第 114 表　菌絲細胞膜ノ主成分

| 菌種＼成分 | Chitin | Pectin | Cellulose | Lignin | Cutin |
|---|---|---|---|---|---|
| 稻胡麻葉枯病原菌 | ++++ | + | − | − | − |
| 稻胡麻葉枯病原菌ノ第1號準突然變異菌 | ± | + | − | − | − |
| ギウギシバ葉枯病原菌ノ第1號準突然變異菌 | ++++ | + | − | − | − |

液ノ兩培養基ヲ使用シ 24° C ニ於テ 16 日間培養シタル後此ノ濾液ニ就キ常法 (1) ニ從ヒテ BERTLAND 氏法其他ヲ用ヒテ定量的ニ測定セリ。測定ニ當リテハ可及的生態ヲ變向セシメザル爲，各酵素ニ對スル水素 ⌊イオン⌉ 濃度其他ヲ調節スルコトナク生態ノ儘測定スルコトトセリ。

**實驗結果**　第115表ニ示ス如ク本菌ハ Chitinase, Pectinase, Cellulase, Amylase, Oxydase 並ニ Catalase 等ノ各種ノ酵素ヲ分泌スルモ Lipase, Tyrosinase 並ニ Peroxydase 等ハ分泌セズ。

以上ノ實驗ニ於テ特ニ興味アルハ Oxydase ニシテ，本酵素ハ，突然變異的現象ヲ發現スルコト多キ系統ハ少キ系統ヨリモ，又突然變異的現象ヲ發現スルコト多キ培養基上ノモノハ，少キ培養基上ノモノヨリモ甚シク多量ニ分泌セラルル點ナリトス。本問題ニ就キテハ第13篇第4章ニ於テ更ニ詳記セントス。

### 第 3 項　Protamylase ニヨル菌絲細胞膜ノ溶解

**實驗方法**　豚ノ膵臟ヨリ製セル Tripsin, Amylase 等各種ノ酵素ヲ含有スル市販 Protamylase 5 g ヲ 100 cc ノ蒸溜水中ニ浸漬シ，1晝夜ノ後 CHAMBERLAND ノ濾過管ニテ濾過シテ得タル濾液ヲ殺菌セル ⌊スライド⌉ 硝子上ニ取リ之ニ菌絲塊ヲ浸漬シ蓋硝子ヲ蓋ヒタル後濕室ニ保リ。

**實驗結果**　實驗後2晝夜後ニ至レバ菌絲細胞膜ハ溶解シテ菌絲ノ形態ヲ成サズ，菌体ハ溶解シ顆粒狀ヲ成ス。

### 第 4 項　考　　察

van WISSELINGH (1898) (348) MOLISCH (1926) (243)， TUNMANN und ROSENTHALER (1931) (344) THOMS (1928) (341) 並ニ ZECHMEISLER und TOTH (1934) (367) 等ノ諸氏ニヨルニ何レモ絲狀菌細胞膜ノ主成分トシテ Chitin ノ存在ヲ肯定セリ。　而シテ

BENECKE (1905)[21] ハ Chitin ヲ分解スル *Bacillus chitinovorus* ヲ報ジ，JOHNSON (1931)[181] ハ黑穗病菌類（*Ustilago* spp.）ノ小生子細胞膜ハ主トシテ Chitin ヨリ成リ，Pectin ハ全面ニ散在スルヲ報ジ，細胞膜ハ或 Bacteria ノ分泌スル Chitinase 並ニ Pectinase 等ニヨリテ溶解セラレ遂ニ死滅スルニ至ルヲ報ジ，BAMBERG (1931)[6] モ亦玉蜀黍黑穗病原菌（*Ustilago zeae*）ノ小生子ニ就キ前者ト同一現象ヲ報告セリ。JOHNSON (1932)[182] 並ニ BENTON (1935)[23] 等ハ Chitin ヲ分解スル Bacteria ヲ報告スルトコロアリキ。

今予ノ實驗結果ヲ考察スルニ菌絲細胞膜ノ主成分ハ Chitin ト看做シ得ベク，若干ノ Pectin 並ニ其他ヲ含有スルモノト推定シ得ベシ。而シテ第3節ニ於テ記述シタル如ク水液中ニハ Chitinase, Pectinase 其他ノ酵素ヲ含有スルコト明カナレバ菌絲細胞膜ノ Chitin ハ Chitinase ニヨリ，Pectin ハ Pectinase ニヨリ各分解溶解シ去ラルルモノト思考スルヲ得ベク，菌絲自身ノ分泌セル酵素ニヨリ其ノ細胞膜ヲ溶解セラルルモノト結論スルヲ得ベシ。

⌊ヒトヨダケ⌉亞科（Coprineae）ニ屬スル諸菌ハ子實體發生後間モ無ク液體ヲ分泌シ全子實體ハ溶化シ遂ニ消失シ去ルモノナルガ，WEIR (1911)[356] ハ溶化シツツアル⌊ヒトヨダケ⌉ノ汁液ヨリ⌊ヒトヨダケ⌉細胞膜ヲ溶解シ得ル酵素ヲ證明シ，BULLER (1909)[53] (1931)[55] ハ⌊ヒトヨダケ⌉溶化ノ原因トシテ次ノ如キ說ヲ發表セリ。即チ⌊ヒトヨダケ⌉菌傘ニ成生セラレタル無數ノ胞子ガ成熟後落下スルニハ先ズ胞子ノ着生部即チ擔子柄上ノ小生子梗ノ上部ニ必ズ小生梗ヨリ分泌セラレタル水液ノ存在ヲ必要トシ，此水液ハ胞子落下後ト雖，絲狀菌ノ特種ノ原形質流動ニヨリテ續々ト水液ヲ分泌シ遂ニ多量ノ水液ヲ分泌スルモノニシテ，此水液中ニハ⌊ヒトヨダケ⌉細胞膜ヲ溶解スル各種ノ酵素ヲ含有スルヲ以テ遂ニ⌊ヒトヨダケ⌉自體ガ溶化消失スルニ至ルモノナリト。本研究ハ擔子菌ノ場合ナルモ予ノ場合ニ於ケル擬溶菌現象發現部細胞膜ノ溶解ニ甚ダシク類似ノ現象ニシテ擬溶菌現象ノ機構說明上重要ナル業績トス。

## 第 5 節　絲狀菌絲再生ノ原因

擬溶菌現象ニヨリ水液中ニ倒伏沈下シタル菌絲ハ原形質分離，捲縮，細胞膜ノ溶解其他種々ノ變化ヲ受クルモノナルガ，遂ニ古キ菌絲ノ先端或ハ原形質ヲ失ヒタル菌絲內ニ細絲狀纖細ナル菌絲ヲ再生（BULLER (1933)[56] ニヨル Intra-hyphae）スルモノナリ。斯ノ如キ再生菌絲ガ如何ニシテ發現スルカ又如何ナル生理學的意義ヲ有スルヤニ就キ檢





討セントス。

擬溶菌現象發現部ノ水液中ニ於テ前記ノ如キ種々ナル變化ヲ受ケタル菌絲ハ遂ニ死滅セシメラルルモ或モノハ遂ニ其遺傳質ニ變化ヲ來シ抗水液性ノ性質ヲ新ニ獲得シ再生スルモノト思考シ得ラル。此再生菌絲ハ其後更ニ發育シ遂ニ白色島狀變異菌叢トシテ現ルルモノナリ。

HADLEY (1927)(1928)[144][145] FROBISHER (1928)[87] 並ニ BORDET (1931)[37] 其他ハ Bacteria ハ Bacteriophage ヲ含ム水液中ニ於テ溶菌セラルルモ或モノハ抗⌊ファーヂ⌉性ノ性質ヲ獲得シテ發育シ，而モ之ガ變異菌トナリテ出現スルヲ報告セシガ上記ノ實驗結果ニ甚ダシク類似ノ點多シ。

# 第 XIII 篇 島狀準突然變異型發現ノ機構ニ關スル研究

## 第 1 章 島狀準突然變異型ニヨリ發現セシ變異菌ノ特性遺傳率

第V篇ニ於テ各種病原絲狀菌ノ島狀準突然變異型ニ關シ記述シタル如ク，本型ニ屬スル突然變異的現象ハ其發現極メテ普通ナルモ，外界事情ノ影響如何ニヨリ其發現ヲ甚シク左右セラルルノミナラズ，發現シタル白色變異菌叢ハ其特性ノ遺傳性不定ニシテ或ルモノハ一定期間後直チニ母菌ニ復歸シ或ルモノハ永久ニ其特性ヲ遺傳シテ變化ナク又或ルモノハ是等ノ中間ノ性質ヲ示ス等種々異リタル遺傳性ヲ示スモノナリ。

斯ノ如キ突然變異的現象ガ如何ナル條件下ニ如何ナル遺傳率ヲ示スカヲ統計的ニ算定スルハ本現象ノ機構考察上甚ダ重要ナル問題ナリト思考シ本實驗ヲ施行セリ。

**實驗方法** 供試菌トシテハ島狀準突然變異型ノ發現最モ良好ニシテ且ツ最モ明瞭ナル稻胡麻葉枯病原菌ノ第3號供試菌ヲ供用セリ。

環境條件トシテハ第116表ニ示シタル如キ培養溫度，培養基ノ種類，培養基中ノ蔗糖濃度並ニ接種源菌叢ノ新舊及ビ菌叢ノ發育性狀等ノ諸點ヲ選ビ，是等ノ異ル條件ニ於ケル本變異型ノ遺傳率ヲ檢セントセリ。培養ニ當リテハ常法ニ從ヒ［ペトリ］皿內ニ平面培養シ，菌叢ノ發育性狀ヲ檢シ，特性ノ遺傳性ノ實驗ニ當リテハ，齊藤氏醬油寒天斜面培養基ヲ使用シ1箇月每ニ新培養基上ニ移植ヲ反覆セリ。

實驗ニ當リテハ1環境條件每ニ10箇宛ノ［ペトリ］皿ヲ使用シ，各［ペトリ］皿內ニ發現シタル白色變異菌叢中ヨリ5箇宛ヲ斜面培養基上ニ釣菌シ以テ，1環境條件每ニ合計50箇宛ノ變異菌ヲ培養シ，其遺傳性ヲ檢スルコトトセリ。

**實驗結果** 變異菌發現後12箇月目ニ於ケル特性ノ遺傳性ヲ示セバ第116表乃至第118表ノ如シ。

是等諸表ノ示ス如ク島狀ヲナシテ發現シタル白色菌叢ノ遺傳性ハ環境條件ノ如何ニヨリ甚シキ差異ヲ示スモノニシテ，少キハ0%ヨリ多キハ46%ニ達スルヲ知ルト共ニ，斯ノ如キ統計的實驗ヲナスニ當リテハ環境條件ヲ同一ニナス必要甚ダ多キヲ痛感セリ。





本實驗結果ヲ要約スルニ齊藤氏醬油寒天培養基上ニ於テハ培養期間ノ長ク，少シク灰白色ヲ呈スル菌叢ヲ接種源トシテ使用セシ場合ニ，各溫度共遺傳性最强ニシテ平均31%ヲ示シ，馬鈴薯煎汁寒天培養基上ニ於テハ接種源菌叢トシテ白色島狀變異菌ノ發現最モ不良ナル第116表Iノ場合ヲ使用シタルニ，添加スル蔗糖濃度0.5%ノ場合ニ於テハ各溫度共其特性ヲ遺傳セズ0%ヲ示スニ反シ，2%蔗糖濃度ノ場合ニ於テハ最强ニシテ7%ヲ示シ，5%蔗糖濃度ノ場合ニ於テハ3.3%ノ遺傳性ヲ示シ，本篇第3章ニ於テ記述セシ結果ト同一ニシテ，突然變異的現象發現ノ機構考察上甚ダ興味アル結果ヲ得タリ。而シテ培養基ノ種類トノ關係ヲ案ズルニ，白色變異菌叢ノ遺傳性最强ナル第116表中ノIIIノ場合ノ菌叢ヲ接種源トセシニ稻藁煎汁寒天並ニ［ペプトン］加用合成寒天培養基上ニ於テハ甚シク多量ノ白色變異菌叢ヲ發現スルモ，特性ノ遺傳率ハ極メテ微少ニシテ前者ニ於テ4%，後者ニ於テハ0%ヲ示シタルニ反シ，［アスパラギン］加用合成寒天培養基上ニ於テハ最强ニシテ40%ヲ示セリ。斯ノ如ク發現シタル白色菌叢ノ特性ノ遺傳率ガ環境條件ノ如何ニヨリテ甚ダシク異ルハ，各條件下ニ於ケル菌類代謝產物ノ差異ニ基ヅクモノトモ思考スルヲ得ベク，本變異型發現ノ機構究明上重要ナル事項ト思考ス。

第116表 齊藤氏醬油寒天培養基上ニ發現シタル白色島狀變異菌叢ノ特性遺傳率

| 使用ペトリ皿數 | 接種源ノ種類＼培養溫度 | 實驗種類 | I | II | III | IV | 平均 |
|---|---|---|---|---|---|---|---|
| | | 培養期間 | 28° C ニテ 22日 | 28° C ニテ 52日 | 28° C ニテ 52日 | 室溫ニテ92日 | |
| | | 接種源菌叢ノ色 | 黑色 | 黑色 | 灰白色 | 灰白色 | |
| 10 | 24° C | | 0 % | 0 % | 30% | 14% | 11% |
| 10 | 28° C | | 8 % | 18% | 46% | 14%. | 19% |
| 10 | 32° C | | 0 % | 0 % | 28% | 0 % | 7 % |
| 10 | 34° C | | 14% | 4 % | 19% | — | 12% |
| 平均 | | | 5.5 % | 5.5 % | 31% | 9.3 % | |

第 117 表　馬鈴薯煎汁寒天培養基上ニ發現シタル
白色島狀變異菌叢ノ特性遺傳率

| 使用ペトリ皿數 | 蔗糖濃度 / 培養溫度 | 0.5 % | 2 % | 5 % | 平均 |
|---|---|---|---|---|---|
| 10 | 24° C | 0 % | 10% | 0 % | 3 % |
| 10 | 28° C | 0 % | 4 % | 2 % | 2 % |
| 10 | 32° C | 0 % | 2 % | 8 % | 3 % |
| 10 | 34° C | 0 % | 12% | | 4 % |
| 平均 | | 0 % | 7 % | 3.3 % | |

第 118 表　培養基ノ種類ト白色島狀變異菌叢ノ
特性遺傳率トノ關係

| 培養基ノ種類 | 稻藁煎汁寒天 | 玉蜀黍煎汁寒天 | ペプトン加用合成寒天 | アスパラギン加用合成寒天 | 乾杏煎汁寒天 | 三好氏醬油寒天 |
|---|---|---|---|---|---|---|
| 遺傳率 | 4 % | 8 % | 0 % | 40 % | 28 % | 20 % |

# 第 2 章　島狀準突然變異型ノ發現過程

第 XII 篇ニ於テ詳記シタル第 3 章稻胡麻葉枯病原菌ニ於ケル擬溶菌現象發現ニ關スル實驗結果並ニ第 XII 篇第 4 章第 5 節擬溶菌現象ト蔗糖濃度トノ關係ニ就キテノ實驗結果ヲ詳細檢討スルニ，馬鈴薯煎汁寒天培養基上ニ於ケル白色島狀變異菌ハ擬溶菌現象ヲ經テ發現スルモノト斷定スルヲ得ベシ。即チ擬溶菌現象發現部ノ氣中菌絲ハ，下面ノ水液中ニ沈下浸漬セラレ，種々ノ作用ヲ受ケテ變性シ擬溶菌現象ノ終期ニ於テ再生スル白色絲狀菌絲ハ，其後ノ發育ヲ繼續シ白色島狀變異菌叢トシテ發現スルモノナリ。此事實ハ島狀準突然變異型ノ或モノノ發現ト擬溶菌現象間ニハ，離ル可ラザル密接ナル因果關係ノ存在スルヲ證明シ得ベク，島狀準突然變異型ノ或モノノ發現ノ重大因子ハ一ニ擬溶菌現象間ニ存在スルモノト思考スルヲ得ベシ。而シテ擬溶菌現象ハ第 XII 篇第 5 章ニ於テ詳記シタル如ク全ク菌自身ノ代謝產物ニ基ヅクモノナレバ，島狀準突然變異型ノ或モノモ亦菌自身ノ代謝產物ニ基ヅクモノナルコト明カナリ。





# 第 3 章　擬溶菌部上ノ白色變異菌叢ノ特性遺傳ニ關スル實驗

擬溶菌部上ニ發現シタル白色變異菌叢ガ果シテ其特性ヲ次代ニ遺傳スルヤ否ヤヲ明カニスルハ本問題研究上最モ肝要ナル事項ナリ。ヨツテ前篇記載ノ各種ノ實驗ノ場合發現セル白色島狀變異菌叢ヲ接種源トナシ，各 10 個體宛ヲ取リ齊藤氏醬油寒天培養基上ニ培養シ，以テ其ノ發育狀態ヲ檢スルコトトセリ。

## 第 1 節　實驗結果

**第 1 回實驗**　前篇第 4 章第 5 節蔗糖濃度ト擬溶菌現象トノ關係ノ場合ニ於ケル，第 1 回實驗ノ際ニ於テ發現セル白色菌叢ノ特性遺傳性ヲ次ノ如ク檢セリ。

I，2 % ノ蔗糖加用馬鈴薯煎汁寒天培養基上ニ於ケルモノニ就キ

**A**，未ダ擬溶菌現象ヲ發現セザル以前ニ於ケル菌叢

**B**，3 日目ニ於テ擬溶菌現象ヲ發現後間モナキ該部ノ菌叢

**C**，9 日目ニ於テ擬溶菌部上ニ形成セラレタル白色島狀菌叢

等ヲ接種源トシ各 10 個宛ヲ取リテ培養シ，其白色性ヲ次代ニ遺傳スルヤ否ヤヲ檢シタルニ次ノ如キ結果ヲ得タリ。

**A**，ハ全部正常ナル黑色菌叢ヲ發育セシメ

**B**，ハ殆ンド灰白色菌叢ヲ發育セシメ

**C**，ハ殆ンド白色或ハ所々桃色ヲ呈スル菌叢ヲ發育セシメタリ。

即チ恰モ液中ニ接觸セル時間ノ永キモノ程其變異度大ナルカノ感ヲ呈セリ。

II，馬鈴薯煎汁ノミヲ含有スルモノ

III，0.5 % ノ蔗糖ヲ含有スルモノ

IV，正常量ノ 1/10 ノ馬鈴薯煎汁ヲ含有スルモノ

等ノ各ノ培養基上ニ發育セル白色菌叢ヲ接種源トセル場合ニハ次代ニ於テ全部正常ノ黑色菌叢ヲ發育セシメ，獨リ II，ノミハ灰白色菌叢ヲ發育セシメタリ。

**第 2 回實驗**　前篇第 4 章第 5 節蔗糖濃度ト擬溶菌現象トノ關係ノ場合ニ於ケル第 2 回實驗ノ際ニ發現セル白色菌叢ノ特性遺傳性ヲ檢セリ。

前實驗ト同一結果ヲ得タルモ，本實驗ニ於テハ，II. ノモノモ母菌ト同樣ナル黑色菌

叢ヲ發育セシメタリ。

**第3回實驗** 前篇第4章第5節蔗糖濃度ト擬溶菌現象トノ關係ノ場合ニ於ケル第3回實驗ノ際ニ發現セシ白色菌叢ノ特性遺傳性ヲ檢セリ。

第1回實驗ト同一結果ヲ得タリ。加之ナラズ5％ノ蔗糖含有培養基上ノ擬溶菌部上ニ形成セラレタル白色菌叢ハ其變異度甚シク，純白或ハ桃色菌叢ヲ發育セシメタリ。

**第4回實驗** 前篇第4章第5節蔗糖濃度ト擬溶菌現象トノ關係ノ場合ニ於ケル第4回實驗ノ際ニ發現セル白色菌叢ノ特性遺傳性ヲ檢セリ。

第1回實驗ト同一結果ヲ得タリ。加フルニ本實驗ニ於テハ2％並ニ5％蔗糖含有培養基上ノ白色島状菌叢ハ變異度甚シク，白色乃至桃色菌叢ヲ發育セシメタリ。

**第5回實驗** 前篇第4章第5節蔗糖濃度ト擬溶菌現象トノ關係ノ場合ニ於ケル第5回實驗ノ際ニ發現セシ白色菌叢ノ特性遺傳性ヲ檢セリ。

本實驗ニ於テモ前實驗ト同一結果ヲ得タリ。

**第6回實驗** 前篇第4章第5節蔗糖濃度ト擬溶菌現象トノ關係ノ場合ニ於ケル第7回實驗ノ際，2％並ニ5％蔗糖加用馬鈴薯煎汁寒天培養基上ノモノ以外ノ各培養基上ノ白色菌叢ノ特性遺傳性ヲ檢セリ。

本實驗ニ於テハ第1回實驗ノ場合ト同樣ニ，全部正常ナル黑色菌叢ヲ發育セシメタリ。

### 第2節 第3章總括

以上ノ實驗ニヨリテ明カナル如ク，馬鈴薯煎汁ノミ，蔗糖ノミ，1/10馬鈴薯煎汁含有ノモノ並ニ0.5％ノ蔗糖加用ノ各培養基上ニ形成セラレタル白色菌叢ハ例ヘ擬溶菌部上ニ形成セラルルモ次代ニ於テ直チニ母菌ニ復歸ス。之ニ反シ2％並ニ5％ノ蔗糖加用馬鈴薯煎汁寒天培養基上ノ擬溶菌部ニ形成セラレタル白色菌叢ハ次代ニ於テ明カナル變異菌トシテ發現ス。然ルニ2％並ニ5％蔗糖加用馬鈴薯煎汁寒天培養基上ニ形成セラレタル白色菌叢ト雖モ，擬溶菌部以外ノ菌叢ハ，次代ニ於テ母菌ニ復歸ス。而シテ此際同ジク擬溶菌部上ノ白色菌叢ト雖モ，液中ニ沈下セシ時間ノ長短ニヨリテ其ノ變異度ヲ異ニスルモノニシテ，液中ニ接觸ノ時間長キモノ程變化著シク，Bノ場合ノ如ク，液中ニ浸漬ノ時間短キモノハ直チニ母菌ノ狀態ニ復歸スルモノニシテ，何レモ注目スベキ現象ト稱セザルベカラズ。

