The *Penicillium* from Wuchang, Central China*

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This paper reports thirty nine species and strains of *Penicillium* collected from Wuchang, Central China. Of thesè, three species and one variety are presumed to be new to science. The culture medium used was CZAPEK's solution agar unless otherwise stated. This work was started under Professor H. H. CHUNG of the Botanical Department of National Wu-Han University, China, and accomplished under Professor J. HANZAWA of the Laboratory of Applied Mycology, Hokkaido Imperial University, Japan. To them the writer wishes to express his hearty gratitude for their kind suggestions and valuable criticisms throughout the work. He is also greatly indebted to Dr. CHARLES THOM of the U. S. Department of Agriculture, Washington D. C. for his great kindness in identifying most of the species.

Enumeration of the Species

1. ***P. sinicum*** SHIH sp. nov. Coloniis albis, dein valde obscure viridibus et demum fuscis, floccosis, dispergentibus, minute guttulosis, rugosis, margine angusta; reverso incolorato, dein profunde violaceo et demum fulvo-fusco; in agaro Koji hyphis abundantibus, sterilibus, at parcis conidiis; conidiophoris 40–260×3–3.5μ, singulatim orientibus aut raro ex repentibus hyphis ramificantibus, plerumque ramosis, septatis, in maturitate leviter asperibus; penicillus 15–35μ longus, monoverticillatus, interdum biverticillatus, catenis conidiorum columnas compactas formantibus, usque ad 160μ longas; pseudobasidiis crebris, leviter viridibus, 7–10×1.8–2.5μ; conidiis leviter viridibus, levibus, globosis, 2.5–3.6μ diam.

Remarks: According to CHARLES THOM's classification, this species will be a member of the *Monoverticillata-Ramigena* section but it has simpler branching

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system. In some respects it is related to ***P. Sartoryi*** THOM from which it is characterized by its branching system, i. e. without secondary branches, conidiophores rough and without vesicular apex, and reverse of colonies colored violet.

Hab. On Chinese ink.

2. ***P.*** (***Citromyces***) ***bruntzii*** SARTORY. Compt. rend. soc. biol. Paris 76: pp. 605–606, (1914).

Remarks: This species contains two strains; see the following key.

Hab. Strain I from air culture; strain II on salted pork.

3. ***P. wuchangense*** SHIH sp. nov. Coloniis per omne incrementum albis aut interdum in partibus minutis leviter lividis, vero in agaro Koji leviter aeruginoso-viridibus, dein obscure glaucis, floccosis, non guttulosis, tarde at late vigentibus, rugosis, gelatina liquescente; reverso incolorato, dein leviter luteo; conidiophoris 20–520×2–2.5μ, ex repentibus hyphis orientibus, raro ramosis, aseptatis, levibus, penicillum in termino portantibus; penicillus monoverticillatus, conidiorum catenas declinantes portans; pseudobasidiis in apicem acutum terminantibus, laxis, 2–4 pseudobasidiis verticillum formantibus, 5–7× 1.5–2μ; conidiis levibus, achrois, globosis, 2.5–3.5μ diam.

Remarks: The present species is related to ***P. restrictum*** GILMAN and ABBOTT but it differs from the latter in its white colonies and smooth conidia.

Hab. On a cake.

4. ***P. chermesinum*** BIOURGE. Monogr. La Cellule 33: fasc. 1, pp. 284–285; Col. Pl. X, Cart. 114; Pl. XVI, fig. 95, (1923).

Hab. On waste paper.

5. ***P. fellutanum*** BIOURGE. Monogr. La Cellule 33: fasc. 1, pp. 262–264; Col. Pl. XIII, Cart. 177; Pl. XXIII, fig. 133, (1923); MARIE, B. M., Mycologia XXIV, 4, pp. 298–401, (1932); MACY, H. & STEELE, G. H., Journ. Dairy Sci. XVII, 5, pp. 397–407, (1934).

Hab. On dead leaves.

6. ***P. frequentans*** WESTLING. Arkiv. för Botanik 11, pp. 58, 133–134, figs. 39, 78, (1911); WAKSMAN, S. A., Soil Sci. II, 2, pp. 103–148, (1916); in BIOURGE Monogr. La Cellule 33: fasc. 1, pp. 292–293; Col. Pl. X, Cart. 127; Pl. XVII, fig. 99, (1923).

