCUSSION

In Korea the diversity of anti-cancer fungi and pharmacy fungi was registered 40 families, 90 genera and 215 species. But these data were cited from Chiense document. In China, various fungi are actually used as anti-cancer mushroom and pharmacy mushrooms. In contract, only a few fungi are used as anticancer

mushroom such as *Ganoderma lucidum*, *Agaricus blazei*, *Phellinus linteus* and *Cordyceps militaris* in Korea.

Korea does not start usually fungi research until the effect of anti-cancer fungi has already been proven by foreign country.

In China only *Cordyceps sinensis* among *Cordyceps spp.* was developed from larva of *Endoclyta excrescens* to be which grows in high altitude areas 400-5000m was known to be a effective as an anti-cancer mushrooms. Anything else has not been effected. But *Cordyceps militaris* instead of *Cordyceps sinensis* which exist in Korea is known as anti-cancer mushrooms but there is not sufficient proof.

So it is necessary to study its effect through experimentation. For example, *Cordyceps* ingredients are Cordycepin, peroxide, ergosterol and polysachharide, but little research has proven theirs effectiveness and specific function as an anti-cancer substance. Fungi as anticancer substances seems to take action by enhancing immunity iderctly.

All anti-cancer mushrooms are distributed all over the world, but *Lampteromyces japonicus* is only distributed Korea, China and Japan. Also it is found only in Mt.Chiri and Kwangneung in Korea.

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