以上ノ事實ニヨリテ絲狀菌ニ於ケル突然變異的現象ノ內，島狀準突然變異型ヲ呈スル變異菌叢ガ其特性ノ遺傳性不定ニシテ或者ハ永代ニ互リテ其特性ヲ遺傳シテ變化スルコ





トナキモ，或モノハ直チニ母菌ニ復歸シ，又是等ノ中間ノ變異ヲ示スモノ等種々アリテ，彼ノ扇狀準突然變異型ヲ呈スルモノガ，確實ニ其特性ヲ遺傳スルニ比シテ，大ナル差異ヲ示ス原因ヲ說明シ得ベシ。

以上ノ實驗結果ハ少クモ馬鈴薯煎汁寒天培養基上ニ於ケル島狀準突然變異型ノ發現ト擬溶菌現象間ニハ離ル可ラザル密接ナル關係ノ存在スルヲ遺傳學的ニ證明シ得タルノミナラズ，培養基中ノ蔗糖濃度ノ差違ニヨル白色變異菌ノ遺傳性ノ差違ハ，培養成分ノ差違ニヨル代謝產物ノ差違ニ基因スルモノト思考シ得ベシ。

## 第4章 島狀準突然變異型ノ發現並ニ擬溶菌現象ノ發現ト酸化酵素トノ關係

予ハ第2章ニ於テ，稻胡麻葉枯病原菌ニ於ケル島狀準突然變異型ニ屬スル突然變異的現象ノ或モノハ，擬溶菌現象（Pseudo-myceliolyse）ニヨリテ，先ヅ菌叢ハ菌叢下面ノ水液中ニ浸漬セラレ，其水液中ニ存スル菌自身ノ代謝產物ニヨリ或ル種ノ作用ヲ受ケテ變性スル結果，發現スルモノト結論セリ。即チ突然變異的現象ヲ生物學的ニ，主トシテ外部形態學的ニ觀察シ，予ノ發見シタル擬溶菌現象ニヨリ突然變異的現象ヲ發現スルヲ明カニセシガ，本章ニ於テハ突然變異的現象ヲ化學的ニ，主トシテ酸化酵素ヲ主題トシテ檢討シ，以テ突然變異的現象發現トノ間ニ如何ナル因果關係ノ存スルヤヲ究明セントセリ。

### 第1節 實驗材料並ニ實驗方法

本實驗ニ於テ使用シタル供試菌ハ稻胡麻葉枯病菌（*Ophiobolus Miyabeanus* Ito et Kuribayashi）ノ內，1ハ突然變異的現象ノ發現最モ多キ第3號菌，他ハ突然變異的現象ノ發現最モ少キ第2號菌ヲ使用セリ。其ノ他比較ノタメ諸種ノ病原絲狀菌ヲ使用セシモ總テ鳥取高農植物病理學教室保存ノ單箇胞子ヨリ出發セル純粹培養ヲ供用セリ。酸化酵素作用力ノ定量ニ當リテハ，主トシテ Tincture of Guaiacum 並ニ Nadi-Reagent ヲ用ヒ，呈スル色調ノ濃淡ニヨレリ。而シテ豫メ常法[332]ニヨリ Pyrogaroll ヲ用ヒ，其 Purpurogallin Number ヲ算出スルト共ニ，同時ニ前記試藥ニヨル供試各液ノ呈スル色調ヲ Ridgway [277] ノ色彩標準書ニヨリ檢定シ置キ，以テ呈色反應ニヨル比較ノ標準タラシメタリ。全實驗ヲ通ジ供試各液ノ PH 其ノ他ハ之ヲ人爲的ニ調節スルヲ避ケ特ニ供試各液ノ生態其儘ノ酸化酵素作用力ノ比較ニ勉メタリ。供試菌ノ培養ニ當リテ

ハ特別ノ場合ヲ除キ，擬溶菌現象並＝突然變異的現象ノ發現最モ多キ２％蔗糖加用馬鈴薯煎汁培養液ヲ使用セリ。一定期間一定溫度＝テ培養シタル後，其培養濾液ヲ實驗＝供用シ，該濾液中ノ酸化酵素作用力ヲ檢定セリ。

## 第 2 節　突然變異的現象ノ發現ト酸化酵素トノ關係

生物ノ生活過程ト酸化酵素トノ間＝ハ極メテ密接ナル關係ヲ有スルハ衆知ノ事實ナルガ絲狀菌類＝於ケル突然變異的現象ノ發現ト酸化酵素トノ間＝如何ナル關係ヲ有スルヤヲ知ルコトハ，突然變異的現象發現ノ機構究明上必要ナル事項タルヲ失ハズ。

### 第 1 項　變異現象ノ發現多キ菌ノ系統ト少キ系統並ニ發現多キ培養基上ト少キ培養基上トノ酸化酵素作用力ノ比較

供試稻胡麻葉枯病原菌ハ其系統ノ異ナル＝從ヒテ變異現象ノ發現率ヲ異＝スルノミナラズ，同一系統＝アリテモ培養基ヲ異＝スル場合＝ハ，變異現象發現＝甚シキ差異ノ存スルハ既＝報告セシトコロナリ。

是等異ナル系統並＝培養基上＝於テ，其酸化酵素作用力＝如何ナル差違ヲ生ズルヤヲ檢セントセリ。

**實驗方法**　變異ノ發現多キ系統トシテ第 3 號菌，少キ系統トシテ第 2 號菌，又發現多キ培養基トシテ 2 ％蔗糖加用馬鈴薯煎汁培養液，少キ培養基トシテ 5 ％蔗糖加用「クノツプ」氏液等ヲ夫々供用セリ。培養溫度ハ 24°C，培養期間ハ 16 日トセリ。

第 119 表　變異ノ發現多キ系統ト少キ系統並＝多キ培養基ト少キ培養基上＝於ケル酸化酵素作用力ノ比較　(培養後 16 日目)

| 調査事項 | 實驗回數 | 變異ノ發現多キ系統 | | 變異ノ發現少キ系統 | |
|---|---|---|---|---|---|
| | | 變異ノ發現多キ培養基 | 變異ノ發現少キ培養基 | 變異ノ發現多キ培養基 | 變異ノ發現少キ培養基 |
| PH | 1 | 6.0 | 7.0 | 6.8 | 7.0 |
| | 2 | 6.0 | 7.0 | 6.9 | 6.9 |
| 色 | 1 | Porcelain green | Grass green | Sage green | Water green |
| | 2 | Porcelain green | Grass green | Grass green | − |
| 酸化酵素作用力 | 1 | ++++++++++<br>++++++++++<br>++++++++++ | +++ | + | + |
| | 2 | ++++++++++<br>++++++++++<br>++++++++++ | + | +++ | ± |



第 121 表　各種絲狀菌ノ酸化酵素作用力比較

(培養後 16 日目，培養溫度 24° C)

| 寄主植物 | 菌種 | PH | 酸化酵素作用力 | Catalase | 供試濾液ノ色 |
|---|---|---|---|---|---|
| イネ | Ophiobolus Miyabeanus Ito et Kuribayashi =Helminthosporium Oryzae Breda de Haan　鳥取系 | 6.2 | +++　+ | + | 無色 |
| 〃 | 同　紫野系 | 6.8 | +++　+++ | + | 〃 |
| 〃 | 同　北白川系 | 6.8 | ++ | + | 〃 |
| 〃 | 同　石原系 | 6.8 | ± | + | Cartridge Buff (極メテ淡シ) |
| 〃 | Ophiobolus Miyabeanus ノ第 1 號準突然變異菌 | 7.0 | ± | ± | 無色 |
| 〃 | Brachysporium Tomato (E. et B.) Hiroe et Watanabe | 7.0 | + | +++　++ | Apricot Yellow 橙黃色 |
| 〃 | 同　上　ノ準突然變異菌 | 7.0 | +++ | ++ +++ | 〃 |
| コゴメガヤツリ | Brachysporium Tomato (E. et B.) Hiroe et Watanabe. | 6.8 | +++ | + | 〃 |
| 〃 | Bra. Tomato ノ第 1 號準突然變異菌 | 7.0 | +++　+++ | + | 〃 |
| ギヤウギシバ | Bra. Tomato ノ第 2 號準突然變異菌 | 7.0 | ++ | ± | 〃 |
| 〃 | Bra. Tomato ノ第 3 號準突然變異菌 | 7.0 | ± | + | 〃 |
| イネ | Helminthosporium Oryzae-microsporum | 6.6 | +++　+ | ± | Cartridge Buff (極メテ淡シ) |
| 〃 | Bra. ovoideum Hiroe et Watanabe | 6.6 | + | + | 無色 |
| 〃 | Bra. senegalense Spegazzini | 7.0 | +++ | +++ | 〃 |
| シロツメクサ | Bra. trifolii Kauffman | 6.2 | ++ | ++ | 〃 |
| ノビエ | Bra. ovoideum Hiroe et Watanabe | 7.0 | +++ | ++ | 〃 |
| アワ | Bra. ovoideum Hiroe et Watanabe | 5.4 | ++ | ± | 〃 |
| オヒシバ | Bra. senegalense Spegazzini | 6.4 | ++ | ++ | 〃 |
| トウガラシ | Bra. Tomato (E. et B.) Hiroe et Watanabe | 6.2 | + | ++ | 〃 |
| 〃 | Bra. ovoideum Hiroe et Watanabe | 6.2 | ++ | ± | 〃 |
| 〃 | Bra. senegalense Spegazzini | 6.2 | +++ | + | Primose yellow 橙黃色 |
| 〃 | Bra. Capsici Hiroe et Watanabe | 4.6 | + | ± | 無色 |
| スキクワ | Fusarium niveum E. F. Smith | 6.1 | ± | ± | 〃 |
| インゲンマメ | Fusarium sp. | 6.1 | ± | ± | Salmon Buff 淡赤褐色 |
| ナシ | Alternaria Kikuchiana Tanaka | 6.6 | + | − | 無色 |

## 實驗結果

**第1種實驗**　Tinctur of Guaiacum ノ呈色反應ニヨル比較。

第119表ニヨリ明カナル如ク，變異ノ發現多キ系統ハ少キ系統ヨリモ，變異ノ發現多キ培養基上ハ，少キ培養基上ヨリモ，常ニ著シク多量ノ酸化酵素ヲ分泌スルヲ知レリ。

**第2種實驗**　Purpurogallin 形成量ニヨル比較。

第120表　Purpurogallin 形成量ニヨル酸化酵素量ノ比較

| | 變異ノ發現多キ系統 | | 變異ノ發現少キ系統 | |
|---|---|---|---|---|
| | 發現多キ培養基 | 發現少キ培養基 | 發現多キ培養基 | 發現少キ培養基 |
| Purpurogallin (mg) | 0.437 | 0.080 | 0.330 | 0 |

前表ニヨリ明カナル如ク第1種實驗並ニ第2種實驗共ニ變異ノ發現多キ系統ハ少キ系統ヨリモ，又變異ノ發現多キ培養基ハ少キ培養基ヨリモ，常ニ著シク多量ノ酸化酵素ヲ分泌スルコト明カニシテ，突然變異的現象ト酸化酵素間ニハ或種ノ關係ノ存在ヲ認メ得ルガ如シ。

### 第2項　各種絲狀菌培養濾液ノ酸化酵素作用力ノ比較

各種絲狀菌ノ酸化酵素ニ就キテ報告セシモノ少ナカラズト雖モ予ハ第1項記述ノ問題ニ連關シ，稻胡麻葉枯病原菌ニ於ケル各種ノ系統，並ニ極メテ近緣ナル *Brachysporium* 屬ニ屬スル各種ノ病原菌トノ比較，更ニ又西瓜蔓割病菌 *Fusarium niveum* E. F. Smith，茱豆苗ヨリ分離セシ *Fusarium* sp. 並ニ梨黑斑病原菌 *Alternaria Kikuchiana* Tanaka 等ノ諸菌ヲ供用シ，是等類似ノ或ハ然ラザル諸菌間ニ於ケル酸化酵素作用力ガ如何ナル關係ニアルヤヲ檢セントセリ。

**實驗結果**　第121表ニヨリテ明カナル如ク，稻胡麻葉枯病原菌ノ各系統間ニ於テハ，變異現象ノ發現多キ鳥取系，紫野系等ニ於テ著シク强勢ナル酸化酵素作用力ヲ現シ，變異現象ノ發現少キ北白川系並ニ石原系等ニアリテハ，共ニ著シク弱キ酸化酸素作用力ヲ示スコト前實驗ト同樣ナリ。*Brachysporium* 屬ニ屬スル各菌ニ於テハ，概シテ共作用力弱少ナリ。而シテ *Fusarium* 屬ニ屬スル西瓜蔓割病原菌並ニ茱豆苗ヨリ分離セシモノ及ビ *Alternaria* 屬ニ屬スル梨黑斑病原菌ハ共ニ著シク弱少ノ酸化酵素作用力ヲ示スニ過ギザルハ注目スベキ現象ナリトス。變異菌ト母菌トノ示ス酸化酵素作用力ヲ比較スルニ，島狀準突然變異型ニ屬スル稻胡麻葉枯病原菌ノ第1號準突然變異菌ニアリテハ，

辛シテ該作用力ヲ認メ得ルニ過ギルモ，扇狀準突然變異型ニ屬スル稻ノ，「ブラキスポリゥム」病菌 *Brachysporium Tomato* (Ell. et Barth.) Hiroe et Watanabe ノ準突然變異菌，「コゴメガヤツリ」葉枯病原菌 *Brachysporium Tomato* (Ell. et Barth.) Hiroe et Watanabe ノ準突然變異菌ニアリテハ反對ニ著シク强キ酸化酵素作用力ヲ現ハセシハ之又注目スベキ現象ナリト思考ス。

### 第 3 項 變異ノ發現多キ蔗糖濃度ノ培養基上ト少キ蔗糖濃度ノ培養基上ノ酸化酵素作用力ノ比較

前篇第4章ニ於テ記述セシ如ク，擬溶菌現象並ニ突然變異的現象ノ發現ハ同一馬鈴薯煎汁寒天培養基上ニ於テモ，其含有スル蔗糖濃度ニヨリテ著シキ差違ヲ示スモノニシテ，2％並ニ5％ノ蔗糖ヲ含有スル培養基上ニ於テ最モ多量ノ變異現象ヲ發現シ，10％，20％並ニ0.5％及ビ其レ以下ニ於テハ殆ド全ク變異現象ヲ發現セザルモノナルガ，此ノ事實ト酸化酵素作用力トノ間ニ如何ナル關係ノ存スルヤヲ明カニセントセリ。

**實驗方法** 馬鈴薯煎汁ニ蔗糖ヲ全ク添加セザルモノ並ニ0.5％，2％，5％，10％，並ニ20％等ノ蔗糖ヲ添加セシモノ等合計6種ノ蔗糖含有量ヲ異ニセシメタル培養液ヲ造リ，之ニ變異ノ發現多キ第3號供試菌ノ菌叢1片ヲ移植シ 24°C ニ於テ17日間培養シ，其濾液ニ Tincture of Guaiacum ヲ加ヘ，20°C ニテ5分後ニ呈スル青色反應ノ濃淡ニヨリ，酸化酵素作用力ヲ比較セリ。

**實驗結果** 第122表ニヨリテ明カナル如ク酸化酵素作用力ノ最モ旺盛ナルハ5％蔗糖區ニシテ，2％蔗糖區之ニ次ギ，0 5％蔗糖區並ニ10％區ハ第3位，20％蔗糖區之ニ次ギ，20％蔗糖區並ニ蔗糖ヲ添加セザル區ニ於テハ殆ド酸化酵素作用力ヲ認メ得ザル程度ナリ。

第 122 表 蔗糖濃度ト酸化酵素作用力ノ比較

| 蔗糖濃度 / 調査事項 | 0 % | 0.5 % | 2 % | 5 % | 10% | 20% |
|---|---|---|---|---|---|---|
| PH | 8.6 | 7.3 | 5.7 | 5.5 | 6.0 | 6.1 |
| 色 | Deep Chrysolite Green | Sage Green | Deep Bluish Glaucous | Bluish Gray Green | Deep Glaucous Green | Pea Green |
| 酸化酵素力 | + | ++ | +++ | +++ +++ | ++ | + |

即酸化酵素作用力ノ强キ蔗糖濃度區ハ又同時ニ多數ノ變異現象ヲ發現スル區ニシテ，





酸化酵素作用力ノ强弱ト變異發現トノ間ニ存スベキ或種ノ關係ハ，培養液中ノ蔗糖濃度ヲ通ジテ考察スルモ亦之ヲ肯定スルヲ得ベシ。

### 第 4 項 培養期間ノ長短ト酸化酵素作用力ノ比較

本第3號供試菌ノ酸化酵素作用力ハ果シテ如何ナル培養期間ニ於テ最高ニ達スルヤヲ知ルコトハ，各種ノ狀態ニ於ケル酸化酵素作用力ノ比較ニ當リ最モ重要ナル問題ナリトス。

**實驗方法** 培養基トシテハ2％蔗糖加用馬鈴薯煎汁培養液ヲ用ヒ，培養期間ハ第123表ニ示シタル如ク，2日ヨリ50日迄合計7期ニ亙リ 24°C ニ於テ培養ヲ繼續セリ。Tincture of Guaiacum ヲ用ヒ其酸化酵素作用力ヲ比較セリ。

**實驗結果** 第123表ニ示シタル如ク，培養後3日目ニ於テハ僅カノ酸化酵素作用力ヲ示スニ過ギザルモ6日目ニ至ラバ相當量ノ酵素作用力ヲ現シ，10日目ニ至リテ最高ニ達シ，16日以後ハ次第ニ作用力ヲ減少シ，50日目ニ至ラバ殆ド之ヲ認メ難シ。即チ 24°C ニ於テハ培養後6日乃至16日ノ間ニ於テ，特ニ10日前後ニ於テ旺盛ナル酸化酵素作用力ヲ示スヲ知レリ。

第 123 表 培養期間ノ長短ト酸化酵素作用力トノ關係

| 培養期間 / 調査事項 | 2 日目 | 3 日目 | 6 日目 | 10日目 | 16日目 | 20日目 | 50日目 |
|---|---|---|---|---|---|---|---|
| PH | 5.4 | 5.4 | 5.6 | 5.8 | 5.9 | 5.9 | 5.8 |
| 色 | − | − | Greenish Glaucous Blue | Bluish Gray-Green | Dark Bluish-Glaucous | Deep Bluish Glaucous | Morguerite Yellow |
| 酸化酵素力 | + | + | +++ | +++++ | +++ | ++ | ± |