Hab. On leather.

7. ***P. implicatum*** BIOURGE. Monogr. La Cellule 33: fasc. 1, pp. 278–280; Col. Pl. IX, Cart. 76; Pl. XIV, fig. 82, (1923).

Hab. From air.

8. ***P. aurantio-violaceum*** BIOURGE. Monogr. La Cellule 33: fasc. 1, pp. 282–284; Col. X, Cart. 33; Pl. XVI, fig. 94, (1923).

Hab. On feather.

9. ***P. aurantio-brunneum*** DIERCKX. Soc. Scientif. Bruxelles 25: p. 86, (1901); BIOURGE, La Cellule 33: fasc. 1, pp. 309–311; Col. Pl. IX, Cart. 145; Pl. XV, fig. 85, (1923).

Hab. On leather shoes.

10. ***P. sublateritium*** BIOURGE. Monogr. La Cellule 33: fasc. 1, pp. 315–317; Col. Pl. X, Cart. 57; Pl. XVI, fig. 92, (1923).

Hab. On leather.

11. ***P. flavi-dorsum*** BIOURGE. Monogr. La Cellule 33: fasc. 1, pp. 290–291; Col. Pl. VIII, Cart. 87; Pl. XIII, fig. 73, (1923).

Hab. From air.

12. ***P. oxalicum*** CURRIE and THOM. Journ. Biol. Chem. XXII, 2, p. 289, fig. 1, (1915); WAKSMAN, S. A., Soil Sci. II, 2, pp. 103–148, (1916); DALVI, P. D., Journ. Indian Inst. Sci. XIII, A, 15, pp. 173–192, (1930); HARISON, J. W., Iowa State Coll. Journ. of Sci. IX, 1, pp. 37–60, 1 fig., 14 graphs, (1934); COEHLER, B., Abs. in Phytopath., XXV, 1, p. 24, (1935).

Hab. On bamboo shoot.

13. ***P. steckii*** ZALESKI. In Bul. Acad. Polonaise Sci.: Math. et Nat. Ser. B, pp. 469–471, taf. 50; ZALESKI No. 1631b (1927).

Hab. On leather.

14. ***P. citrinum*** THOM. Emended from U. S. Dept. Agric. Bur. Anim. Ind. Bul. 118, pp. 61–63, fig. 22, (1910); LECLERG, E. L., Mycologia, 22, (4): pp. 186–210, (1930), and Phytopath. XXI, 11, pp. 1073–1081, (1931); PASSMORE, S. R., Bull. Imper. Inst. XXX, 3, pp. 296–205, (1932).

Hab. On a fungus belonging to the *Basidiomycetes*.

15. ***P. chlorophaeum*** BIOURGE. Monogr. La Cellule 33: fasc. 1, pp. 271–273; Col. Pl. VIII, Cart. 39; Pl. XIII, fig. 78, (1923).

Remarks: This species contains two strains; see the following key.

Hab. Strain I on rice; strain II on pear.

16. ***P. notatum*** WESTLING. Arhiv för Botanik 11: 55, pp. 95–97; figs. 17, 59, (1911); WAKSMAN, S. A., Soil Sci. II, 2, pp. 103–148, (1916); BIOURGE Monogr. La Cellule 33: fasc. 1, pp. 179–181; Col. Pl. IV, Cart. 19; Pl. VIII, fig. 37, (1923); CIFERRI, R., Journ. Dept. Agric. Puero Rico, XV, 3, pp. 223–286, 1 Pl., 1 diag., (1931); KOEHLER, B., DUNGAN, G. H., & BURLISON, W. L., Journ. Amer. Soc. Agron., XXVI, 4, pp. 262–274, 3 graphs, (1934).

Remarks: This species contains two strains; see the following key.

Hab. Strain I on bread; strain II on rubber.

17. ***P. puberulum*** BAINIER. Bul. Soc. Mycol. France 23: pp. 16–17; Pl. IV, figs. 6–12, (1907); MORGAN, G. E. V., Journ. Dairy Res. IV, 2, pp. 226–237, 2 figs., (1933); GEORGE, D. PUEHLE, Phytopath. XXI, 10, p. 1139, (1931).