### 第 5 項 各種溫度ニ於ケル酸化酵素作用力ノ比較

第8篇第3章ニ於テ論ジタル如ク本菌ノ馬鈴薯煎汁寒天培養基上ニ於ケル變異率ハ 28°C − 32°C ニ於テ最モ大ニシテ，該培養溫度ト酸化酵素作用力トノ間ニ如何ナル關係ノ存スルヤヲ檢セントセリ。

**實驗結果** 第124表ニ表示シタルガ如ク，濾液ニ試藥ヲ添加シ 20°C ノ定溫ニテ檢シタル場合ニ於テハ，36°C ヲ除キ各溫度共大ナル差違ヲ認メ得ザリシモ，生態學的見地ヨリ夫々ノ培養溫度ニ從ツテ各々ノ培養溫度ニ保チ檢シタル場合ニ於テハ，32°C ニ

於テ最モ旺盛ニシテ，20°C 之ニ次ギ，他ノ温度上ノモノハ大同小異ナリキ。

第 124 表　培養温度ト酸化酵素作用力トノ關係

| 培養温度 / 調査事項 | | 15° C | 20° C | 24° C | 28° C | 32° C | 36° C |
|---|---|---|---|---|---|---|---|
| PH | | 6.1 | 5.8 | 5.7 | 5.6 | 5.7 | 5.4 |
| 夫々ノ温度ニテ10分後ノ色 | | Deep Lichen Green | Niagara Green | Light Niagara Green | Pale Turtle Green | Lumiere Blue | – |
| 酸化酵素力 | 20° C ニテ10分後 | ++ | ++ | ++ | + | + | ± |
| | 夫々ノ温度ニテ10分後 | ++ | ++ | ++ | + | +++ + | ± |

## 第 6 項　培養期間ヲ異ニシタル場合ニ於ケル培養温度ト酸化酵素作用力ノ比較

前第 4 項ニ於テ記述シタル如ク，酸化酵素作用力ハ培養期間ノ長短ニヨリテ著シキ影響ヲ蒙ルモノナレバ，本實驗ニ於テハ，各温度ノ酸化酵素作用力ヲ培養後夫々 5 日目，10 日目並ニ 27 日目等異ナル培養期間ニ於テ比較ヲ試ミタリ。

第 125 表　培養温度ト酸化酵素力トノ關係

(培養後18日目)

| | 培養温度 / 調査事項 | 15° C | 20° C | 24° C | 28° C | 32° C |
|---|---|---|---|---|---|---|
| 5 日 目 | PH | 5.6 | 5.6 | 6.0 | 5.8 | 5.0 |
| | 酸化酵素力 | ± | + | ++ | ++ | ++ |
| 10 日 目 | PH | 5.8 | 5.8 | 6.6 | 6.0 | 6.0 |
| | 酸化酵素力 | + | +++ | ++ | +++ | + |
| 27 日 目 | PH | 6.0 | 6.2 | 6.2 | 6.2 | 7.2 |
| | 酸化酵素力 | ++ | ++ | ++ | +++ | ++ |





**實驗結果**　第125表ニ示シタル如ク培養後 5 日目ニ於テハ 24°C 乃至 32°C ニ於テ酵素作用力旺盛ニシテ，10 日目ニ於テハ 20°C 並ニ 28°C 最モ強ク，24°C 之ニ次ゲリ，然ルニ 27日目ニ於テハ 28°C ニ於テ最モ強ク，他温度ニ於テハ殆ド同一程度ノ酵素作用力ヲ示セリ。即チ前項並ニ本項ニ於ケル實驗結果ニヨリ，培養期間ノ短キ場合ニ於テハ酸化酵素作用力ト變異現象間ニ存スルナラント思惟セラルル或種ノ關係ヲ肯定シ得ザルモ長期間即チ27日間培養セシモノニ於テハ上記ノ關係ヲ若干肯定シ得ルガ如シ。

## 第 7 項　培養温度ヲ異ニシタル場合ニ於ケル蔗糖濃度ト酸化酸素作用力ノ比較

前項ニ於テ記述シタル如ク本菌ノ酸化酵素作用力ハ温度ニヨリテモ大ナル影響ヲ蒙ルモノナレバ，本項ニ於テハ蔗糖濃度ニ加フルニ温度ノ點ヲ考慮ニ入レ，以テ本菌ノ酸化酵素作用力ヲ比較セントス。

**實驗結果**　第126表ニ示シタル如ク 20°C ニテ培養セル場合ヲ除キ大体各温度共ニ 2％ノ蔗糖濃度區ニ於テ旺盛ナル酸化酵素作用力ヲ認メ得ベシ。

第 126 表　蔗糖濃度ト酸化酵素力トノ關係

(培養後18日目)

| 温 度 | 蔗糖濃度 / 調査事項 | 0 ％ | 0.5 ％ | 2 ％ | 5 ％ | 10％ | 20％ |
|---|---|---|---|---|---|---|---|
| 20° C | PH | 7.0 | 6.9 | 5.8 | 5.6 | 5.6 | 5.5 |
| | 酸化酵素力 | ± | + | ++++ | ++ | ++ | ++ |
| 24° C | PH | 7.8 | 6.8 | 5.6 | 5.4 | 5.4 | 5.4 |
| | 酸化酵素力 | ± | + | +++ | +++ | + | ++ |
| 28° C | PH | 7.8 | 6.2 | 5.4 | 5.4 | 5.4 | 5.5 |
| | 酸化酵素力 | ± | ± | +++ | +++ | ++ | ++ |
| 32° C | PH | 7.8 | 6.4 | 5.6 | 5.4 | 5.4 | 5.4 |
| | 酸化酵素力 | ± | ± | ++ | +++ | +++ | ++ |
| 36° C | PH | 5.8 | 5.6 | 5.4 | 5.2 | 5.2 | 5.2 |
| | 酸化酵素力 | – | – | – | – | – | – |

☆ 36° C ニ於テハ殆ド發育セズ.

## 第 3 節 擬溶菌現象發現ト酸化酵素トノ關係

前第2章ニ於テ記述セシ如ク，本菌ノ馬鈴薯煎汁寒天培養基上ニ於ケル島狀準突然變異型ハ擬溶菌現象ヲ經テ發現スル事實ハ，之ヲ外部形態學的ニ證明シタルトコロナルガ，突然變異的現象ノ發現ニ重大ナル關係ヲ有スル此ノ擬溶菌現象ト酸化酵素トノ間ニ如何ナル關係ヲ有スルヤヲ檢セントス。

**實驗方法** 培養基上ニ生產セラレ居ル酸化酵素ノ定性ニ關シテハ從來種々ナル方法(18)(344) アリト雖モ，何レモ培養基中ニ豫メ各種ノ試藥ヲ添加スルヲ以テ，培養成分其他ノ狀態ヲ變化セシムル缺點アリ。予ハ斯ル缺點ヲ除去スルタメ，次ノ如キ方法ヲ考案採用セリ。先ヅ供試菌ヲ目的ノ供試培養基即チ擬溶菌現象ノ發現多キ2%蔗糖加用馬鈴薯煎汁寒天平面培養基上ニ，24°, 28°, 30°, 並ニ 32° C 等各種ノ溫度ニ於テ培養シ，擬溶菌現象ノ發現ヲ期待シ得ベキ2日目ニ於テ Tincture of Guaiacum 或ハ Nadi-Reagent ヲ注ギ，過剩ノ試藥ハ速カニ除去シ，呈色反應ノ出現ヲ待テリ。本法ハ極メテ迅速ニ，明瞭ニ反應ヲ現ハスモノニシテ本實驗ニハ最適ノ方法ナリト思考ス。

**實驗結果** 第21圖版，第3圖ニ示シタル如ク，各種溫度上ノモノ共ニ，何レモ例外ナク，擬溶菌現象ヲ發現シ得タルモノハ，觀察時ノ溫度 20°C ニ於テ早キハ2分後，遲クモ5分以內ニ於テ濃青色ヲ呈シ明カニ酸化酵素ノ存在ヲ檢出シ得ルニ反シ，擬溶菌現象ヲ發現シ居ラザルモノハ，20分後ト雖モ青色ヲ呈スルコトナク，40分後ニ至リテ極メテ僅少ニ着色スルニ過ギズ。以上ノ實驗結果ハ擬溶菌現象ノ發現ニハ必ズ酸化酵素ノ存在ヲ伴フ事實ヲ明示スルモノニシテ，明確ニ擬溶菌現象ト酸化酵素間ニ或ル種ノ因果關係ノ存スルヲ肯定シ得ベシ。

## 第 4 節 論議並ニ結論

本章ニ記述シタル實驗結果ヲ考察スルニ次ノ2事項ヲ肯定シ得ベシ。

I. 突然變異的現象ノ發現ニハ大ナル酸化酵素作用力ノ共存スル事實ハ，菌ノ種類並ニ系統，培養基中ニ於ケル蔗糖濃度，培養基ノ種類，培養溫度並ニ培養期間等ノ諸點ヲ通ジテモ之ヲ肯定シ得ルトコロナリ。

II. 擬溶菌現象ノ發現ニモ亦大ナル酸化酵素作用力ノ存スル事實ハ本章第3節記載ノ實驗ニヨリ明確ナルトコロナリ。

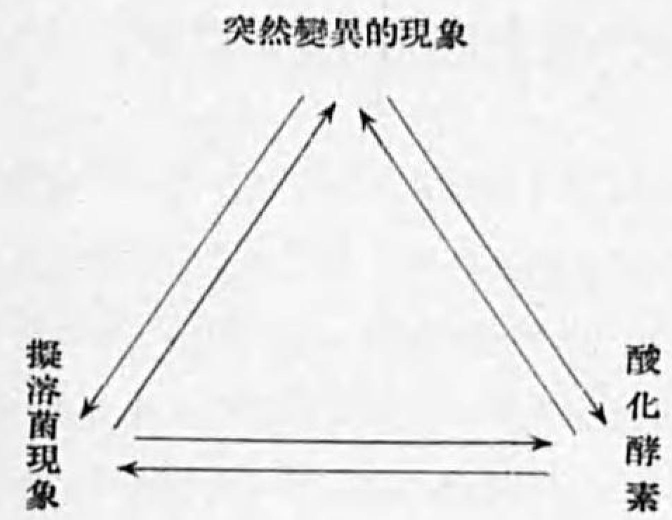
III. 馬鈴薯煎汁寒天培養基上ニ於ケル島狀準突然變異型ハ擬溶菌現象ヲ經テ發現スル





モノニシテ兩者間ニ密接ナル關係ヲ有スルコトハ前第2章ノ實驗ニ於テ明確ナルトコロナリ。

故ニ以上ノ3事項ヨリ次式ノ如キ關係成立シ得ベシ。




即チ島狀準突然變異型ト擬溶菌現象間ニ存スル密接ナル關係ハ，外部形態學的ニ證明シ得ルノミナラズ，(第2章)本菌ノ分泌スル酸化酵素ヲ通ジテ，化學的ニモ亦之ヲ肯定シ得ルモノナリ。

## 第 5 節 第 4 章 總 括

本章ニ於テハ稻胡麻葉枯病原菌ノ島狀準突然變異型ノ發現ト擬溶菌現象トノ關係ヲ酸化酵素ヲ通ジテ，化學的ニ檢討シタル實驗結果ヲ報告セリ。

突然變異的現象ヲ發現スルコト多キ培養基上ニ於テハ少キ培養基上ヨリモ酸化酵素作用力著シク强大ナリ。

突然變異的現象ヲ發現スルコト多キ菌ハ少キ菌ヨリモ概シテ强キ酸化酵素作用力ヲ示ス。

突然變異的現象ヲ發現スルコト多キ蔗糖濃度ニ於テハ少キ蔗糖濃度ヨリモ强キ酸化酵素作用力ヲ示ス。

本菌培養濾液ノ酸化酵素作用力ハ，24°C ニ於テ培養スルトキハ，20日目前後ニ於テ最高ニ達ス。

突然變異的現象ヲ發現スルコト多キ培養溫度ハ少キ培養溫度上ヨリモ概シテ强キ酸化酵素作用力ヲ示ス。

以上ノ實驗結果ヨリ突然變異的現象ト酸化酵素間ニハ密接ナル關係ヲ有スルコト明カナリ。

酸化酵素ノ發現ハ必ズ擬溶菌現象ノ發現ニ伴フモノニシテ，擬溶菌現象ト酸化酵素間ニハ極メテ密接ナル關係ヲ有ス。

以上ノ事實ヨリ突然變異的現象ノ內，島狀準突然變異型ノ或モノト擬溶菌現象間＝存スル密接ナル關係ハ之ヲ外部形態學的＝證明シ得ルノミナラズ（第2章），酸化酵素ヲ通ジテ化學的＝モ亦證明シ得ルモノト結論セリ。

## 第 5 章　島狀準突然變異型變現ノ機構

第1章乃至第4章＝於テ記述シタルトコロ＝ヨリテ明カナル如ク，島狀準突然變異型ノ或モノハ擬溶菌現象ナル過程ヲ經テ發現スルモノ＝シテ，島狀準突然變異型ノ或モノト擬溶菌現象間＝存在スベキ密接ナル關係ハ，之ヲ形態學的＝證明シ得ルノミナラズ，前記ノ如ク遺傳學的並＝化學的ノ3方面ヨリモ亦之ヲ證明シ得ルモノナリ。故＝擬溶菌現象發現ノ機構ハ即チ島狀準突然變異型ノ或モノノ發現ノ機構トシテ認メ得ベシ。

前第 XII 篇＝於テ詳記シタル如ク，擬溶菌現象ハ菌自身ノ分泌スル水溶液中＝，氣中菌絲ガ沈下浸漬セラルルコト＝ヨリテ發現スルモノ＝シテ，該水液中＝テ受クル氣中菌絲ノ變化ガ次代＝遺傳スルモノト認メザルベカラズ。水液中＝ハ菌自身ノ代謝產物ナル各種ノ酵素並＝化學物質等ヲ含有スルコトハ前實驗＝於テ明カナルトコロ＝シテ，水液中＝浸漬セラレタル氣中菌絲ガ是等各種ノ酵素並＝化學物質＝ヨリテ受ケタル菌絲細胞膜ノ溶解並菌絲原形質分離，捲縮等ノ如キ大變化ガ，更＝菌絲內部ノ細胞質並＝細胞核＝迄及ビ遂＝其ノ遺傳質＝變性ヲ來スモノト斷定シ得ベシ。

即チ島狀準突然變異型ノ或モノハ菌自身ノ代謝產物＝ヨリ發現スルモノト斷定シ得ラル。之ヲ要スル＝島狀準突然變異型ノ或モノハ，予（1932）[228] ガ既＝發表シタル如ク氣中菌絲ガ擬溶菌現象＝ヨリテ菌叢下面＝形成セラレタル水液中＝沈下浸漬セラレ，該水液中＝存スル菌自身ノ代謝產物，就中酵素並＝毒性化學物質等＝ヨリテ種々ノ作用ヲ受ケテ變性スル結果發現スルモノト看做シテ大過無カルベシ。

## 第 6 章　島狀準突然變異型發現ニ關スル予ノ代謝產物說ノ實驗的證明

予ハ前章＝於テ，島狀準突然變異型ノ或モノハ，菌自身ノ代謝產物＝ヨリテ發現スル事實ヲ，形態學的，遺傳學的並＝化學的ノ3方面ヨリ證明セシガ，若シ予ノ說＝シテ眞ナリトセバ，島狀準突然變異型ヲ實驗的＝該水液ヲ以テ發現セシメ得ル理ナリ。ヨツテ予ハ母菌ノ代謝產物ヲ無菌的＝採取シ，之＝母菌ヲ浸漬セシメ，突然變異的現象ノ發現





＝如何ナル影響ヲ及ボスヤヲ實驗セリ。

### 第 1 節　擬溶菌現象發現部水液ヲ以テスル實驗

**實驗方法**　供試培養基トシテハ島狀準突然變異型ノ發現最モ良好ナル2%蔗糖加用馬鈴薯煎汁寒天培養基ヲ用ヒ，培養溫度ハ島狀準突然變異型ノ發現並＝水液ノ形成最モ良好ナル 32°C ヲ選ベリ。斯ノ如キ條件下＝形成セラレタル擬溶菌現象發現部ノ水液ヲ，豫メ殺菌シ置ケル毛細管＝採集シ，殺菌セル 「ペトリ」皿內ノ凹窩硝子內＝移シ，該液＝供試菌菌絲ヲ浸漬セシメタル後盍硝子ヲ被ヒテ密閉シ，以テ該液ノ蒸發其他＝ヨル變化ヲ避ケツツ一定期間 32°C ノ恒溫器內＝保チタル後，該水液中＝浸漬セシメタル菌絲ヲ釣菌シ，齊藤氏醬油寒天培養基上＝平面培養シ，其發育性狀ヲ檢セリ。水液＝浸漬セシ供試母菌ノ菌絲ハ，第 XIII 篇第3章＝記述セシ如ク，島狀準突然變異型ヲ全ク發現スルコトナキ馬鈴薯煎汁寒天培養基（蔗糖ヲ添加セザルモノ）上＝，24°C ＝テ平面培養後7日目ノ若キ菌叢ヲ使用セリ。以上ノ操作ハ總テ無菌接種室內＝於テ行ヒ雜菌ノ混入ヲ避ケタルヲ以テ極メテ容易＝純粹培養＝成功スルヲ得タリ。

**實驗結果**　第127表＝示シタル如ク水液中＝浸漬セシ菌絲ヨリハ明カ＝島狀準突然變異型ノ發現スルヲ認メ得タリ。而シテ特＝興味アルハ，水液＝浸漬セシ時間ノ永キモノホド島狀準突然變異型ノ發現率大ナル事實＝シテ，第 XIII 篇第 3 章＝於テ記述セシ自然狀態下ノ場合ト全ク同一ナリ。此事實ハ島狀準突然變異型ノ或モノノ發現ガ菌ノ分泌セシ水液即チ代謝產物＝ヨリ發現スルヲ，實驗的＝證明シ得タルモノナリ。（第24圖版參照）

### 第 2 節　酵素液ヲ以テスル實驗

予ハ前章＝於テ，島狀準突然變異型ノ或モノノ發現ハ菌自身ノ代謝產物＝ヨリ發現スルヲ結論シ，就中菌ノ分泌スル酵素ハ重要ナル因子ノ一ナルヲ論ゼシガ，本節＝於テハ各種ノ酵素ノ混合浸出液＝供試菌ノ菌絲ヲ浸漬セシメ，次代＝於ケル發育性狀ヲ檢スルコトトセリ。

**實驗方法**　Merck 會社精製粉末酵素 Emulsin, Trypsin, Pepsin, Arbutin 並＝Papayotin 等5種ノ酵素ヲ 0.01 gr 宛採リ，是等ヲ 100 cc ノ蒸溜水中＝溶解セシメ，1晝夜 0°C ノ冷藏庫＝放置シタル後，Berkefeld 氏細菌濾過管ヲ通シテ，無菌的＝酵素濾液ヲ製シ，之＝第1節ノ場合ノ母菌ノ菌絲ヲ移植浸漬シ，其次代＝於ケル發育性狀ヲ檢スルコトトセリ。

第 127 表 擬溶菌現象部水液ニヨル島狀準突然變異型ノ發現

| 實驗回數 | 個体數 | 培養日數 | 浸漬日數 | 發育性狀 No. 1 | No. 2 | No. 3 | No. 4 | No. 5 | No. 6 |
|---|---|---|---|---|---|---|---|---|---|
| I | 5 | 4 | 2 | 正常菌ト同様 | 白色並ニ灰色綿狀菌叢ヲ生ズ. | 黒色菌叢上ニ白色島狀變異菌叢ヲ多數(30)生ズ. | 黒色菌叢上ニ白色島狀變異菌叢ヲ多數生ズ. | 黒色菌叢上ニ白色島狀變異菌叢ヲ多數生ズ. | |
| II | 6 | 7 | 2 | 黒色菌叢上ニ白色乃至桃色菌叢ヲ多量ニ生ズ | 全菌叢白色乃至灰白色綿狀菌叢ヲ生ズ. | 黒色菌叢上ニ白色島狀變異菌叢ヲ多數生ズ. | 灰色菌叢上ニ少量ノ桃色菌叢ヲ生ズ | 正常菌ト同様. | 灰色菌叢上ニ白色菌叢ヲ多量ニ生ズ |
| III | 4 | 9 | 9 | 正常菌叢ト同様ニシテ殆ド黒粉狀菌叢ヨリナル. | 左ニ同ジ. | 白色島狀變異菌叢ヲ生ズ. (20個位) | 發育セズ | | |
| IV | 4 | 9 | 9 | 發育セズ. | 發育セズ. | 發育セズ' | 發育セズ. | | |
| V | 5 | 9 | 9 | 灰白色菌叢ヲ多ク發育セシム. | 白色島狀變異菌叢ヲ甚シク多量ニ發現ス. (50個以上) | 左ニ同ジ. | 左ニ同ジ. | 灰白色菌叢上ニ白色島狀變異菌叢ヲ少量發現ス. | |
| VI | 4 | 9 | 9 | 白色島狀變異菌叢ヲ生ズ. (20個位) 他ハ白粉狀菌叢ヨリナル. | 左ニ同ジ. | 左ニ同ジ. | 左ニ同ジキモ白色島狀變異菌叢少ナシ. (10個位) | | |