Hab. From air.

18. ***P. roqueforti*** THOM. U. S. Dept. Agr. Bur. Anim. Ind. Bull. 82, pp. 35–36, fig. 2, (1906); Also idem Bull. 118, p. 34, fig. 4, (1910); BUCHANAN, R. E., Mycologia 2, pp. 99–108, (1910); WAKSMAN, S. A., Soil Sci. II, 2, pp. 103–148, (1916); VERNON, T. R., New Zealand Journ. of Sci. & Techn., XV, 4, pp. 237–247, 5 figs. (1934); HANZAWA, J. and YOSHIMURA, S., Journ. of Sapporo Soc. of Agric. & Fores. Year XXVII, No. 125, pp. 1–18, 1 Pl., (1935).

Probable synonyms: ***P. aromaticum*** SOPP, ***P. vesiculosum*** BAINIER, ***P. glaucum*** in the French cheese literature (see DUCLAUX, pp. 694, MAZÉ, ROGER).

Hab. On dead twig.

19. ***P. corymbiferum*** WESTLING. Arkiv. för Botanik 11, pp. 56, 92–95, figs. 16, 58, (1911); VAN BEIJMA, THOE KINGMA F. H., "Willie Commelin Schoten", Baaru, XII, pp. 28–30, (1928); WEBER, A., Reprinted from Aarbog. for Gartneri (1931), 19 pp. 7 figs. (1932); CHARMRWAY, A. K., Trans. Brit. Mycol. Soc. XVIII, 3, pp. 249–252, 1 graph, (1933).

Hab. On paste.

20. ***P. divergens*** BAINIER and SARTORY. Bul. Soc. Mycol. France 28, pp. 270–276, Pl. XIII, figs. 3–6, (1912).

Hab. From air.

21. ***P. viridicatum*** WESTLING. Arkiv. för Botanik 11: 53, pp. 88–90, figs. 14, 56, (1911); DALE, E., Annal. Mycol. Vol. 12, pp. 33–62, (1914); WAKSMAN, S. A., Soil Sic. II, 2, pp. 130–148, (1916); LECLERG, E. L., Mycologia XXII, 4, pp. 186–210, (1930); DALE, E., Phytopath., XXI, 10, pp. 1142, (1931).

Hab. On orange.

22. ***P. johannioli*** ZAL. In Bul. Acad. Polonaise Sci.: Math. et Nat. Ser. B, pp. 453–454, taf. 40; ZALESKI No. 402, (1927); KENNELLEY, VIOTET, C. E., & GRIMES, M., Scient. Proc. Roy. Dublin Soc. N. S. XIX, 40–47, pp. 549–569, 2 Pl., (1930).

Hab. On paste.

23. ***P. martensii*** BIOURGE. Monogr. La Cellule 33: fasc. 1, pp. 152–154; Col. Pl. II, Cart. 118, Pl. III, fig. 14, (1923); GEORGE, D. DUEHLE., Phytopath., XXI, 10, pp. 1142, (1931).

Hab. From air.

24. ***P. crustosum*** THOM. The *Penicillia*, p. 399, (1930).

Hab. On rice.

25. ***P. elongatum*** DIERCKX. Soc. Scient. Bruxelles, 25: 87, (1901); Synonym: (?) ***P. leucopus*** (PERS.), BIOURGE fide BIOURGE.

Hab. On dog dung.