**實驗結果** 第128表ニ示ス如ク，前記ノ場合ト同様ニ母菌ヲ酵素液ニ浸漬スルコトニヨリ，多クノ島狀準突然變異型ヲ發現セシメ得タレドモ擬溶菌現象發現部水液ヲ用ヒタル場合ヨリモ其程度弱少ナリ。

## 第 3 節 高濃度ノ蔗糖液ヲ以テスル實驗

擬溶菌現象發現部ノ水液中ニ沈下セシ氣中菌絲ハ屢々原形質分離其他ノ形態的變化ヲ起スヲ以テ， 人爲的ニ 2 mol. 蔗糖液中ニ供試母菌ノ菌絲ヲ浸漬シ以テ原形質分離ヲ發現セシメタル菌絲ヨリ島狀準突然變異型ヲ發現スルヤ否ヤヲ檢セントセリ。

**實驗方法** 2 mol. 蔗糖液ヲ BERKEFELD 氏細菌濾過管ヲ用ヒテ無菌的蔗糖液ヲ調製シ，之ニ供試母菌菌絲ヲ浸漬セシメタリ。

**實驗結果** 第129表ニ示ス如ク高濃度ノ蔗糖液ハ，島狀準突然變異型ノ發現ニ殆ド



第 128 表 酵素混合液ガ菌ノ發育性狀ニ及ボス影響

| 實驗回數 | 浸漬日數 | 使用個体數 ＼ 發育性狀 | ペトリ皿番號 No. 1 | No. 2 | No. 3 | No. 4 | No. 5 | No. 6 | No. 7 | No. 8 | No. 9 | No. 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 2 | 10 | 正常ナル黒色粉狀菌叢ヲ發育セシム. | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ | 灰色ノ氣中菌絲ヲ多量ニ形成ス. | 右ニ同ジ |
| II | 5 | 10 | 正常ナル黒色粉狀菌叢上ニ白色島狀菌叢ヲ多數發生ス | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ | 殆ド正常ナル黒色粉狀菌叢ヨリナルモ中央部ニハ少量ノ白色菌叢ヲ發育ス. | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ |
| III | 7 | 10 | 灰色氣中菌絲多量ニ發育ス | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ | 灰色，白色，桃色ノ氣中菌絲ヲ發育ス. | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ | 右ニ同ジ |

關係無キモノノ如シ。

第 129 表　高滲透壓ガ菌ノ發育性狀ニ及ボス影響

| 實驗回數 | 個体數 | 浸漬日數 | 發育性狀 | | | |
|---|---|---|---|---|---|---|
| | | | No. 1 | No. 2 | No. 3 | No. 4 |
| I | 5 | 2 | 黑色菌叢上ニ少數ノ白色島狀變異菌叢ヲ生ズ. | 左ニ同ジ. | 殆ド黑色菌叢ヲ生ズ. | 左ニ同ジ. |
| II | 7 | 5 | 灰白色綿狀菌叢ヲ發育セシム. | 左ニ同ジ. | 發育セズ. | 發育セズ. |

## 第 4 節　考　察

以上ノ實驗結果ヨリ，島狀準突然變異型ノ或モノノ發現ハ，菌ノ分泌スル水液即チ代謝產物ヲ以テ，實驗的ニ發現セシメ得ルモノニシテ，島狀準突然變異型發現ニ關スル予ノ代謝產物說ハ之ヲ實驗的ニ證明シ得タリ。

島狀準突然變異型ハ人爲的ニ調製シタル酵素液ニヨリテモ亦發現セシメ得ルモ，擬溶菌現象發現部水液ニヨル場合ヨリモ微弱ナリ。此原因ハ擬溶菌現象部水液中ニ存在スベキ酵素ト同一狀態ノ酵素液ヲ使用シ得ザリシ點更ニ酵素以外ノ化學物質モ亦島狀準突然變異型ノ發現ニ關與スルヲ暗示スルモノノ如シ。而シテ高濃度（2 mol.）ノ蔗糖液ハ島狀準突然變異型ノ發現ニ殆ド關係無キヲ知レリ。

以上ノ實驗結果ハ島狀準突然變異型ノ或モノノ發現ガ菌自身ノ代謝產物中特ニ酵素並ニ化學物質ニ影響セシメラルルコト大ナルヲ思考セシム。一方島狀準突然變異型ノ發現ト密接ナル關係下ニアル擬溶菌現象ノ發現モ亦菌自身ノ代謝產物中特ニ酵素並ニ化學物質ニ影響セシメラルルコト大ニシテ，兩者又實驗的ニ一致ノ結果ヲ得タリ。

之ヲ要スルニ絲狀菌ニ於ケル突然變異的現象中，島狀準突然變異型ノ或モノハ菌自身ノ代謝產物ニヨリテ發現セシメラルルモノニシテ，就中酵素並ニ化學物質ニ影響セシメラルルコト大ナルヲ實驗的ニ立證シ得タリ。

# 第 7 章　母菌ノ細胞學的研究

以上各篇ニ亙リテ記述シタル如キ絲狀菌ニ於ケル突然變異的現象ガ，眞ノ Mutation ニヨリテ發現セシモノナルヤ或ハ其他ノ原因ニヨルモノナリヤ，若シ Mutation ナリトセバ如何ナル種類ノ Mutation ナルカ等ノ根本問題ヲ解ク鍵ハ一ニ母菌ノ細胞學的研究ニ俟タザル可ラズ。

子囊菌ニ屬スル絲狀菌ハ有性生殖ニヨリテ形成セラルル子囊胞子（Ascospore）形成時ニ於テハ，細胞核特ニ大形トナリ染色體ヲ檢シ得ルモノ無キニ非ザルモ，是等ハ寧ロ異例ニ屬シ，一般絲狀菌ノ細胞核ノ極メテ小形ナルト，子囊胞子ヲ形成スルコト稀ナル等ノ爲メ，染色體ノ研究セラレタルモノ極メテ少ク，就中無性生殖時代ト思惟セラルル菌絲並ニ分生胞子ノ染色體ニ至リテハ，之ヲ報告セシモノアルヲ知ラズ。

DICKINSON (1933) (104) ハ *Helminthosporium pedicellatum*, *H. monoceras* 並ニ *Brachysporium* sp. 等ノ諸菌ハ總テ分生胞子並ニ菌絲共ニ多核ナルモ，分生胞子ハ形成初期ニ於テハ1核ノミ存シ，成熟マデニ數回ノ核分裂ニヨリテ多核トナル事實ヲ觀察シ，前記諸菌ノ多核ハ總テ1核ニ由來スルヲ確メ，*Fusarium fructigenum* 並ニ *F. vas-infectum* モ亦分生胞子並ニ菌絲共ニ1核ナルヲ確メ，兩屬菌ニ於テ屢々發現スル永久的ノ變異現象ハ Mutation ト看做スベキモノナルヲ主張セリ。

GRAHAM (1935) (140) ハ *Helminthosporium gramineum* ノ分生胞子並ニ菌絲ハ多核ニシテ，而モ形成初期ノ分生胞子內ニモ多核ノ存スルヲ發表シタレドモ，分生胞子形成初期ノ多核ハ，DICKINSON ガ觀察セシ如ク最初1核ナルモ，其後ノ分裂ニヨリ多核トナリタルモノヲ觀察セシ廣無キニ非ラズ。

SCHOENEFELDT (1935) (303) ハ *Neurospora tetrasperma* 並ニ *N. sitophila* ノ子囊胞子ハ1核ナルモ，發芽時ニハ既ニ多核トナリ，發芽セシ菌絲又多核ナルヲ報告シ，菌絲並ニ分生胞子ノ多核ハ1核ニ由來セシヲ證セリ。

ULLSTRUP (1935) (346) モ亦 *Gibberella Saubinetii* ノ子囊胞子ヨリ生ジタル菌絲內ノ細胞核ハ總テ其源ヲ同一ニナシ遺傳學的ニ同一ナルヲ論ゼリ。

供試母菌ノ分生胞子並ニ菌絲內ノ多核ガ1核ニ由來セシモノナルヤ否ヤヲ知ルハ突然變異的現象ノ性質闡明上極メテ緊要ナル事項ナリ。

予ハ目下各種ノ絲狀菌ノ細胞學的研究ニ從事中ナレバ本問題ニ關シテハ他日詳細發表ノ機アルベシ。





## 第 1 節　分生胞子並ニ菌絲內ノ細胞核數

**實驗方法**　豫メ齊藤氏醬油培養液中ニテ培養セシ適期ノ菌絲並ニ分生胞子ヲ清洗セル［スライド］硝子上ノ水滴中ニ置キ 28°C ノ定溫器內ニテ菌休ノ捲縮スルコト無キ樣注意シテ水分ヲ蒸發セシメ，直チニ，固定液中ニテ固定セシモノ，並ニ清洗セル［スライド］硝子ニ豫メ薄キ透明寒天膜ヲ塗リ，之ニ齊藤氏醬油培養液ヲ適下シ，液中ニ分生胞子ヲ培養シ適期ニ至リ，直チニ固定セシモノ等種々ナル方法ヲ用ヒタリ。固定，染色ニ當リテハ常法ニ從ヒ，固定液トシテ FLEMMING 氏液，染色劑トシテハ HEIDENHEIN'S Iron Alum Haematoxylin ヲ使用セリ。

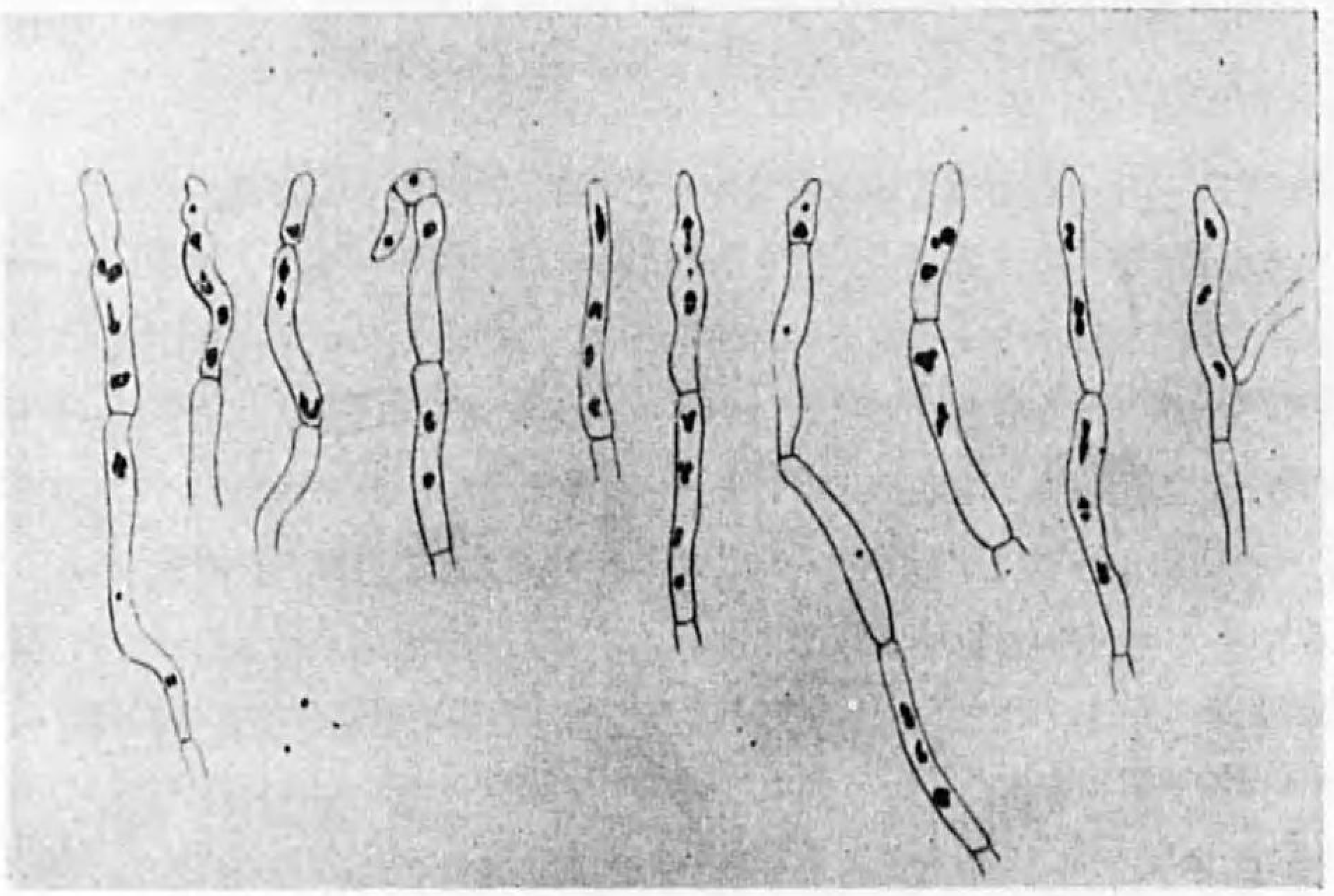
**實驗結果**　第103表ニ示シタル如ク菌絲細胞測定數183箇休中1箇乃至6箇ノモノ最多ニシテ169箇ヲ占メ，2箇，4箇並ニ6箇等ノ偶數ヲ示スモノ最多ナリ。而シテ各細胞核ハ第25圖版，並ニ 第7, 8圖ニ示ス如ク正ニ分裂セントシツヽアルモノ甚ダ多シ。此2事實ハ1細胞內ニ於ケル多核ハ，1核ノ分裂ニヨリテ增殖セシモノナルヲ證スルモノニシテ，奇數ヲ示スモノニアリテハ內1核ガ未ダ分裂セザリシニ由ルモノナルベク，先端細胞ノ1核ハ形成初期ニシテ未ダ分裂ヲ起サザルモノ，中間細胞ノ1核ハ何等カノ原因ニヨリ其後ノ核分裂ヲ起サザルニヨルモノト看做シ得ベシ。

第 130 表　稻胡麻葉枯病原菌菌絲ノ細胞核數

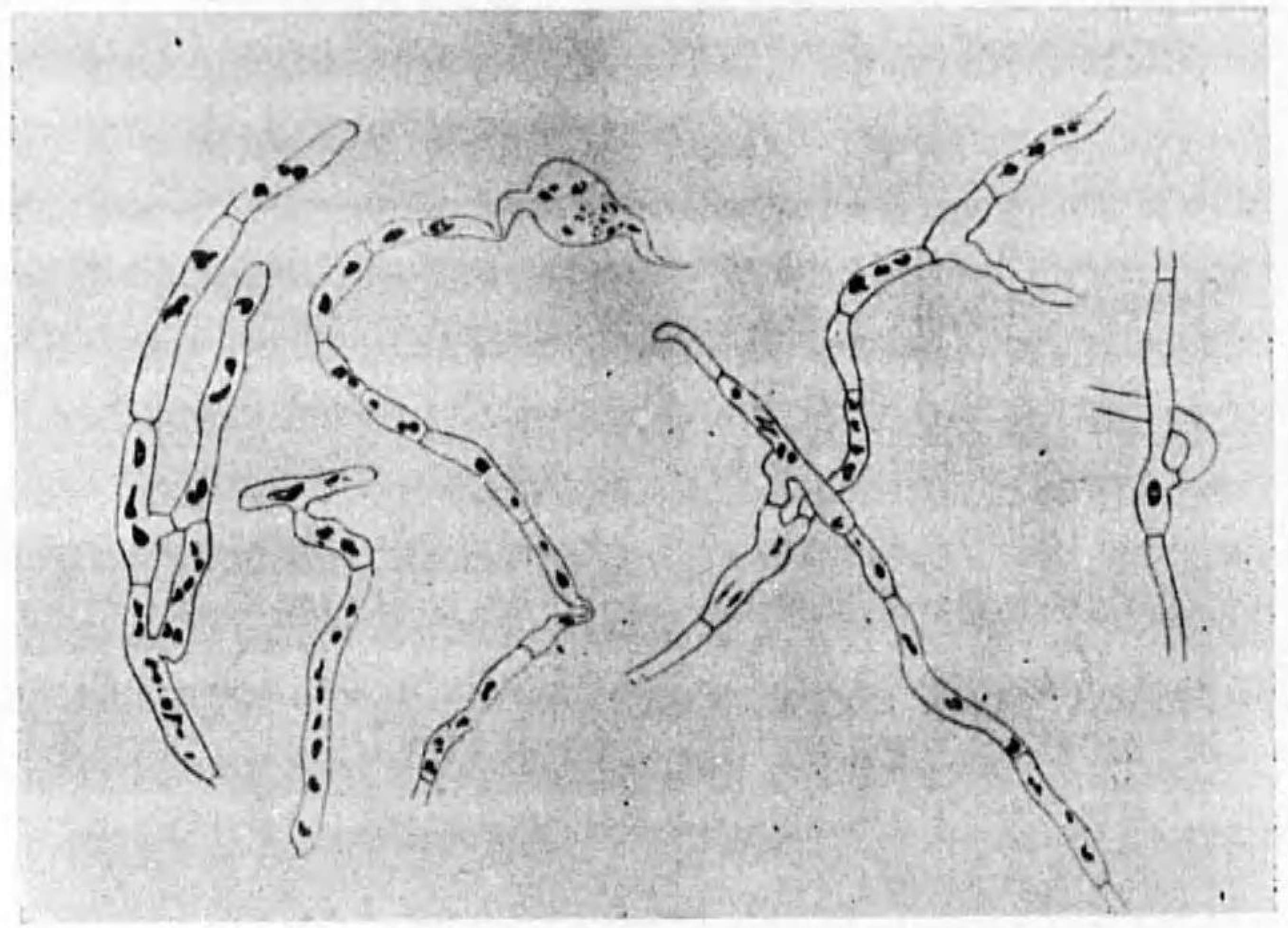
| 細胞核數 | 1箇 | | 2 箇 | 3 箇 | 4 箇 | 5箇 | 6箇 | 7箇 | 8箇 | 9箇 | 10箇 | 11箇 | 12箇 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 先端細胞 | 中央細胞 | | | | | | | | | | | |
| 員　數 | 9 | 6 | 39 | 21 | 63 | 6 | 25 | 2 | 6 | 1 | 3 | 1 | 1 |

次ニ分生胞子內ニ於ケル細胞核數ヲ考察スルニ第25圖版第3圖，並ニ 第5圖 ニ示ス如ク，分生胞子形成初期ニ於テハ明カニ1核ニシテ其後ノ核分裂ニヨリ多核トナル。

以上ノ實驗結果ノ示ス如ク，分生胞子形成初期ニ於テハ明カニ1核ニシテ，此分生胞子內ノ1核ハ核分裂ニヨリテ多核トナリ，分生胞子ノ發芽シテ生ゼシ菌絲ノ先端細胞又1核ナルモ，其後ノ速カナル核分裂ニヨリ多核トナルモノニシテ分生胞子並ニ菌絲內ノ多核ハ總テ同一形質ノ細胞核ヨリ成ルコト明カナリ。



第 7 圖 先端細胞ノ核ノ形成順序並ニ速カナル核分裂ニヨリ多核トナルヲ示ス。(×1200)



第 8 圖 多核細胞ト核分裂ヲ示ス。(×1200)



第 131 表 菌絲內ニ於ケル細胞核ノ大サ

| 細胞核ノ形狀 | 圓形 | | | | | | | 短紡錘形並ニ三角形 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 階級 (μ) | 0.5×0.5 | 0.8×0.8 | 1.0×1.0 | 1.5×1.5 | 1.65×1.65 | 1.7×1.7 | 2.0×2.0 | 1.30×0.8 | 1.70×1.2 | 1.78×1.5 | 1.80×1.2 | 1.90×1.4 | 2.00×1.50−1.75 | 2.30×1.4−1.7 | 2.46×1.40−2.00 | 2.78−2.95×1.7 | 3.00×1.8−2.0 | 3.28×1.4−1.9 | 3.54×2.0 |
| 員數 | 13 | 5 | 1 | 1 | 1 | 6 | 2 | 1 | 14 | 2 | 2 | 2 | 3 | 2 | 4 | 2 | 2 | 4 | 2 |

第 132 表 對峙培養ニヨル菌絲癒着試驗

| | Helminthosporium Oryzae | Helminthosporium Oryzae-microsporum | Piricularia Oryzae | Brachysporium Tomato | Saltant of Helminthosporium Oryzae | Saltant of Brachysporium Tomato |
|---|---|---|---|---|---|---|
| Helminthosporium Oryzae | × | − | + | + | ± | ± |
| Helminthosporium Oryzae-microsporum | − | × | + | | | |
| Piricularia Oryzae | + | + | × | ± | −(?) | |
| Brachysporium Tomato | + | | −(?) | × | − | × |
| Saltant of Helminthosporium Oryzae | ± | | | − | × | |
| Saltant of Brachysporium Tomato | ± | | | × | | × |

×……兩菌絲ノ癒着 (兩菌絲間ノ細胞膜存在).
+……兩菌絲錯綜スルモノ.
−……嫌觸現象ヲ現スモノ.
±……兩菌絲錯綜スルモ菌絲ノ癒着ヲ證明シ得ザルモノ.