26. ***P. italicum*** WEHMER. In Hedwigia 33: pp. 211–214, (1894); see also Beitr. z. Kennt. Einh., Pilze II, 1, pp. 68–72, Taf. I, figs. 1–3, Taf. II, figs. 1–10, Jena, (1895); WEIDEMANN, C., Centralbl. f. Bakt. XIX, pp. 755 u. 769, fig. a, (1907); WAKSMAN, S. A., Soil Sci. II, 2, pp. 103–148, (1916); SCHWARTZ, W., Centralbl. f. Bakt. LXX, p. 463, (1927); KLOTZ, L. J., Abs. in Phytopath., XIX, pp. 1144, (1929); BARKER, J., Dept. Sci. & Indus. Res., Food Invest. Board, Special Rept. 38, VI, p. 62, 9 Pl., 5 graphs, (1930); HAHNE, B., S. Africa Dept. of Agric. Bull. 98, p. 20, (1931); GIOELLI, F., Riv. Pat. Veg. XXII, 7–8, pp. 195–200, 3 figs. (1932); SAVASTANO, G., Boll. R. Staz. Pat. Veg., N. S. XII, 3, pp. 306–340, 7 Pl., 2 graphs, (1932); FRIEND, W. H., & BACH, W. J., Texas Agric. Exper. Stat. Bull. 446, P. 40, 4 figs., (1932); MÜLLER, A. S., Pytopath., XXIII, 9, pp. 734–737, (1933); BARGER, W. R., California Citrograph, XVIII, 9, pp. 240–256, 3 graphs, (1933); CIFERRI, R., & BALDACCI, E., Atti Inst. Bot. R. Univ. di Parvia, Ser. IV, 4, pp. 204–280, 27 figs., (1933); HAUSSMANN, G., Ann. Sper. Agric. XV, pp. 104–116, 5 Pl., (1934).

Hab. On orange.

27. ***P. patulum*** BAINIER. Bull. Soc. Mycol. France, 22 (fasc. 3): p. 208, Pl. XI, figs. 14–17; also ibid. 23; Pl. V, figs. 10–16, (1907).

Hab. On soy bean milk.

28. ***P. ventruosum*** WESTLING. Arktiv. för Botanik 11, pp. 57, 112–114, figs. 26, 67, (1911).

Hab. On bread.

29. ***P. purpurogenum*** STOLL. Beitr. a. Morph. u. Biol. Char. Penicill. Wurzburg, p. 32, t. I, fig. 6, t. III, fig. 2, (1904); THOM, C., U. S. Dept. Agric. Bur. Anim. Ind. Bul. 118, p. 36, fig. 5, (1910); and Mycologia VII, 3, pp. 134–142, (1915); LECLERG, E. L., Mycologia XXII, 4, pp. 186–210, (1930); DURRELL, L. W., Bull. Torrey Bot. Club, LVII, 4, pp. 233–237, (1930).

Hab. On decaying wood.

30. ***P. crateriforme*** GILMAN and ABBOTT. Iowa State Coll. Journ. Sci. 1: No. 3, p. 293, fig. 28, (1927).

Remarks: This species comprises two strains; see the following key.

Hab. Strain I on paraffin; strain II on fruit of Litchi.

31. ***P. luteum*** ZUKAL. Sitzber. K. Akad. Wiss. (Vienna) Math. Naturw. Kl. 98: p. 521, (1888); WEHMER, C., Ber. Deut. Bot. Gesellsch. 2: pp. 499–516, Taf. 25, (1893); THOM, C., U. S. Dept. Agric. Bur. Anim. Ind. Bul. 118: p. 39, (1910); BIOURGE Monogr. pp. 231–235; DERX, H. G., Bul. Soc. Mycol. France 41: pp. 375–381, (1925).

Remarks: This species comprises three strains; see the following key.

Hab. Strain I on walnut; strain II on rice; strain III from air culture.

32. ***P. rugulosum*** var. ***levis*** SHIH var. nov. Precipue conidiis levibus a typo differens.

Remarks: The present variety has the morphology of ***P. rugulosum*** THOM but with smooth conidia.

Hab. On a woody wall of an old house.

33. ***P. Hanzawanum*** SHIH sp. nov. Coloniis primum albis et sine fructibus in triduum, dein profundè aeruginoso-viridibus, tum valde canis olivaceis, et demum obscure canis olivaceis, floccosis, conidiis parcis, margine sterili angusta, hyphis aeriis sterilibus, tarde vigentibus, rugosis, non guttulosis; reverso primum incolorato, dein leviter fusco, agaro achroo; gelatina leviter liquescente; coloniis in agaro Koji obscure viridibus, abundanter magnas guttas oleaceas et glutinosas exsudantibus; conidiophoris 40–200×3–3.5μ, ex repentibus orientibus, interdum ramosis, septatis, parce verrucosis, penicillum in termino portantibus; penicillus aequaliter biverticillatus, 25–38μ longus; basidiis compactis, 2–5 verticillum formantibus, 8–15×3μ; pseudobasidiis crebris, 9–15×2–2.5μ; conidiis in catenis parallelis stantibus, leviter flavo-viridibus, ellipticis, levibus, 3.2–5×2.5–3.8μ.

Remarks: Dr. CHARLES THOM identified this species as an undescribed

species of the *Biverticillate* series. It is related to ***P. tardum*** THOM from which it is characterized by its larger conidia and far shorter conidiophores, especially its floccose colonies and oil-like drops in Koji agar.

Hab. From air culture.

Key to the Species of *Pencillium* in Wuchang, Central China

I. Penicillus typically monoverticillate, consisting of one series of sterigmata either borne upon simple conidiophore or its branches ..... ***Monoverticillate division.***

A. Colonies floccose, with more or less extensive development of aerial mycelium as simple hyphae, not ropy or fascicled ..... ***Stricta floccosa.***

B. Conidial areas some shades of green or blue green during the growing period; conidia globose or subglobose, less than 4.5μ in diameter.

C. Conidiophores rough when mature, with more or less dichotomous branches; reverse violet to brownish; conidia 1.8 to 3μ in diameter.. ..... ***P. sinicum*** SHIH sp. nov.

CC. Conidiophores smooth, not branching; reverse rose; conidia 3 to 3.5μ in diameter ..... ***P. (Citromyces) bruntzii*** SARTORY.

a. Colonies with a thin layer of aerial hyphae in Koji agar .... *Strain I.*

aa. Colonies without aerial hyphae in Koji agar ..... *Strain II.*

BB. Conidial areas white throughout development or occasionally partly bluish but blue green in Koji agar; conidiophores 20 to 520μ long; conidia globose or rarely elliptical, 2.5 to 3.5μ in long axis..... ..... ***P. wuchangense*** SHIH sp. nov.

AA. Colonies not floccose.

D. Colonies with part of the aerial hyphae as ropes or funiculose masses or networks of trailing or ascending hyphae .... ***Stricta Funiculosa.***

E. Ropiness or funiculose condition well marked as the colonies are examined under the microscope; colonies closely felt, greenish white; reverse sordid orange, red to almost blackish; conidia elliptical, 2.5 to 4 by 2 to 2.5μ ..... ***P. chermesinum*** BIOURGE.

EE. Ropiness reduced to trailing and more or less fascicled hyphae in colonies velvety or nearly so in appearance; colonies bluish to yellowish green to drab; reverse yellowish, greenish, to deep blackish green; conidia globose or oval, 2.5 to 3.5μ in long axis .... ***P. fellutanum*** BIOURGE.

DD. Colonies velvety in appearance.

F. Colonies with trailing hyphae and more or less ropy as seen under

the microscope; conidiophores arising from creeping hyphae, with apex swollen to about twice the diameter of the stalk .... ***P. frequentans*** WESTLING.

FF. Colonies velvety; conidiophores arising from submerged mycelium.

G. Conidia elliptical.

H. Colonies dull bluish green, overgrowth of long hyphae; agar brown red; conidia 2 to 3.5 by 1.8 to 2.8μ .... ***P. implicatum*** BIOURGE.

HH. Colonies deep bluish glaucous to wood brown, with or without small tuft of aerial hyphae; reverse and agar ochraceous-salmon to brown; conidia 2.5 to 4.2 by 4 to 6μ .... ***P. aurantio-violaceum*** BIOURGE.

GG. Conidia globose or subglobose.

I. Conidia smooth.

J. Colonies 100 to 200μ deep, blue green to olive green; reverse orange brown; conidia globose, 3 to 4μ in diameter .... ***P. aurantio-brunneum*** DIERCKX.

JJ. Colonies about 300μ deep, gray green; reverse yellowish brown to brick red; conidia ovoid or subglobose, 2.8 to 3.2μ in long axis ..... ***P. sublateritium*** BIUORGE.

II. Conidia faintly echinulate, 3 to 3.5μ in diameter; colonies blue green to gray green; reverse yellow to reddish brown .... ***P. flavi-dorsum*** BIOURGE.