### 第 2 節　細胞核ノ大サ並ニ形狀

菌絲内ニ於ケル細胞核ノ大サ並ニ形狀ハ實驗材料ノ如何ニヨリ甚シキ差違ヲ示スモノニシテ，圓形，短紡錘形，三角形等諸種ノ形態ヲ呈ス。而シテ圓形ヲ呈スル場合ハ最小ニシテ 0.5－2×0.5－2μ ノ大サヲ有シ，休止核ト認メ得ベク，大ナル場合ハ短紡錘形乃至三角形等ヲ呈シ。短紡錘形ヲ呈スル場合ハ最大ニシテ核分裂ノ完了直前ノ細胞核，三角形ヲ呈スル場合ハ中位ノ大サヲ示シ，短紡錘形ノ細胞核ガ中央ヨリ 2 個ニ分裂セシ結果生ジタルモノト認メ得ラル。(第 25 圖版並ニ 131 表參照)

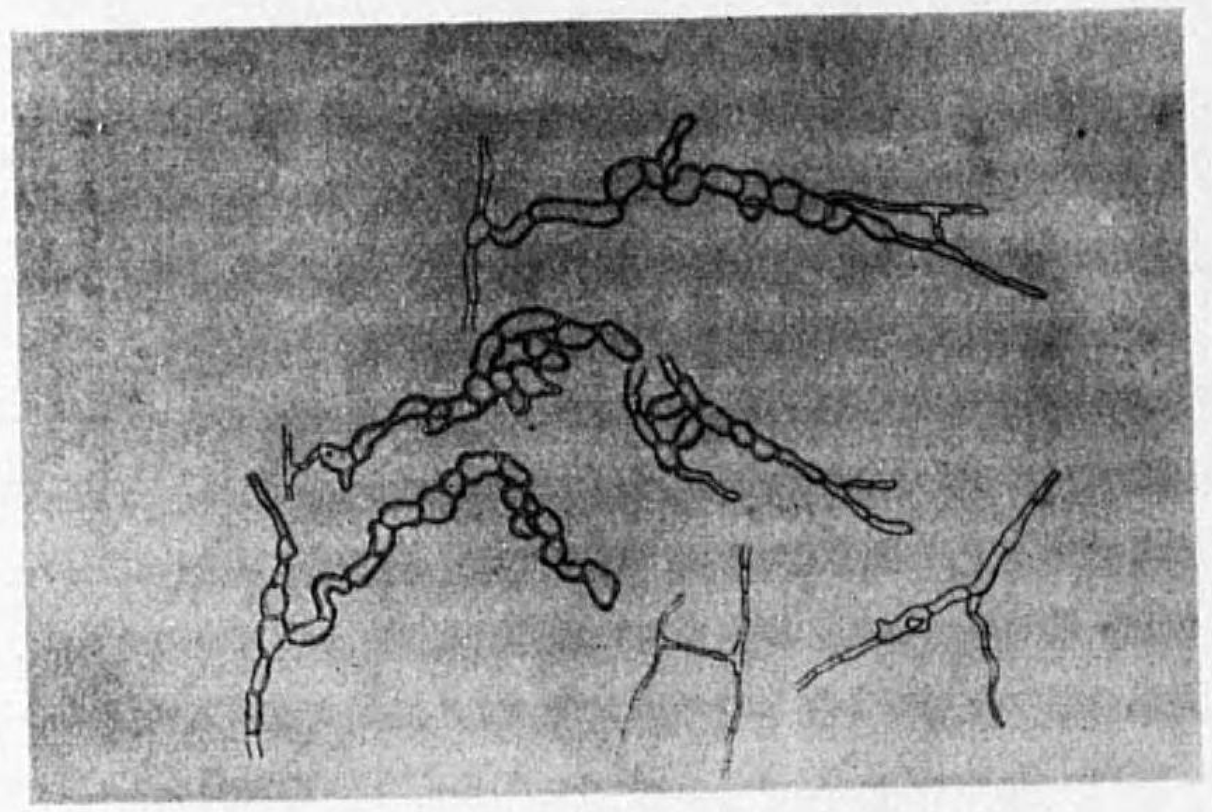
以上ノ實驗結果ヨリ菌絲並ニ分生胞子内ノ多核ハ 1 核ニ其源ヲ發スルモノニシテ總テ同一形質ノ細胞核ナルヲ知ル。而シテ SCHOENEFELDT (1935) (303) ハ子嚢菌類ニ屬スル *Neurospora* 屬菌ニ於テ，無性生殖時代ト思惟セラルル菌絲並ニ分生胞子ノ多核ハ總テ其源ヲ有性生殖ノ結果生ジタル子嚢胞子ノ 1 核（原數核）ニ發スルモノニシテ，總テ同一形質ノ細胞核ナルヲ發表セリ。從ツテ供試母菌タル稻胡麻葉枯病原菌（*Ophiobolus Miyabeanus* = *Helminthosporium Oryzae*）ノ分生胞子並ニ菌絲内ノ多核ハ其源ヲ同一核（原數核）ニ發シタル同一形質ノ細胞核ト認メ得ベク，同一形質ノ細胞核（原數核）ノミヲ有スル單個分生胞子ヨリ出發セル供試稻胡麻葉枯病原菌ノ純粹培養ハ　**純系** (**Pure line**) ナリト稱シ得ベシ。

## 第 8 章　菌絲ノ癒着 (Anastomosis, Hyphal fusion) ニ關スル實驗

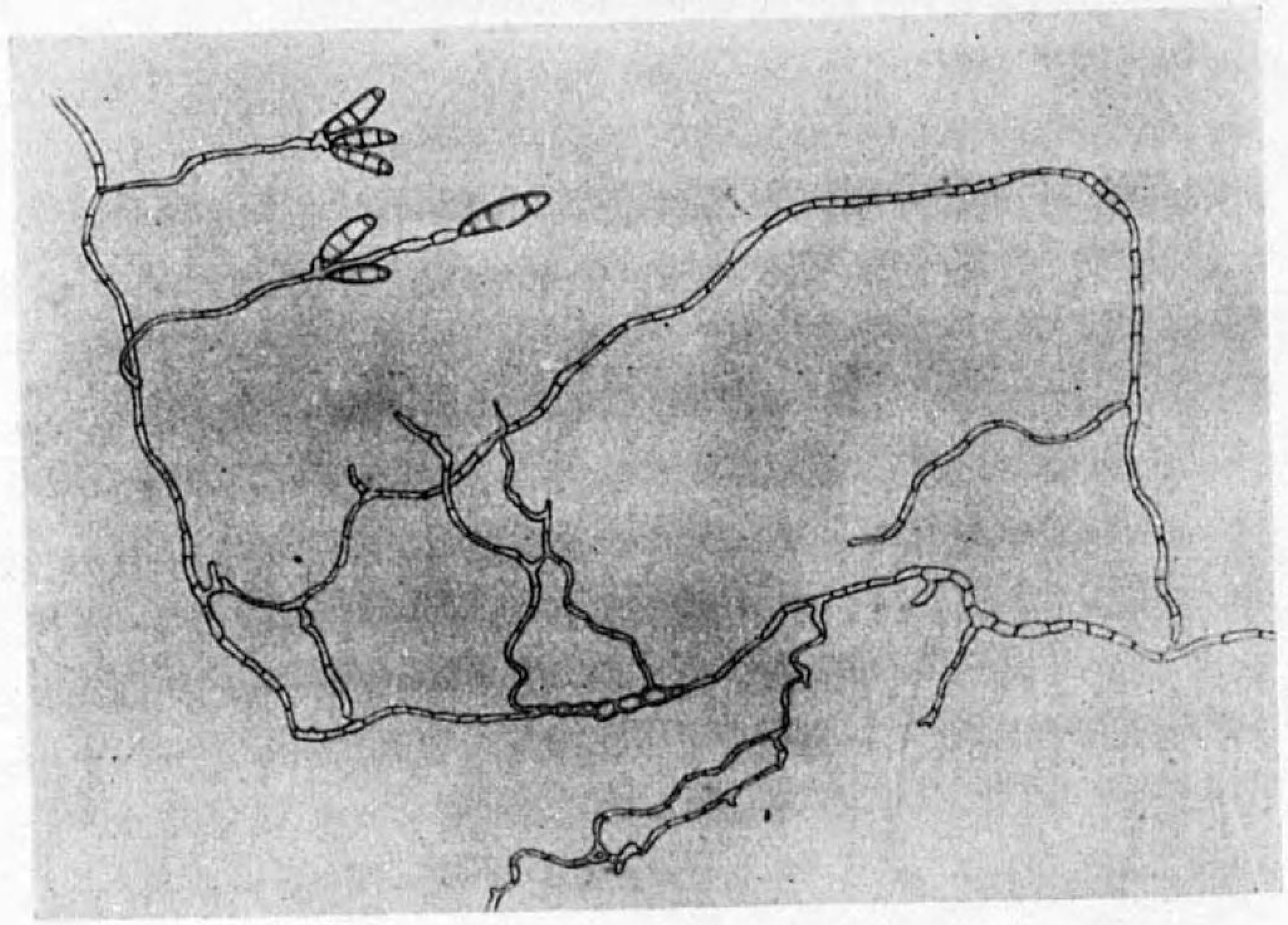
BRIERLEY (1920, 1931) (42–46) ハ絲狀菌ノ同一種 (Species) 或ハ系統ハ勿論ノ事，異ナル種 (Species) 間ニ於テモ兩菌絲ノ癒着 (Anastomosis, Hyphal fusion) ヲ起ス事アルヲ指摘シ，此場合ニ於テ異形質ノ細胞核混入ノ虞アルヲ推定シ，從來突然變異 (Mutation) トシテ發表セラレタル現象モ，之ヲ菌絲内ニ於ル異形質ノ細胞核ノ分離 (Mixochimaera) ニ基因スルモノト看做セリ。ヨツテ予ノ實驗ノ場合ニ發現シタル準突然變異菌ガ果シテ母菌ト，菌絲ノ癒着ヲナスヤ否ヤヲ檢セントシ本實驗ヲ施行セリ。同時ニ數種ノ他ノ絲狀菌ヲモ供用シ以テ本問題ヲ闡明セントセリ。

**實驗方法**　供試培養基トシテハ島狀準突然變異型ノ發現良好ナル齊藤氏醤油寒天平面培養基ヲ使用シ，供試兩菌ヲ對峙培養シ，28°C ノ恒溫器内ニ保チ兩菌叢發育シテ

相接スル=及ビ，直接蓋硝子ヲ被ヒ檢鏡セリ。然シテ癒着菌絲ノ細胞學的研究=當リテハ前章=於テ記述シタル如キ⌊スライド⌉硝子上ノ培養基ノ薄膜上=兩菌ヲ對峙培養シ兩菌叢相接スル=及ビ固定，染色後檢鏡セリ。



第9圖 稻ブラキスポリウム病原菌ノ準突然變異菌=於ケル菌絲ノ癒着ヲ示ス。



第10圖 同 上





**實驗結果** 第132表=示ス如ク菌絲ノ癒着ハ同一種間ノ同一系統=於テハ極メテ普通=起ル現象ナレドモ，異種間=於テハ兩菌叢相錯綜スル場合アレドモ兩菌絲ノ癒着ハ之ヲ發見シ得ズ。若シ存スルモ極メテ稀=生ズルモノト解セラル。獨リ⌊コゴメガヤツリ⌉葉枯病原菌 (*Brachysporium Tomato* (Ell. et Barth.) Hiroe et Watanabe) ト其準突然變異菌ノミハ兩菌絲ノ癒着ヲ生ズルヲ發見セリ。Buller (1933)(56) ハ菌絲ノ癒着ヲ詳論シ，之=（1）兩菌絲ノ單ナル接觸，（2）兩菌絲密着スルモ兩菌絲ノ密着部=細胞膜ノ存スル場合，（3）兩菌絲密着部ノ細胞膜溶解シ原形質ノ混和スル場合等ヲ擧ゲタリ。今予ノ⌊コゴメガヤツリ⌉葉枯病原菌ト其準突然變異菌間=於ケル菌絲ノ癒着部ヲ精檢スル=明カナル細胞膜ヲ有シ，原形質混入ノ事實ヲ認メ難キモ，同一種間ノ同一系統=於ケル場合=ハ兩菌絲ノ癒着部=細胞膜存セザル場合屢々ナレドモ，同一系統ナレバ異形質ノ原形質混入ノ虞ナシ。然シテ Brierley ノ主張スル異形質ノ原形質混入ハ兩菌絲間ノ細胞膜ノ溶解ヲ必要條件トナスモノト考ヘラルレドモ，Buller (1933)(56) ノ研究=ヨレバ菌絲細胞ノ隔膜=ハ中央部=原形質並=細胞核ヲ通過セシメ得ル孔ヲ有スルヲ發表セリ。果シテ兩菌絲癒着部ノ細胞膜=モ斯ル孔ヲ有スルヤ否ヤハ未ダ判明セザルヲ以テ，⌊コゴメガヤツリ⌉葉枯病原菌ノ場合ノ如キ癒着部細胞膜ノ溶解セザル場合=於ケル原形質混入ノ有無=就キテハ容易=斷定ヲ下シ得ザレドモ，少クモ原形質混入ノ極メテ困難ナルハ推定=難カラズ。之ヲ要スル=供試稻胡麻葉枯病原菌ト其準突然變異菌間=ハ菌絲密着ノ事實ヲ認メ難ク，從ツテ Brierley (1922–1929)(43–46) ノ主張セシ如キ Mixochimaera ノ存在ヲ肯定シ得ズ。

# 第 XIV 篇　論義並ニ結論（永久的變異ニ關スル諸説ノ實驗的批判）

絲狀菌ニ於ケル永久的ノ變異現象ハ之ヲ（1）**突然變異**（Mutation）或ハ**突然變異的現象**（Saltation）ニ歸セシムルモノ，（2）**Mixochimaera**（Heterocaryosis）ニ歸セシムルモノ（3）**雜婚或ハ雜種ノ分離**（Hybridization or Segregation）ニ歸セシムルモノ（4）**永續變異**（Dauermodifikation, Semi-permanent Variation）或ハ**細胞質遺傳**（Cytoplasmic Inheritance）ニ歸セシムルモノ等甲論乙駁何等ノ定説ナキ現狀ナルヲ以テ，予ハ予ノ得タル絲狀菌ニ於ケル永久的ノ變異現象ガ前記諸説中果シテ如何ナル現象ニヨリ發現セシモノナリヤニ就キ，予ノ實驗的研究ヲ基礎トシテ論及スルト共ニ，一般絲狀菌ノ永久的變異ニ關スル諸説ニ對シ實驗的批判ヲ試ムルトコロアラントス。

## 第 1 章　Mixochimaera, Heterocaryosis 説ノ考察

Burgeff (1914, 1915) [57] ハ多核菌絲ヲ有スル *Phycomyces nitens* ニ於テ同一菌絲細胞内ニ異形質ノ多核ガ存在シ菌絲成長ノ途中ニ於テ屢々異形質ノ核ガ分生シ，新シキ菌叢ヲ生ズルヲ報告シ，**Mixochimaera** ナル名稱ヲ與ヘタリ。而シテ斯ノ如ク同一細胞内ニ異形質ノ核ノ共存スルニハ次ノ如キ場合アルヲ報告セリ。即チ異形質ノ細胞核ヲ有スル2品種ノ菌絲癒着（Anastomosis）ニ基ヅク場合並ニ細胞核ノ或ルモノガ，突然變異ニヨリ新形質ノ核ヲ生ズル場合之ナリ。同氏（1925）[59] ハ *Phycomyces Blakesleeanus* ニ於テモ殆ド同一現象ヲ認メタリ。

Brierley (1920, 1925) [41, 42, 43, 44] ハ同一種 (Species) ノミナラズ異ナル種 (Species)，甚シキ場合ニ於テハ異ナル屬（Genus）間ニモ屢々兩菌絲ノ癒着ヲ生ズルヲ觀察シ，異形質ノ細胞核ノ混入ヲ推定シ，此 Mixochimaera ノ現象ヲ以テ絲狀菌ニ於ケル永久的變異現象發現ノ唯一ノ原因トシテ擧ゲ，之ヲ强力ニ主張セシガ，其後菌絲細胞核ガ異形質ノ核ヲ混入スル事實ヲ實驗的ニ證明スルコトノ極メテ困難ナル點ヨリ，前説ヲ緩和シテ，永久的ノ變異現象ヲ Continuous and discontinuous variation ナル名稱ヲ以テ取扱ヒ其原因ノ一トシテ Mixochimaera ヲ擧グルニ至レリ。





Hansen 並ニ Smith (1932) [152][153] ハ *Botrytis cinerea* ノ分生胞子並ニ菌絲ハ多核ヲ有シ，加ルニ菌絲ノ癒着極メテ普通ニ行ハレ，異形質ノ細胞質並ニ核ノ混入ヲ觀察シ得タリトナシ，本菌ニ於ケル變異現象ヲ Mixochimaera ニ歸セシメタリ。

從來ハ菌絲癒着ノ事實ヨリ異形質ノ細胞核ノ混入ヲ推定スルニ止リタルガ，氏等ハ之ヲ細胞學的ニ，兩菌絲間ノ菌絲（Connecting hyphae）中ニ核ノ移行スル事實並ニ之ヨリ新菌絲ヲ發生スルヲ證明シ，從來ノ Mixochimaera 説ヲ一層實驗的ニ有力付ケタルモ細胞核ノ接合ハ之ヲ觀察シ得ザリキ。然シテ同氏等ハ前記ト殆ド同樣ナル結果ヲ *Phoma terrestris*, *Verticillium alboatrum*, *Ramularia* sp. 並ニ *Fusarium* sp. 等ニ於テモ觀察シタルヲ以テ，不完全菌類ノミニ止ラズ，子囊菌類並ニ擔子菌類ニ於テモ，永久的變異現象ヲ考察スルニ當リテハ，單ニ Mutation ニ歸セシムルコトナク，斯ノ如キ Mixochimaera ノ事實ヲ最初ニ考慮スベキヲ唱ヘタリ。更ニ (1934) [154] ニ至リ，*Botrytis allii* ト *B. ricini* ヲ混合培養セシニ兩菌絲間ニ癒着起リ之ヨリ生ジタル分生胞子ノ特性ヲ檢セシニ兩種ニ屬スルモノ並ニ兩種ノ何レニモ屬セザルモノノ3型ヲ生ジ，之ヲ反覆スルニ常ニ3型ヲ發現スル事實ヨリ Mixochimaera ヲ假定セリ。

Graham (1935) [140] ハ *Helminthosporium gramineum* ノ分生胞子並ニ菌絲細胞ハ多核ニシテ菌絲ノ癒着ヲ起シ，細胞核ハ一方ニ移行スルヲ觀察シ，本菌ニ於ケル變異ノ原因トシテ Mixochimaera 説ヲ主張セリ。

以上諸氏ノ説ハ共ニ絲狀菌ノ永久的變異ノ原因トシテ Mixochimaera ヲ擧ゲ，菌絲並ニ分生胞子細胞ノ多核ヲ一ニ菌絲ノ癒着ニ基ヅク細胞核混入ノ假定ニ歸セシメタリ。

然ルニ Leonian (1930) [206] ハ Mixochimaera ガ果シテ實在スルヤ否ヤヲ檢セントシ變異ノ發現甚シキ *Fusarium moniliforme* ノ A. B 2系ヲ同一「ペトリ」皿内ニ混合培養シ，形成セラレタル數百ノ分生胞子ヲ檢シタルニ内4個ノ分生胞子ガ A. B 2系ノ中間ノ性質ヲ有スル C系ナルヲ知リ，一見 Mixochimaera ヲ肯定セシムルガ如キモ，其後之ヲ詳細檢討セシニ B系ハ常ニ B並ニ C系ノ分生胞子ヲ形成シ，C系ハ常ニ C並ニ B系ノ分生胞子ヲ形成スルヲ知リ，Mixochimaera ノ結果ナラザルヲ證スルト共ニ，有性生殖ナラザル單ナル菌絲ノ癒着ニ基ヅク原形質混合ノミニテハ新シキ性質ヲ發現セザルモノニシテ，本菌變異ノ原因トシテ Mixochimaera ヲ擧ゲ得ズト説ケリ。

Paxton (1933) [265] ハ *Helminthosporium sativum* ノ永久的變異ハ Czapeck 氏培養基上ニ於テハ發現セザルモ，之ヨリ $NaNO_3$ ヲ除去シタル培養基上ニ於テハ非常ニ多クノ變異ヲ發現スルモノナルガ，此際變異ノ發現多キ方モ少キ方モ共ニ殆ド同樣ニ多クノ菌絲癒着ヲ認メ得ルヲ以テ，菌絲癒着ヲ變異ノ原因トシテ擧ゲ得ザルヲ發表セリ。

HANSEN 並ニ SMITH (1935)[155] ハ *Botrytis allii* ト *B. ricini* ヲ混合培養シタル際ニ形成セラレタル分生胞子20箇中，6箇ハ母菌ノ一方，9箇ハ他ノ母菌ノ一方殘リ5箇ハ何レニモ屬セザルモノナルヲ認メ，之ハ恐ラク Mixochimaera ノ結果ナラント推定セシガ,[154] 之ヲ實驗的ニ證明セントシテ，母菌ノ何レニモ屬セザル5箇ノ分生胞子カラノ培養ヲ詳細檢シタルニ，永ク其ノ特性ヲ傳ヘ變化スルコトナキヲ以テ Mixochimaera ニ非ラザルヲ證セリ。

以上記述セシ如ク絲狀菌ニ於ケル永久的ノ變異現象發現ノ原因トシテノ Mixochimaera 說ハ之ヲ强力ニ主張シタル BRIERLEY 先ヅ自說ヲ緩和シ，永久的變異現象發現ノ原因ノ一部トシテ擧グルニ止メ，其後 Mixochimaera 說ヲ强力ニ主張セシ HANSEN 並ニ SMITH 兩氏モ亦 Mixochimaera ト共ニ他ノ原因ヲモ肯定スルニ至レリ。斯ノ如ク Mixochimaera 說ハ絲狀菌ノ永久的變異現象發現ノ原因ノ全部ナラズシテ單ニ一部ヲナスニ過ギザルモノナリ。

Mixochimaera 說ノ主体ハ，菌絲ノ癒着ニ基ヅク異形質ノ細胞質並ニ細胞核ノ混入ヲ前提トナシ，新シキ性質ヲ有スル菌絲ノ出現ヲ其結果トナスヲ以テ，絲狀菌ニ於ケル永久的ノ變異現象ヲ Mixochimaera 說ヲ以テ說明セントセバ，先ヅ第一ニ異形質ノ菌絲ガ，容易ニ癒着ヲナシ得ルヤ否ヤヲ檢セザル可ラズ。

de BARY (1884)[98] ガ絲狀菌ニ於ケル兩菌絲ノ癒着ヲ觀察シ Anastomosen ナル名稱ヲ以テ發表セシ以來，之ヲ報告セシ者尠ナカラズト雖モ之ヨリ前旣ニ TULASNE(1863), WORONIN (1870), BREFELD (1877, 1881)[38][39] 等ノ諸氏ニヨリ子嚢菌類ニ於テ其ノ發現ヲ報ゼラレタリ。

DRECHSLER (1923)[120] 並ニ 西門 (1923)[261] ハ *Helminthosporium* ニ於テ觀察シ，HEIN (1929)[160] ハ之ヲ Cell fusion トシテ報告シ，SLEUMER (1932)[312] ハ *Ustilago Zeae* ノ小生子間ニ於テ，NEAL 並ニ GUNN (1933)[256] ハ *Phymatotrichum omunivorus* ニ於テ，LINDEGREN (1934)[210][211] ハ *Neurospora* ニ於テ，何レモ菌絲ノ癒着ノ行ハルルヲ報ゼリ。

KNIEP (1926)[189] ハ黑穗病菌ノ異ナル種 (Species) 或ハ異ナル品種 (Races) 間ニ於テ，DICKINSON (1927)[100] ハ *Ustilago hordei* ト *U. levis* 間ニ於テ，BAUCH (1927)[13] ハ *Ustilago* ノ異ナル種 (Species) 或ハ異ナル品種 (Races) 間ニ於テ，KOEHLER (1930)[191] ハ *Neurospora sitophila* ト *N. crassa* 間ニ於テ，ROHDENHISER (1932)[283] ハ *Sphacelotheca sorghi* ト *S. cruenta* 間ニ於テ共ニ菌絲ノ癒着ヲ生ズルヲ報告セリ。





然ルニ REINHARDT (1892)[276] ハ *Penicillium*, *Aspergillus*, Mucorineae 並ニ *Sclerotinia* 等ニ於テ,同一種ニハ菌絲ノ癒着起ルモ異種間ニハ發現セザルヲ報ジ, CAYLEY (1923)[64] ハ *Diaporthe perniciosa* ニ於テ，異種間ニハ明カナル嫌觸現象ヲ呈シ，菌絲ノ癒着發現セザルヲ報告セリ。PORTER (1924)[269] モ亦 *Helminthosporium* 其他ノ菌ニ於テ，異種間ニハ明カナル嫌觸現象ヲ呈シ菌絲ノ癒着起ラザルヲ報告セリ。

中田 (1925)[253] ハ *Sclerotium Rolfsii* ニ於テ，同一種間ノ同一系統間ニ於テノミ菌絲ノ癒着ヲ生ズルヲ報ジ，LAIBACH (1928)[199] ハ *Coniothyrium* ニ於テ同様ノ結果ヲ得，KNIEP (1928)[190] ハ *Hypholoma*, *Collybia* 並ニ *Mycena* 間ニ於テハ，癒着ノ生ゼザルヲ報ジ，FORSTENEICHER (1931)[134] ハ棉上ノ *Rhizoctonia* ハ一般ニ菌絲ノ癒着ヲナスモ，*R. solani* 並ニ他ノ *Rhizoctonia* ノ2系トハ癒着生ゼザルヲ報ジ，DAVIDSON, DOWDING 並ニ BULLER (1932)[97] ハ *Dermatophytes* ニ於テ，同様ノ關係ヲ報ジ，松本，山本並ニ廣根 (1932)[215] ハ *Hypochnus Sasakii* ハ同一系統間ニ於テハ菌絲ノ癒着起ルモ，形態學的ニ少シク異ナル系統間並ニ *R. solani* トノ間ニテハ起ラザルヲ報ジ，DAS GUPTA (1933)[95] ハ *Cytosporina ludibunda* ノ胞子形成性ヲ喪失シタル異ナル2系間ニハ菌絲癒着ノ生ゼザルヲ報ジ，BULLER (1933)[56] ハ *Coprinus* ノ多クノ種類ヲ實驗材料トナシ，異種間ニハ菌絲ノ癒着起ラザルヲ證シ，少クモ Basidiomycetes 間ニ於テハ異種間ノ菌絲ノ癒着ハ認メ難ク，若シ存スレバ極メテ稀ナル旨ヲ發表セリ。

予ノ實驗（第 XIII 篇第8章）ニ於テハ同一系統間ニ於テハ容易ニ菌絲ノ癒着ヲナスモ，異種間ニ於テハ之ヲ認メ難ク，獨リ *Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE ト其準突然變異菌間ニ於テノミ之ヲ認メ得タルモ，兩種間ノ細胞膜ノ消失ハ之ヲ認メ得ザリキ。

以上記述シタル如ク異形質ノ菌絲間ニ於ケル癒着ハ極メテ稀ナル現象ト認メ得ベク，生ジタル場合ト雖モ兩菌絲間ノ細胞膜消失シ，原形質ノ完全ナル合一ヲ記述セシモノハ HANSEN 並ニ SMITH (1932)[153] 以外ニナク，單ニ BULLER (1933)[56] ノ指摘セシ兩菌絲ノ接觸 (Contact) 或ハ密着 (Adhesion) 等ヲ觀察シ，直チニ之ヲ Ánastomosis, Hyphal fusion, Cell fusion 等トシテ發表シタル處アリ。BULLER (1933)[56] ハ菌絲ノ融合ヲ分類シ（**1**）Hyphal contact（**2**）Hyphal adhesion（**3**）Hyphal fusion or anastomosis トナシ，Anastomosis (菌絲ノ癒着) トハ癒合セル兩菌絲間ノ2細胞膜消失シ，原形質ノ合一セル場合ノミヲ指スモノトナセシガ，正ニ至當ノ結論ト稱セザル可ラズ。

斯ノ如ク從來報告セラレタル異ナル種或ハ系統間ニ於ケル菌絲ノ癒着ハ疑團甚ダ多ク

再檢討ヲ要スルモノナリ。

Muller (1924) [246] ハ *Hypochnus solani* 間ニ於ケル菌絲ノ癒着ニ於テ，細胞核ノ混入ヲ記述シ，Hansen 並ニ Smith (1932) [53] 又 *Botrytis cinerea* 間ニ於テ細胞核ノ混入ヲ記述シタレドモ細胞核ノ接合ハ認メ得ザルヲ報ジ，Schoenefeldt (1935) [303] ハ *Neurospora* ニ於テ無性的ノ菌絲ノ癒着ニハ細胞核ノ接合生ゼザルヲ報告セリ。

Paravicini (1918) [264] ハ *Fusarium* ニ於テ菌絲癒着部ヲ詳細ニ研究シ，兩菌絲ヲ結合スル Connecting hyphae ハ兩菌絲トノ接觸部ニ 2 細胞膜ヲ形成シ細胞核混入ノ虞ナキヲ報告セリ。

Dickinson (1933) [104] ハ *Fusarium fructigenum* 並ニ *F. vasinfectum* ハ分生胞子並ニ菌絲共ニ單核細胞ナルヲ明カニシ，菌絲癒着ニ基ヅク細胞核混入ノ事實無キニ拘ラズ，永久的ノ變異ヲ發現スルヲ證スルト共ニ *Fusarium fructigenum* 並ニ其變異菌ノ癒着セル菌絲ヲ切斷シ，培養ヲ試ミタルニ常ニ一方或ハ他方ノ菌ノ性質ヲ示シ，中間或ハ新シキ性質ヲ示スコト無カリシ事實ヨリ，菌絲癒着ニヨリ細胞質並ニ細胞核ノ混入スルコト無キヲ實驗的ニ證明シ，Mixochimaera 說ニ一大痛棒ヲ與ヘタリ。

從來 Mixochimaera 說ガ重視セラレタル所以ハ，絲狀菌ノ菌絲並ニ分生胞子ノ多クガ多核細胞ニシテ，加フルニ一見菌絲ノ癒着ノ如キ現象ガ普通ニ行ハルルヲ以テ，此多核ノ事實ヲ菌絲ノ癒着ニ基ヅク細胞核ノ混入ニ歸セシメ易カリシニヨレドモ，前記ノ如ク細胞核ノ混入ハ容易ニ行ハルルモノニ非ラザルコト證セラレ，加フルニ多核ナルハ單核ノ分裂ニヨリ生ズルコト，Dickinson (1933) [304] Schoenefeldt (1935) [303] 並ニ予(第 XIII 篇第 7 章) ニヨリテ實驗的ニ證明セラルルニ及ビ，其ノ根底ハ極メテ薄弱トナルニ至レリ。

今予ノ行ヘル稻胡麻葉枯病原菌ニ於ケル島狀準突然變異型ノ場合ヲ考察スルニ，菌絲並ニ分生胞子ノ多核細胞ナルハ單核ノ分裂ニ基因シ，母菌ト變異菌間ノ菌絲ノ癒着ヲ認メ難ク，Mixochimaera 說ヲ以テ說明シ得ザルコト明カナリ。

## 第 2 章　雜婚 (Hybridization) 並ニ雜種ノ分離 (Segregation) 說ノ考察

齊藤並ニ永西 (1915) [294] ハ *Mucor* ノ近似種間ノ雜婚ニヨリ新シキ種ノ育成ニ成功シ，Burgeff (1925) [59] ハ *Phycomyces nitens* 並ニ *P. Blakesleeanus* 間ノ雜婚ニ





ヨリ新シキ Zygospore ヲ得，Stakman 並ニ Christensen (1927) [315] ハ *Ustilago zeae* ノ異性間ニ於ケル雜婚ヲ報ジ，Dodge (1928) [113] ハ *Neurospora sitophila* ト *N. tetrasperma* ノ雜婚ヲ，Dickinson (1929) [101] ハ *Ustilago levis* ノ厚膜胞子ノ發芽ニヨリテ形成セラルル小生子ハ兩性ニ分離スルヲ報告シ，Stakman, Christensen, Eide 並ニ Peturson (1929) [317] ハ *Ustilago zeae* ノ異性間ニ於ケル雜婚ヲ，Stakman, Levin 並ニ Cotter (1930) [319][320] ハ *Puccinia graminis* ノ異性間ノ雜婚ヲ，Newton, Johnson 並ニ Brown (1930) [259] ハ *Puccinia graminis tritici* ノ異性間ニ於ケル雜婚ヲ，Ficke 並ニ Johnston (1930) [132] ハ *Sphacelotheca sorghi* ノ原數核 (Haploid) ヲ有スル小生子ヨリ分離セシモノニハ變異發現セザレドモ，小生子ノ雜婚ニヨリ形成セラレタル培數核 (Diploid) ヲ有スル，厚膜胞子ヨリノモノニハ屢々扇狀變異ヲ發現スルヲ報ジ，Petri (1930) [267] ハ微生物ノ永久的ノ變異ノ一部ハ Segregation ニヨルヲ主張シ，Hansen (1930) [151] ハ *Phoma terrestris* ニ於ケル永久的變異ヲ Segregation ト看做シタレドモ之ガ實驗的證明ヲ缺ケリ。Hanna 並ニ Popp (1930) [148] ハ *Ustilago levis* ト *U. avenae* 間ノ雜婚ヲ，Dodge (1931) [117] ハ *Neurospora* ノ異種間ニ於ケル雜婚ヲ，Newton, Johnson 並ニ Brown (1931) [260] ハ *Puccinia graminis tritici* ト *Puccinia graminis secalis* 間ニ於ケル雜婚ヲ，Holton (1931) [174] ハ *Ustilago avenae* 並ニ *U. levis* ノ各々ノ厚膜胞子カラ生ジタル 4 箇ノ小生子ハ兩性ニ別レ是等相對セル性ノ小生子ハ雜婚ニヨリ厚膜胞子ヲ形成スルヲ報ズルト共ニ前記兩種ハ雜婚ニヨリ，何レニモ屬セザル新シキ型ノ厚膜胞子ヲ形成スルヲ報ジ，Dickinson (1931) [103] ハ *Ustilago kolleri* ノ厚膜胞子ノ發芽ニヨリテ生ジタル前菌絲ニ於テ sex segregation 起リ，生ジタル小生子ハ兩性ニ別レ，其培養的性狀ヲ異ニスルヲ報ゼリ。而シテ sex segregation ノ割合ハ，窒素源，培養基濃度，炭水化物濃度，水素「イオン」濃度，溫度等ノ如キ外界ノ狀態ニヨリ變ゼラルルヲ報ゼリ。Christensen (1931) [76] ハ *Ustilago zeae* ノ異性間ニ於ケル雜婚ヲ，Holton (1932) [175] ハ *Ustilago avenae* ト *U. levis* 間ニ於ケル雜婚ヲ，Rodenhiser (1932) [283] ハ *Sphacelotheca sorghi* ト *S. cruenta* 間ノ雜婚ヲ，Cotter 並ニ Levine (1932) [85] ハ *Puccinia graminis secalis* ノ新シキ品種ノ出現ヲ，異性間ノ雜婚ニ歸セシメ，Flor (1932) [133] ハ *Tilletia tritici* ト *T. laevis* 間ノ雜婚ヲ，Hanna (1932) [149] モ亦 Flor ト同一現象ヲ，Levine, Cotter 並ニ Stakman (1934) [208] ハ *Puccinia graminis* ノ新シキ品種ノ出現ヲ異性間ニ於ケル雜婚ニ歸セシメ，Ruttle (1934) [292] ハ *Ustilago nuda* ト *U. hordei*，或ハ *U. tritici* 間ノ雜婚ヲ Johnston, Newton 並ニ Brown (1934)

[84] ハ *Puccinia graminis tritici* ノ生理學的品種間ニ於ケル雜婚ヲ各報告セリ。

RODENHISLER (1935) [284] ハ *Sphacelotheca sorghi* 並ニ *S. cruenta* ノ小生子間ニ於ケル雜婚ニヨリ生ジタル厚膜胞子ヨリハ分離ニヨリ種々ノ發育性狀ヲ示ス小生子ヲ生ズルヲ報ズルト共ニ各種間ノ單一小生子ヨリ出發セルモノ並ニ單性ノ癒着ニヨリ生ジタル菌絲ハ氣中菌絲ヲ生ズルコト無キモ，兩性ノ小生子並ニ菌絲ノ雜婚ニヨリ生ジタル菌絲ハ氣中菌絲ヲ多量ニ發育セシムルヲ報ジ，小生子ト菌叢發育性狀間ニ或ル種ノ關係アルヲ報ゼリ。斯ノ如キ性ト菌叢ノ發育性狀トノ關係ニ就キテハ既ニ BUACH (1922, 1932) [11, 12, 13, 14, 15] ガ *Ustilago* 共ノ他ニ於テ報告セシトコロニシテ，變異問題ヲ論議スルニ當リ重視スベキ事項ナリ。TYLER 並ニ SHUMWAY (1935) [345] ハ *Sphacelotheca* ト *Sorosporium Reilianum* 間ノ雜婚ニ就キ報告スルトコロアリキ。

SHANDS, JAMES 並ニ DICKSON (1934) [306] ハ *Helminthosporium gramineum* ノ單一胞子ガ發芽シ，數度分岐シテ生ジタル多數ノ菌絲先端ノ細胞ヲ，箇々ニ培養シ共ノ發育性狀ヲ檢シタルニ，各異ナル發育性狀ヲ示シタルヲ豫報シ，恰モ Segregation ニヨリ發現セシカノ如キ現象ヲ報告セリ。然レドモ予 (1931) [226] ガ稻胡麻葉枯病原菌ノ分生胞子時代ナル *Helminthosporium Oryzae* ニ就テノ實驗結果ニヨレバ，菌叢ノ發育性狀ハ接種源トシテ使用スル菌叢ノ培養期間ノ長短ニヨリ甚大ナル差異ヲ示スノミナラズ，培養溫度ニヨリテモ又甚大ナル差異ヲ示スモノニシテ，單ニ培養性狀ノ差違ヲ以テハ，Segregation ナルヲ證シ得ズ。

上記セシ如ク有性生殖ヲナス場合ノ菌類ニ於ケル永久的ノ變異ニ於テハ Hybridization 並ニ Segregation ハ甚ダ重要ナル地位ヲ占ムルモノニシテ，斯ル場合ノ永久的ノ變異ノ主因トシテ Hybridization 並ニ Segregation ヲ擧ゲ得ベキモ，STAKMAN 共他 [315, 316, 317, 318, 319, 320, 321, 322] ノ報ジタル如ク，更ニ Mutation ノ發現ヲ認メザル可ラズ。

今予ノ菌ノ場合ヲ考察スルニ，菌絲，分生胞子共ニ，原數核 (Haploid) ヨリ成ル子嚢胞子 (Ascospore) ヨリ無性的ニ增殖シ來リシモノト認メ得ベク，Hybridization ヲ生ジタル處無キノミナラズ，原數核ニ於ケル變異ナレバ Segregation ニ非ラザルハ明カナリ。