II. Penicillus consisting of two or more series of sterigmata and metulae, with the branching system typically lopsided or asymmetrical .... ***Asymmetrica division.***

A. Colonies velvety, at times showing a basal network of aerial hyphae, but maintaining the general velvety appearance ..... ***Velutina section.***

B. Conidia more than 4.5μ in long axis; colonies dark green; conidia in deep mass breaking off easily, elliptical and large, 3.5 to 6.8 by 2.3 to 3μ ..... ***P. oxalicum*** THOM and CURRIE.

BB. Conidia less than 4.5μ in long axis.

C. Penicilli with metulae divaricate, producing verticils of conidia approximating separate monoverticillate penicilli.

D. Colonies broadly but indistinctly zonate, thinner toward margin, grayish blue green; reverse yellow; conidia 2 to 2.5μ in diameter ..... ***P. steckii*** ZALESKI.

DD. Colonies narrowly growing, thin, not zonate, dull blue green; reverse yellow to dark red; conidia 2.4 to 3.5μ in diameter..... ..... ***P. citrinum*** THOM.

CC. Penicilli more compact in the characteristic form of a brush or broom.

E. Conidiophores mostly ascending rather than erect; penicilli characterized by terminal verticils of metulae more or less closely aggregated and each subtended by one or more distant secondary penicilli often monoverticillate ..... ***Radiata***.

F. Colonies thick, up to 600μ; reverse yellow to brown; conidia subglobose, 3.6 to 4.2 by 3 to 4μ ..... ***P. chlorophaeum*** BIOURGE.

a. Colonies slowly becoming grayish green, with large yellow drops ..... *Strain I.*

aa. Colonies quickly becoming gray, drops colorless .. *Strain II.*

FF. Colonies thinly and closely textured, about 200μ deep; reverse deep yellow; conidia globose, 2.6 to 3.2μ in diameter..... ***P. notatum*** WESTLING.

a. Colonies grayish green in age; aerial hyphae abundant in Koji agar ..... *Strain I.*

aa. Colonies showing blackish in age; aerial hyphae very scanty in Koji agar ..... *Strain II.*

EE. Conidiophores more erect; penicilli more completely aggregated into a morphological unit.

G. Colonies narrowly growing; reverse and agar deep red; conidiophores 100 to 200μ long; conidia 4 to 4.2μ in diameter.. ..... ***P. puberulum*** BAINIER.

GG. Colonies spreading broadly; reverse and agar yellow to greenish; conidiophores about 100μ long; conidia 4 to 5μ in diameter ..... ***P. roqueforti*** THOM.

AA. Colonies with part or all of the conidiophores combined into fascicles or coremia which are erect or ascending ..... ***Fasciculata section***.

II. Colonies with most or all of the conidiophores in fascicles or in definite coremia.—Fascicles small and with simple conidiophores among them ..... ***Subsection coremiella***.

I. Colonies blue green to olive gray; reverse deep orange to brown; conidia globose or subglobose, 3 to 4μ in long axis. ..... ***P. corymbiferum*** WESTLING.

II. Colonies bluish green to blackish; reverse red; conidia oval or subglobose, 3 to 4.5μ in long axis ..... ***P. divergens*** BAINIER.

III. Colonies with simple conidiophores and fascicles closely mixed, but with simple conidiophores predominating.

J. Colonies in bright green or yellowish green shades (***Subsection***

viridicatum); reverse yellowish to brownish; conidia globose or subglobose, 3 to 4.5μ in long axis ..... ***P. viridicatum*** WESTLING.

JJ. Colonies in blue green, dull to dark gray green or glaucous shades.

K. Colonies in blue green shades ..... ***Subsection aeruginosa.***

L. Colonies with narrow crowded zones; reverse quickly colored brown red; conidia oval or globose, 3 to 4.5μ in long axis.... ..... ***P. johannioli*** ZALESKI.

LL. Colonies with broad zones; reverse yellow to maroon; conidia mostly elliptical, 3.5 to 4 by 2.4 to 3μ .... ***P. martensii*** BIOURGE.

KK. Colonies in dull to dark gray green or glaucous shades .... ***Subsection glauca.***

M. Zonation indistinct or reduced to ridges in the conidial mass; fascicles seen only at margin; conidial chains forming continuous crusts over the surface of mycelium .... ***P. crustosum*** THOM.

MM. Zonation usually evident and broad, especially in outer areas of colonies.

N. Conidia 2.8 to 3.5μ in long axis.

O. Sclerotia and perithecia not described; colonies green to brown; conidia mostly oval .... ***P. elongatum*** DIERCKX.

OO. Sclerotia and perithecia described but not often uncountered; colonies bluish green to gray; conidia cylindrical to elliptical ..... ***P. italicum*** WEHMER.

NN. Conidia 4 to 4.5μ in long axis.

P. Colonies with narrow white margin; growth restricted; reverse red to red brown ..... ***P. patulum*** BAINIER.

PP. Colonies with broad white margin; growth spreading; reverse uncolored to clear brown .... ***P. ventruosum*** WESTLING.

III. Penicillus typically consisting of one symmetrical verticil of metulae, bearing symmetrical verticils of sterigmata lanceolate or acuminate at apex ..... ***Biverticillata-Symmetrica division.***

A. Colonies showing green conidial areas on a mycelium usually showing yellow shades, sometimes red in age.—Ropiness reduced to inconspicuous amounts or absent.—Colonies more or less bordered, mixed with or overgrowth by yellow to orange hyphae; reverse yellow, orange or red.

B. Reverse quickly and intensely red.

C. Colonies tending toward floccose, with thick overgrowth of cottony

sterile hyphae; conidiophores up to 300μ long; reverse quickly becoming deep red ..... ***P. purpurogenum*** STOLL.

cc. Colonies velvety in appearance, aerial hyphae scanty and closely mixed; conidiophores up to 150μ long; reverse orange to pinkish red ..... ***P. crateriforme*** GILMAN and ABBOTT

a. Colonies with reddish mycelium in Koji agar ..... *Strain I.*

aa. Colonies without reddish mycelium in Koji agar ..... *Strain II.*

BB. Reverse predominantly yellow to orange rather than intense red.

D. Conidial areas dark gray green to olive green; reverse colorless to yellow; conidia globose or oval, 2 to 3μ in long axis ..... ***P. luteum*** ZUKAL.

a. Colonies partly colored sulphur yellow during the growing period in Koji agar ..... *Strain I.*

aa. Colonies without sulphur yellow during the growing period in Koji agar.

b. Colonies in Koji gelatine grayish green in age, with abundant cottony aerial hyphae ..... *Strain II.*

bb. Colonies in Koji gelatine gray blackish in age, aerial hyphae very scanty ..... *Strain III.*

DD. Conidial areas yellowish green to dark green; reverse yellow orange in spots; conidia smooth, mostly elliptical, 3.4 to 4 by 2.5 to 3μ .. .. ***P. rugulosum*** var. ***levis*** SHIH var. nov.

AA. Colonies lacking the yellow to red mycelium, with shades of gray green to blackish, floccose; conidiophores with walls sparingly tuberculate, 40 to 160μ long; conidia elliptical, 3.2 to 5.2 by 2.5 to 3.8μ ....***P. Hanzawanum*** SHIH sp. nov.

摘　　要

中華民國武昌產 *Penicillium* に就て

本報告は中華民國武昌產 *Penicillium* の 39 菌種を記載せるものにして其中に三新種並に一新變種を包含す. 卽ち *P. wuchangense, P. sinicum, P. Hanzawanum, P. rugulosum* var. *levis* なり.

Explanation of Plate

Fig. 1. *P. wuchangense* SHIH. A, Conidiophore under low power, bearing divergent chains of conidia; B, short branching conidiophores; C, D, E, and F, part of conidiophores with different arrangement of sterigmata; G, conidia.

Fig. 2. *P. Hanzawanum* SHIH. A, Branching conidiophores under low power, bearing parallel chains of conidia; B and C, part of the branching conidiophores magnified; D, a simple conidiophore with penicillus consisting of three superposed series of verticils; E, elliptical conidia, three of which are with connectives.