然シテ予ノ場合ニ於ケル稻胡麻葉枯病原菌ノ第1號，第7號並ニ第14號準突然變異菌ノ示ス母菌ヘノ歸先遺傳ノ現象ハ明カニ該準突然變異菌ガ少クモ母菌ヨリ，Segregation ニヨリテ生ジタルモノニ非ラザルヲ證シ得。如何トナレバ，若シ Segregation ニヨルモノトセバ，更ニ母菌ニ變異スル事實ハ之ヲ證明シ得ザルニ至ル。





## 第 3 章　永續變異並ニ細胞質遺傳 (Dauermodifikation, Semi-permanent Variation, Cytoplasmic Inheritance) 說ノ考察

JOLLOS (1914, 1920, 1921) [185, 186, 187] ハ原生動物ノ1種ガ砒素ニ對スル抵抗性ノ獲得ニ關スル實驗ヲナシ，砒素ヲ含ム培養液ニ永ク培養ヲ反覆スルトキハ次第ニ其抵抗性ヲ增大シ，遂ニ普通ノ培養液ニ移シタル後モ，無性繁殖ニヨリ幾代モ抵抗性ヲ保有スルモ次第ニ之ヲ減ジ，有性生殖ニヨルトキハ直チニ之ヲ喪失スルヲ實驗シ，斯ノ如キ變異ニ對シ **Dauermodifikation** ナル名稱ヲ與ヘ細胞質ノミノ變化ニ歸セシメタリ。氏ハ Dauermodifikation ノ外ニ，無性的ニハ1箇年ノ永キニ亘リ，有性生殖後モ尙其特性ヲ遺傳スル變異ヲモ觀察シ，之ヲ遺傳因子ノ變化ニ歸セシメ，Echte Mutation ニヨルモノトセリ。即チ氏ハ原生動物ニ於ケル變異ヲ（**1**）Modifikation（**2**）Dauermodifikation（**3**）Mutation ノ3群ニ類別セリ。

BAUR (1922) [16] ハ Bacteria 或ハ銹病菌類ノ寄生性ノ變異ハ Dauermodifikation ニヨルモノト思考シ，CALDIS 並ニ COONS (1926) [63] ハ多數ノ不完全菌類ニ於ケル永久的ノ變異ハ細胞質ノミノ變化ニ基因スルモノト看做シ **Semi-permanent variation** ナル語ヲ使用セリ。

LINDNER (1925) [212] ハ *Monascus purpureus* ノ赤色菌叢ヨリ生ジタル白色ノ菌叢ヲ移植シタルニ1週間後ニハ赤色ヲ呈スルヲ觀察シ，Dauermodifikation ニ極メテ近キ現象ナリト思考セリ。

HARDER (1927) [156] ハ Hymenomycetes ノ或種ニ於テ，細胞質自身ガ，菌絲ノ發育性狀ヲ支配シ得ルヲ報告シ，GOLDSCHMIDT (1928) [139] ハ *Ustilago violaceae* ニ於テ細胞質ハ核トハ關係無ク遺傳的性質ニ影響ヲ及ボスナラント思考シ，該菌ニ於ケル永久的變異ヲ Dauermodifikation ト看做シタリ。

COONS, LARMER (1930) [83] ハ *Cercospora beticola* ニ於ケル永久的變異ヲ前報告同樣 Semi-permanent variation ト看做シ，NEWTON, JOHNSON 並ニ BROWN (1930) [258] ハ *Puccinia graminis tritici* ニ於テ細胞質ハ細胞核トハ關係ナク遺傳的性質ニ影響ヲ與ウルナラント思考シ，CHRISTENSEN (1931) [76] ハ *Ustilago zeae* ニ於ケル永久的變異ヲ一部ハ Mutation ニ歸セシメタルモ，一部ノ原因トシテ **Cytoplasmic influence** ヲ顧慮ス可キヲ報告セリ。

DICKINSON (1928) [102] ハ *Ustilago levis* ノ永久的變異ハ細胞質ニ關係ナク發現スルヲ報告セリ。

STAKMAN, CHRISTENSEN, EIDE 並ニ PETURSON (1929) [317] ハ *Ustilago zeae* ニ於ケル永久的變異ヲ Mutation ニ歸セシメ Dauermodifikation ナラザルヲ報ゼリ。即チ該菌ニ於ケル變異ハ（**1**）Dauermodifikation ノ場合ノ如ク或ル刺戟ノ結果之ニ對スル抵抗性ガ除々ニ增加セシガ如キコト無ク，（**2**）刺戟消失セシ後モ永ク遺傳スルコト，（**3**）變異ハ突然ニ發現スルコト，（**4**）母菌ノ系統ニヨリ發現ニ多少アルコト，（**5**）變異セシ性質ハ菌叢ノ成長率，色，性，病原性等多岐ニ亘ルコト，等ノ諸點ヨリ Dauermodifikation ニ非ラザルヲ說キ，Dauermodifikation ハ次ノ如ク解スベキモノナリト唱ヘタリ。

（**1**） 刺戟ニヨリ變異發現シタル際，其刺戟ヲ除去シタル場合ト雖モ，無性的繁殖ニヨルトキハ，相當期間其特性ヲ傳ヘ，其後次第ニ喪失スルコト。

（**2**） 變化ハ主トシテ細胞質ニ或ハ又若干細胞核ニモ起リタルナラント推定セラルル場合ニ限定スベキモノナルコト。

以上記シタル如ク Dauermodifikation ハ最初 JOLLOS ノ唱ヘタル如ク變異セシ特性ノ遺傳性不確實ナル場合ニハ之ヲ肯定シ得ルガ如シ。

今予ノ得タル島狀準突然變異型ノ場合ヲ見ルニ，發現シタル變異菌ノ特性ノ遺傳性ニハ甚シキ相違ヲ示スモノニシテ（**1**）一定期間後直チニ母菌ニ復歸スルモノ，（**2**）相當期間後次第ニ母菌ニ復歸スルモノ，（**3**）現在迄滿10箇年ノ長キニ亘リ特性ヲ遺傳スルモノノ（第1號準突然變異菌其他ノ）3群ニ別チ得ルモノニシテ彼ノ JOLLOS (1926) [186] ガ原生動物ノ場合ニ得タル3群ノ變異ニ類似ノ點多シ。即チ予ノ得タル島狀準突然變異型中永ク其特性ヲ傳ヘ變化ナキモノハ JOLLOS ノ得タル Echte Mutation ト解スベキモノナランカ。

Dauermodifikation ニ於テハ變化ガ，細胞質ノミニ止マリ，Mutation ニ於テハ細胞質ノミニ止マラズ更ニ細胞核ニモ變異ノ及ビタルモノト解スベキヲ至當ナリト信ンズ。

## 第 4 章　突然變異 (Mutation) 說ノ考察

ARCICHOVSKIJ (1908) [1] ハ *Aspergillus niger* ニ於テ，EDGERTON (1908) [122] ハ *Glomerella rufomaculans* ニ於テ，SCHIEMANN (1912) [302] ハ *Aspergillus niger*





ニ於テ，WATERMAN (1912) [352] ハ *Penicillium glaucum* 並ニ *Aspergillus niger* ニ於テ，BLAKESLEE (1913) [25] ハ *Mucor* ニ於テ，CRABILL (1913) [86] ハ *Phyllosticta* ニ於テ，SCHOUTEN (1913) [304] ハ *Rhizopus Oryzae, Dematium pullulans, Phycomyces nitens* ニ於テ，SHEAR 並ニ WOOD (1913) [307] ハ *Glomerella* ニ於テ，CRABILL (1914) [87] ハ *Phyllosticta* ニ於テ，EDGERTON (1914) [123] ハ *Glomerella* ニ於テ，CRABILL (1915) [88] ハ *Coniothyrium pirinum* ニ於テ，BLAKESLEE (1920) [26, 27] ハ *Mucor* ニ於テ，BURGER (1921) [61] ハ *Colletotrichum gloeosporioides* ニ於テ，LA RUE (1922) [200] ハ *Pestalozzia Guepini* ニ於テ，BLOCHWITZ (1923) [28] ハ *Aspergillus versicolor* ニ於テ，ROBERTS (1924) [280] ハ *Alternaria mali* ニ於テ，BONAR (1924) [33] ハ *Brachysporium trifolii* ニ於テ，BAUCH (1925) [12] ハ *Ustilago bromivora* ニ於テ，CHRISTENSEN (1925) [72] ハ *Helminthosporium sativum* ニ於テ，LEONIAN (1925) [202] ハ *Phytophthora* ニ於テ，NADSON 並ニ PHILIPPOV (1925) [243] ハ *Mucor genevensis* ニ於テ，CHODAT (1926) [70] ハ *Aspergillus ochraceus* ニ於テ，CHRISTENSEN 並ニ STAKMAN (1926) [72] ハ *Ustilago zeae* ニ於テ，CHRISTENSEN (1926) [74] ハ *Helminthosporium sativum* ニ於テ，LEONIAN (1926) [203] ハ *Phytophthora* ニ於テ，PLUNKETT (1926) [268] ハ4屬7種ノ絲狀菌ニ於テ，NEWTON 並ニ JOHNSON (1927) [257] ハ *Puccinia graminis tritici* ニ於テ，逸見並ニ松浦 (1927) [162] ハ *Brachysporium* sp. ニ於テ，CHODAT (1928) [91] ハ *Phoma* 並ニ *Aspergillus* ニ於テ，HAYMAKER (1928) [159] ハ *Fusarium Lycopersici* ニ於テ，RODENHISER (1928) [281] ハ *Ustilago nuda, U. hordei, U. levis* 並ニ *U. avenae* ニ於テ，CHODAT (1928) [71] ハ *Aspergillus ochraceus* 並ニ *Phoma alternariacearum* ニ於テ CHRISTENSEN (1929) [75] ハ *Helminthosporium sativum* ニ於テ，SELLSCHOP (1929) [305] ハ *Gloeosporium* ニ於テ，STAKMAN (1928) [316] ハ各種ノ病原菌ニ於テ，BLOCHWITZ (1930) [30] ハ *Aspergillus* ニ於テ，CURZI (1930) [91] ハ *Fusarium moronei* ニ於テ，STEVENS (1930) [328] ハ *Glomerella cingulata* ニ於テ，BLOCKWITZ (1931) [31] ハ *Citromyces luteus* ニ於テ，榎本 (1931) [130] ハ *Helminthosporium sativum* ニ於テ，BLOCHWITZ (1932) [32] ハ *Aspergillus flavus, A. versicolor* 並ニ *A. glaucus* ニ於テ，GASSNER 並ニ STRAIB (1932) [38] ハ *Puccinia glumarum tritici* ニ於テ，SWIFT (1932) [335] ハ *Phoma conidiogena* ニ於テ，MC DONALD (1932) [230] ハ *Glomerella cingulata* ニ於テ，MITRA (1934) [238] ハ *Fusarium solani* var. *medium* 並ニ *F. semitectum* ヨリ共ニ永久的變異ヲ觀察シ，之ヲ突然變異 (Mutation) ト看做シタレドモ何レモ該變異現

象ガ異形質ノ菌ニ於ケル Hybridization or segregation 其他ニ非ラズシテ，眞ニ Mutation ナルコトノ實驗的證明ヲ缺ケリ。

Haenicke (1916) (146) ハ *Aspergillus niger* ヨリ，種々ノ刺戟劑ヲ用ヒ，正常ノ分生胞子ヨリモ2乃至3倍モ大形ナル分生胞子ヲ發現セシメ，正常菌ノ單核ナルニ對シ大形變異菌ノ多核ナルヲ檢シ，突然變異ナルヲ細胞學的ニ證明セリ。

Jollos (1920) (186, 187) ハ原生動物ニ於テ，刺戟ニ對スル抵抗力ヲ獲得シタルモノノ內，有性生殖ニヨリテ增殖セシムルモ依然トシテ特性ヲ傳フルモノアルヲ觀察シ，永續變異 (Dauermodifikation) ニ非ラズシテ眞ノ突然變異ナルヲ遺傳學的ニ證明セリ。

Killion (1926) (188) ハ子囊菌並ニ不完全菌ニ於ケル Biological races ハ性因子ノ變化ニ基ヅク突然變異ナルヲ報ジ，中田 (1927) (254) ハ *Sclerotium Rolfsii* ニ於テ，菌核著シク不正形ニシテ大ニ，培養基上ニ於テ容易ニ胞子ヲ形成シ，且ツ殆ド寄生性ヲ缺クモノ並ニ母菌ニ對シ兩嫌觸現象ヲ呈スル外ハ殆ド母菌ニ等シキ2個ノ突然變異体ヲ得該菌ガ嫌觸現象ニヨリテ他系菌トノ菌絲ノ癒着ヲ行ハズ Hybridization or segregation ヲナスコト不可能ナル點ヨリ菌絲細胞內ノ多核ハ總テ同一ナルヲ認メ Genotypic change ヨリナル Mutation ナルヲ證セリ。

Dodge (1928, 1929) (112, 114, 115) ハ *Neurospora tetrasperma* ノ菌絲ハ元來 bisexual mycelium ナルガ子囊胞子形成ニ當リ行ハルル減數分裂ニ際シ，一方ノ sex ノ核ノミヲ受ケタル際ハ unisexual ノ菌絲並ニ分生胞子ヲ形成シ，決シテ子囊胞子ヲ形成セズ，加ルニ無性繁殖ニ於テハ sex change ヲ起スコト無キヲ以テ，該菌ノ unisexual ノ菌絲即チ一方ノ性因子ノミノ原數核ヲ有スル菌絲ガ培養基上ニ於テ現ス扇形變異部ハ明カナル Mutation ニヨルコトヲ證シ，*Monilia sitophila* ニ於テモ亦同樣，Mutation ノ發現セシヲ細胞學的並ニ遺傳學的ニ證明セリ。

Stakman, Christensen 並ニ Hanna (1929) (317) ハ *Ustilago zeae* ニ於ケル變異ハ原數核 (haploid) ナル小生子ニヨリ出發セル培養ニ發現シタルモノナレバ明カナル Mutation ナルヲ細胞學的並ニ遺傳學的ニ證明セリ。更ニ Hanna (1929) (147) 並ニ Stakman, Christensen, Eide 並ニ Peturson (1929) (317) ハ前報告ト同一結果ヲ發表セリ。

Dodge (1930) (116) ハ *Neurospora sitophila* ノ白色系 (Albinistic strain) ノ出現ハ有性生殖ノ營マルル子囊內ニ於ケル子囊胞子形成時ノ細胞核ノ減數分裂ニ當リ sex ヲ決定スル因子並ニ分生胞子形成ヲ決定スル因子ガ分離スル結果生ズル Mutation ナルヲ細胞學的ニ證明スルト共ニ，其他ノ原因ニヨリテモ亦子囊胞子內或ハ無性的ニ形成セ





ラルル分生胞子ノ時代ニ於テモ亦 Mutation ノ發現スルヲ報告セリ。

Rodenhiser (1930) (282) ハ *Phlyctaena linicola* ノ變異ハ，該菌ノ分生胞子單核ニシテ，菌絲ノ癒着ヲ認メザルヲ以テ，Mutation ニヨルコトヲ證明セリ。

Stakman 並ニ Levine (1930) (320) ハ *Puccinia graminis* ニ於テ，明カナル Mutation ニヨル病原性ノ變異ヲ報告セリ。

Christensen (1931) (76) ハ *Ustilago zeae* ニ於ケル變異ハ，細胞學的ニ檢シタル結果 gene changes or some abnormal behavior of chromosomes or even of nuclei themselves ノ何レカナルヲ證セリ。

Dikinson (1933) (104) ハ *Helminthosporium pedicellatum*, *H. monoceras*, 並ニ *Brachysporium* ノ分生胞子並ニ菌絲細胞ノ多核ナルハ同一核ノ分裂ニヨリテ生ジタル同一核ナルヲ細胞學的ニ確ムルト共ニ，*Fusarium fructigenum*, *F. vasinfectum* 等ハ分生胞子，菌絲細胞共ニ單核ナルヲ證シ，*F. fructigenum* ト共ノ變異菌トノ菌絲癒着部ヲ切斷培養スルコトニヨリ，該菌ニ於ケル變異ハ明カナル Mutation ニ基ヅクコトヲ細胞學的並ニ遺傳學的ニ證明セリ。

Paxton (1933) (265) ハ *Helminthosporium sativum* ニ於ケル變異ハ Mutation ナルヲ細胞學的並ニ生理學的ニ證明セリ。

Stakman, Tyler 並ニ Hafstad (1933) (321) ハ再ビ *Ustilago zeae* ニ於ケル變異ハ Mutation ナルヲ論ゼリ。

Christensen 並ニ Graham (1934) (79) ハ *Helminthosporium gramineum* ニ於ケル變異ハ，該菌ノ細胞核ガ總テ單核ニ基因スル同一核ヨリ成ル事實ヨリ Mutation ニヨリ發現セシヲ報ゼリ。

Henrad (1934) (163) ハ *Aspergillus nidulans* ノ單箇子囊胞子ヨリノ培養ヨリ，*A. nidulans imminutus* 並ニ *A. nidulans fertilior* ノ2變異菌ヲ得，前者ハ子囊胞子ヲ形成セザルヲ以テ，有性生殖後ニ於ケル特性ノ遺傳性ハ不明ナルモ，後者ハ有性生殖後ト雖モ明カニ特性ヲ遺傳シ得ルヲ證シ，Dauermodifikation 其他ニヨルニ非ラズシテ明カナル Mutation ニヨリ發現セシヲ報告セリ。

Stakman, Tyler, Hafstad 並ニ Sharoele (1935) (322) ハ *Ustilago zeae* ノ原數核ナル單箇小生子ノ培養ヲ13世代繼續スルモ，少シモ變異發現ノ減ゼザル點ヨリ，該菌ニ於ケル變異ガ Segregation ニ因ルニ非ズシテ，前報告ノ如ク Mutation ニ基因スルヲ報告セリ。

Hansen 並ニ Smith (1935) (151) ハ *Botrytis allii* ト *B. ricini* ヲ混合培養セシ場

合ニ生ズル變異ハ Mutation ニ基因スルヲ遺傳學的ニ確メタリ。

KOEHLER (1935) [192, 193, 194] ハ *Mucor mucedo* ノ遺傳學的研究ヲナシ，同形質ノ細胞核ヨリナル系統ニ於ケル永久的變異ヲ發見シ，明カナル Mutation ナルヲ報ゼリ。

ULLSTRUP (1935) [346] ハ *Gibberella Saubinetii* ノ，子囊胞子ハ homocaryosis ニシテ heterocaryosis ナラザルヲ說キ，單個子囊胞子ヨリノ純粹培養ヨリ，培養的性狀並ニ病原性等ヲ異ニスル多數ノ變異菌ヲ發見シ，是等ノ變異菌ハ永ク其特性ヲ遺傳スル點，突然ニ發生スル點，有性生殖ヲ營マシメタル後ト雖モ明カニ其特性ヲ遺傳スル等ノ諸點ヨリ，該變異現象ヲ明カナル Mutation ニ歸セシメタリ。而シテ氏ハ本菌ノ變異性ハ（**1**）Abnormal nuclear divisions with subsequent reassortment and segregation of a new nuclear complex or（**2**）the existence of true mutants ノ何レカニ因ルモノトセリ。

以上記述シタル如ク絲狀菌ニ於ケル永久的ノ變異現象ニ對シ，之ヲ細胞學的並ニ遺傳學的ニ Mutation ト認メザル可ラザルヲ報告セシモノ甚ダ多ク，永久的變異ノ原因トシテ Mutation ヲ度外視得ザルニ至レリ。

今予ノ場合ヲ考察スルニ本稿第1章ニ於テ記述シタル如ク，母菌ノ細胞ノ多核ハ單核ノ分裂ニ基因シ，DODGE (1928, 1929, 1930) [112, 114, 115. 116] 並ニ SCHOENEFELDT (1935) [303] 等ノ諸氏ニヨレバ該核ハ原數核ト認ム可キモノニシテ加ルニ Mixochimaera ノ事實ヲ認メ難キヲ以テ，前記諸氏ノ所見ニヨレバ當然之ヲ Mutation ト看做サヾル可ラズ。