Fig. 3. *P. sinicum* SHIH. A, Conidiophore under low power, with short branches and bearing chains of conidia in columns; B, part of a conidiophore in young stage; C, D, and E, conidiophores with different forms of branching; F, and G, conidiophores bearing verticils of metulae, suggesting the *Biverticillata-Symmetrica* form; H, conidia.

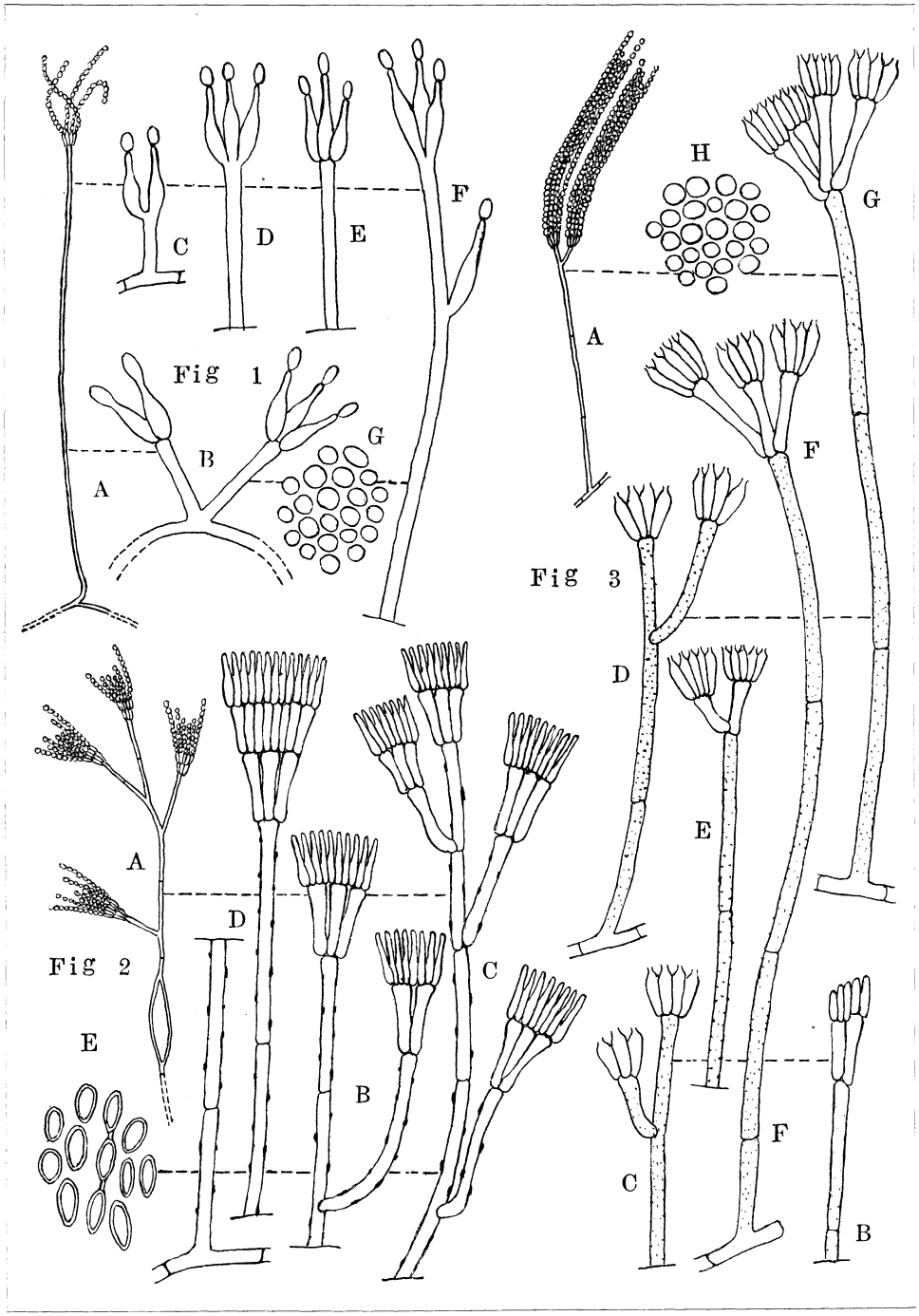

Fig 1

Fig 2

Fig 3