## 第 5 章　突然變異的現象 (Saltation) 說ノ考察

STEVENS (1922) [324] ハ多數ノ *Helminthosporium* 屬菌ニ於ケル永久的ノ變異ヲ研究シ，恐ラク Mutation ナラント思惟シタルモ，母菌ガ有性生殖ヲナスヤ否ヤ不明ニシテ加ルニ母菌ノ細胞學的構成不明ノ故ヲ以テ，取敢ヘズ Saltation ナル語ヲ以テ取扱ヘリ。其後絲狀菌ニ於ケル永久的ノ變異現象ニ對シ STEVENS ト同一所見ノモトニ Mutation ト思考セシモ Saltation ナル語ヲ以テ說明セシモノ甚ダ多シ。

DASTUR (1920) [96] ハ *Glomerella piperatum* ニ於テ永久的變異ヲ發見シ之ヲ Variation トシテ記セシモ變異菌ノ性狀並ニ氏ノ見解ニ於テ Saltation ト同一ナリ。

CAYLEY (1923) [64] ハ單箇子囊胞子ヨリ培養セシ *Diaporthe perniciosa* ニ於テ，嫌觸現象ヲ生ズル別種ノ菌叢ノ出現ヲ報告シ，DICKSON (1923) [106] ハ *Colletotrichum* ニ





於テ，BROWN 並ニ HORNE (1924) [47] ハ *Fusarium* ニ於テ，CHANDHURI (1924) [67] ハ *Colletotrichum biologicum* ニ於テ，DICKSON (1925) [106, 107] ハ *Colletotrichum atramentarium* ニ於テ，BROWN (1926) [50] ハ *Fusarium* ニ於テ，BONDE (1927) [35] ハ *Alternaria solani* ニ於テ，LINFORD 並ニ SPRAGUE (1927) [213] ハ *Ascochyta* ニ於テ，BARNES (1928) [7] ハ *Eurotium herbariorum* ニ於テ，BROWN (1928) [51] ハ再ビ *Fusarium* ニ於テ，MOHENDRA (1928) [243] ハ *Neocosmospora vasinfecta*, *Phoma* A and B, 並ニ *Alternaria tenuis* ニ於テ，中村 (1928) [255] ハ *Septoria Callistephi* ニ於テ，BONDE (1929) [36] ハ *Alternaria solani* ニ於テ，HORNE 並ニ DAS GUPTA (1929) [397] ハ *Cytosporina*, *Phomopsis* 並ニ *Diaporthe* ニ於テ，栗林 (1929) [204] ハ *Ophiobolus Miyabeanus* ニ於テ，LEONIAN (1929) [378] ハ多數ノ *Fusarium* ニ於テ（Dissociation ナル語ヲ使用）MITTER (1929) [239] ハ *Fusarium* ニ於テ，SUNDARARAMAN (1929) [333] ハ *Colletotrichum* ニ於テ，TU (1929) [342] ハ *Fusarium* ニ於テ，WILTSHIRE (1929) [359] ハ *Stemphylium* ニ於テ，DOWSON (1929) [339] ハ *Fusarium* ニ於テ，HORNE (1929) [377] ハ *Cytosporina ludibunda* ニ於テ，BARNES (1930) [3] ハ *Botrytis cinerea* ニ於テ，CHENEY (1930) [68] ハ *Verticillium albo-atrum* ニ於テ，CURZI (1930) [90, 91, 92] ハ *Acremoniella thermophila* [92] 並ニ *Fusarium moronei* [90, 93] ニ於テ，DAS GUPTA (1930) [93] ハ *Cytosporina ludibunda* 並ニ *Diaporthe perniciose* ニ於テ，橋本，入澤並ニ太田 (1930) [358] ハ *Epidermophyton rubrum* ニ於テ，HORNE 並ニ GUPTA (1930) [379] ハ *Cytosporina ludibunda* ニ於テ，予 (1930) [222, 223, 225] ハ *Ophiobolus Miyabeanus*, *Brachysporium* spp., *Alternaria Kikuchiana*, *Fusarium niveum* 等ニ於テ，WORMALD (1930) [364] ハ *Sclerotinia cinerea* forma *pruni* ニ於テ，MOHENDRA 並ニ MITRA (1930) [242] ハ *Sphaeropsis malorum* ニ於テ，BARNES (1931) [9] ハ *Eurotium herbariorum*, *Botrytis cinerea* 並ニ *Thamnidium elegans* ニ於テ，BRETT (1931) [40] ハ *Stemphylium* ニ於テ，CAYLEY (1931) [65] ハ *Diaporthe perniciosa* ニ於テ，ELLIS (1931) [325] ハ *Pleospora herbarum* ニ於テ，予 (1931) [226] ハ更ニ *Ophiobolus Miyabeanus* ニ於テ，MITRA (1931) [236, 237] ハ8種ノ *Helminthosporium* ニ於テ，CHRISTENSEN (1932) [77, 78] ハ *Pestalozzia funerea* ニ於テ（Variant トシテ記載），DICKSON (1932) [308] ハ *Chaetomium cochliodes*, *Mucor genevensis*, *Phycomyces Blakesleeanus* 等ニ於テ，EMMONS (1932) [327] ハ *Achorion gypseum* ニ於テ，LEONIAN (1932) [207] ハ *Fusarium moniliforme* ニ於テ，予 (1932) [227, 228] ハ更ニ多數ノ *Brachysporium* 並ニ *Ophiobolus Miyabeanus*

＝於テ，MOREAU 並＝ MORUZI (1932) (244, 245) ハ *Neurospora* ＝於テ，WILTSHIRE (1932) (360) ハ *Stemphylium* ＝於テ，CHARLES 並＝ LAMBERT (1933) (66) ハ *Oospora fimicola* ＝於テ，DAS GUPTA (1933) (94) ハ *Cytosporina ludibunda* ＝於テ，DICKSON (1933) (369) ハ *Chaetomium* ＝於テ，GALLOWAY (1933) (337) ハ *Aspergillus terreus* ＝於テ，GREANEY 並＝ MACHACEK (1933) (343) ハ *Helminthosporium sativum* ＝於テ，GREENE (1933) (342) ハ *Aspergillus fischeri* ＝於テ（Variation ナル語ヲ使用），小西 (1933) (396) ハ *Piricularia Oryzae* ＝於テ，MC RAE (1933) (233) ハ *Cercospora dolichi*, *C. cruenta* 並＝ *Helminthosporium Sacchari* ＝於テ，SUNDARARAMAN (1933) (334) ハ *Colletotrichum* ＝於テ，SNYDER (1933) (334) ハ *Fusarium orthoceras* var. *pisi* ＝於テ（Variation ナル語ヲ使用），田中 (1933) (336) ハ *Alternaria Kikuchiana* ＝於テ，WINGERBERG (1933) (363) ハ *Actinomyces flavis* ＝於テ，BIRAGHI (1934) (24) ハ *Gloeosporium olivarum* ＝於テ（Variation ナル語ヲ使用），HENRY (1934) (364) ハ *Polyspora lini* ＝於テ，PALMITER (1934) (263) ハ *Venturia inaequalis* ＝於テ，SIBILIA (1934) (309) ハ *Heterosporium gracile* ＝於テ，SLEETH (1934) (333) ハ *Fusarium niveum* ＝於テ（Dissociation ナル語ヲ使用），RAMSEY (1935) (274) ハ *Pleospora Lycopersici* 並＝ *Macrosporium sarcinaeforme* ＝於テ，共＝ STEVENS (334) ト同一所見ノモト＝永久的變異ヲ Saltation トシテ取扱ヘリ。

LEONIAN (1925, 1926) (202, 203) ハ最初 *Phytophthora* ノ變異ヲ Mutation ト認メタレドモ後 Dissociation ナル語ヲ以テ説明スル＝至レリ。

LEONIAN (1932) (207) ハ 96 種ノ *Fusarium* 菌＝就キ永久的變異ヲ研究シ，JOLLOS (1914, 1920, 1921) (385, 386, 387) ノ原生動物，CALDIS 並＝ COONS (1926) (63) ノ各種絲狀菌，予 (1930) (222) ノ *Ophiobolus Miyabeanus* ノ場合ト殆ド同一現象ヲ發見シ，之ガ發現ノ原因＝關シ，各種ノ刺戟ヲ與ヘテ實驗シタル結果，次ノ如キ興味アル所見ヲ發表セリ。即チ“純粹ナル種 (Species) ト看做サルル場合ト雖モ單一細胞内ノ原形質ノ異ナル部分ハ同一狀態ト認ムルハ誤リ＝テ，寧ロ適當ナル刺戟ヲ受ケタル際初メテ發現スル極メテ多數ノ相 (Phase) ヨリ成立シ，外界ノ事情ガ變異ノ發現＝適シタル際＝ノミ發現スルモノ＝シテ，或ル刺戟ガ變異ノ原因トナリ得ルモ，常＝必ズシモ變異ノ發現＝役立タザルハ，細胞内ノ原形質＝一定ノ變遷アリ，其結果原形質ト外界ノ因子トノ間＝存スル一定ノ關係ヲ常＝保持シ得ザル＝ヨル。”トノ所見ヲ發表シ，該菌ノ變異ノミナラズ一般生物ノ變異ヲ以上ノ如キ原形質ノ變異能力＝歸セシメ，Dissociation ナル語ヲ以テ取扱ヒ，Fluctuation ハ變異程度最モ少キモノ，Mutation ハ最モ強キ場合トナセリ。





ORTON (1935) (262) ハ西瓜蔓割病原菌 (*Fusarium niveum* E. F. SMITH) ヨリ多數ノ變異菌ヲ得 Dissociation ナル語ヲ以テ取扱ヘリ。

以上記述シタル如ク，絲狀菌＝於ケル永久的ノ變異現象ヲ，恐ラク Mutation ナラント認メタルモ，母菌ノ細胞學的構成不明ノ故ヲ以テ暫ク **Saltation（突然變異的現象）** トシテ取扱ハントスルモノ甚ダ多シ。

今予ノ場合ヲ考察スル＝前節＝記述シタル如ク母菌ノ細胞學的構成明瞭＝シテ，明カ＝原數核ノ單核＝基因スル同核質核ヨリ成ル菌＝起リタル永久的變異ナルヲ以テ，之ヲ Mutation ト看做シテ大過無カルベキモ，予ハ嚴密ナル檢討ノモト＝，母菌ト變異菌ノ有性生殖＝ヨル交配育種的實驗結果ノ判明迄，暫ク**突然變異的現象**（Saltation）ナル語ヲ以テ取扱ハント欲ス。

## 第 6 章　絲狀菌ノ永久的變異ノ原因

以上各章＝亘リ詳細記述シタル如ク，絲狀菌＝於ケル永久的變異ハ，從來諸氏＝ヨリテ唱ヘラレタル如ク，決シテ單一ナル原因＝ヨリ解決ス可キモノ＝非ラズシテ，實ハ多クノ原因＝ヨリ發現スルモノナリ。從來甲論乙駁絲狀菌ノ永久的變異＝何等ノ定説無キハ，各論者ガ自已ノ得タル限ラレタル菌＝於ケル，限ラレタル現象ヲ以テ，復雜極リ無キ一般絲狀菌ノ變異現象ヲ論議セシ＝基ヅク點尠カラズ。

予ハ一般絲狀菌ノ永久的變異ヲ次ノ如ク考察ス。

絲狀菌ノ永久的變異ハ（**1**）Mixochimaera（**2**）Hybridization or Segregation,（**3**）Dauermodifikation（**4**）Mutation or Saltation 等種々ノ原因＝ヨリテ發現スルモノ＝シテ，有性生殖ノ營マレタル場合ノ變異ハ Hybridization or Segregation, 無性生殖ノ場合ノ變異ハ Mutation or Saltation ＝ヨルモノ多シ。

## 第 7 章　突然變異的現象發現ノ原因<br>トシテノ予ノ代謝產物説ノ考察

前記セシ如ク絲狀菌ノ永久的變異ノ多クハ突然變異的現象 (Saltation) 或ハ突然變異 (Mutation) ヲ以テ説明セラルベキモノナルガ，之ガ發現ノ機構＝至リテハ論究セシモノ甚ダ尠シ。

GURNEY-DIXON (1919) [143] ハ Bacteria ニ於ケル永久的變異ヲ Transmutation ト呼ビ，之ガ發現ノ原因トシテ Bacteria ノ分泌スル酵素ヲ擧ゲ，HADLEY (1927, 1928) [144, 145] FROBISHER (1928) [135] 並ニ BORDET (1931) [37] ハ共ニ Bacteria ノ永久的變異ヲ Bacteriophage ニ基因スルモノト認メタリ。

以上ハ何レモ Bacteria ニ於ケル場合ニシテ，絲狀菌ニ於テハ 1932年ニ至ル迄明確ナル結論ヲ與ヘタルモノナシ，予 (1932) [228] ハ *Ophiobolus Miyabeanus* ニ於ケル突然變異的現象中，島狀準突然變異型ヲ呈スルモノノ多クハ，菌自身ノ代謝產物ニヨリ變性，發現スルヲ，予ノ發見シタル擬溶菌現象ヨリ結論シ，該菌ノ分泌スル酸化酵素ヲ通シテ之ヲ化學的ニ說明シ，(1934) [166] 更ニ本報第 XIII 篇第 1 章ニ於テ遺傳學的ニ之ヲ證明セリ。而シテ本報告第 XIII 篇第 5 章ニ於テ代謝產物中酵素並ニ化學物質ハ其主因ヲナスヲ結論セリ。

予 (1930) [225] ノ實驗（第 VIII 篇第 1 章）ニヨルニ，島狀準突然變異型ノ發現ハ「レントゲン」線ノ放射ニヨリテハ大ナル變化無キモ，紫外線，並ニ紫外線ト「レントゲン」線ヲ前後シテ混合放射スルトキハ，其發現ヲ甚シク減少ス。故ニ若シ此處ニ突然變異的現象發現ノ本體ヲ假定セバ，此本體ハ「レントゲン」線ニヨリテ變化ナク，紫外線或ハ紫外線並ニ「レントゲン」線ノ混合放射ニヨリ變化ヲ受ケタルモノト推論シ得ベシ。紫外線並ニ「レントゲン」線ニヨリ，同様ノ變化ヲ受クルモノヲ他ニ求ムルニ，酵素 [81, 124] 並ニ Bacteriophage [240] ノ二者ヲ擧ゲ得ベシ。而シテ現在ノ知見ヲ以テセバ Bacteriophage ハ甚シク酵素ニ類似ノ性質ヲ有スルモノト認メラルルヲ以テ，突然變異的現象發現ノ本體トシテ酵素並ニ類似ノ物質ヲ重視セザル可ラザルベシ。予ノ唱フル代謝產物說ハ，斯ノ如キ「レントゲン」線並ニ紫外線ヲ以テスル實驗結果ヨリ考察スルモ亦之ヲ立證シ得タリト言フヲ得ベシ。

更ニ予 (1932) [228] ノ得タル白色變異菌ノ特性ノ遺傳性ト培養基蔗糖濃度トノ關係（本報告第 XIII 篇第 1 章）ノ實驗結果ノ示ス如ク，馬鈴薯煎汁寒天培養基中ニ含有スル蔗糖濃度ハ發現シタル白色菌ノ特性ノ遺傳性ニ甚大ナル影響ヲ及ボスモノニシテ，0.5% 以下ノ蔗糖ヲ含有スル場合ハ生ジタル白色菌ハ直チニ母菌ニ復歸シ，2% 乃至 5% ノ場合ハ最モ確實ニ遺傳シ，10% 並ニ 20% ニ至レバ白色菌ヲ發現シ得ザルモノニシテ之ガ原因トシテハ培養基中ニ含有スル蔗糖濃度ノ差違ニ基ヅク菌ノ代謝產物ノ差違ヲ擧ゲザルベカラズ。斯シテ突然變異的現象ニ對スル代謝產物說ハ，變異菌ノ遺傳性ノ實驗結果ヨリモ亦之ヲ肯定セザル可ラズ。

其ノ後 PAXTON (1933) [265] ハ，*Helminthosporium sativum* ヲ CZAPECK 氏寒天





培養基上ニ培養スルトキハ永久的變異ヲ發現セザレドモ，$NaNO_3$ ヲ除去シタル場合並ニ蔗糖ヲ添加シタル場合ニハ甚シク多數ノ變異ヲ發現スルヲ認メ，之ハ $NaNO_3$ ヲ除去スルトキハ菌ノ發育ニ長時日ヲ要スルコト，並ニ $NaNO_3$ 或ハ蔗糖ヲ除去シタル場合ノ代謝產物ノ變化ニ基クモノト認メ，予ノ代謝產物說ト殆ド同一所見ヲ發表セリ。

HANSEN 並ニ SMITH (1935) [155] ハ *Botrytis allii* ト *B. Ricini* ヲ混合培養シタル場合ニ發現シタル變異菌ハ氏等ガ年來主張シ [152, 153, 154] 來リタル Mixochimaera ニテ說明シ得ベキモノトノ假定ノモトニ實驗ヲ試ミタルニ，意外ニモ Mixochimaera ニ非ラズシテ，Gene change ニ基ヅクモノトノ結論ニ到達シ，之ガ原因トシテ異種菌ヲ混合培養シタル場合ノ或ル原因ニ基ヅクモノトナシ，或ル原因トハ混合培養シタル場合ノ代謝產物ヲ想起セシムルカノ如キ所見ヲ發表セシハ，突然變異的現象發現ノ機構考察上重視スベキ傾向ナリト思考ス。

斯ノ如ク島狀準突然變異型ノ多クノモノノ發現ノ原因トシテ擧ゲタル，予ノ代謝產物說ハ益々其至當ナルヲ信ゼシム。

## 第 8 章　結　論

上記諸實驗結果ヨリ次ノ如キ結論ヲ得タリ。

**I.** 絲狀菌ニ於ケル永久的變異ハ（**1**）Mixochimaera (Heterocaryosis)，（**2**）Hybridization or Segregation（雜婚或ハ雜種ノ分離），（**3**）Dauermodifikation（永續變異）並ニ（**4**）Mutation（突然變異）或ハ Saltation（突然變異的現象）等各異ナル原因ニヨリ發現シ，有性生殖ノ營レタル場合ノ永久的變異ハ Hybridization 或ハ Segregation 其主因ヲナシ，無性生殖ノ營レタル場合ハ Mutation 或ハ Saltation 其主因ヲナスモノナルガ本報告所載ノ各菌ニ於ケル永久的變異ハ突然變異的現象 (Saltation) ニヨリ發現セシモノナリ。

**II.** 突然變異的現象ハ其發現型ニヨルトキハ（**1**）扇狀準突然變異型（**2**）島狀準突然變異型（**3**）全準突然變異型並ニ（**4**）恒準突然變異型ノ 4 型ニ分類スルヲ得。

**III.** 突然變異的現象ヲ變異菌ノ特性ヨリ分類スルトキハ（**1**）扇狀準突然變異型ノ A 型（**2**）扇狀準突然變異型ノ B 型並ニ（**3**）島狀準突然變異型ノ **3** 型ニ分類シ得ラレ，全準突然變異型並ニ恒準突然變異型ハ，變異菌ノ發現狀態ニ於テ，變異菌ノ特性ニ於テ共ニ島狀準突然變異型ト同様ナリ。

**IV.** 稻胡麻葉枯病原菌 (*Ophiobolus Miyabeanus* ITO et KURIBAYASHI) ノ島狀準

突然變異型ノ或モノハ予ノ發見シタル擬溶菌現象ヲ經テ發現ス。

**V.** 擬溶菌現象ハ菌自身ノ代謝產物＝ヨリテ發現ス。

**VI.** 稻胡麻葉枯病原菌ノ島狀準突然變異型ノ或モノハ菌自身ノ代謝產物＝ヨリテ發現シ，菌ノ代謝產物中酵素並＝化學物質ハ共ノ主因ヲナスモノナリ。

**VII.** 全準突然變異型並＝恒準突然變異型ハ共＝島狀準突然變異型ト同樣ナル原因＝ヨリテ發現ス。





# 第 XV 篇 總 括

本報告＝於テハ *Ophiobolus* (*Helminthosporium*), *Brachysporium*, *Alternaria* 並＝ *Fusarium* 等＝屬スル 8 種，13 系統ノ植物病原絲狀菌＝於ケル突然變異的現象＝關スル實驗的研究ノ結果ヲ登載セリ。

**第 I 篇**＝於テハ，突然變異的現象 (Saltation) ＝對シ次ノ如キ定義ヲ與ヘタリ。**突然變異的現象**トハ，細胞學的構成ノ不明ナル，或ハ明カナルモ交配育種的試驗結果ノ不明ナル絲狀菌ノ變異中，突然變異ト同樣ナル變異現象ヲ指スモノナリ。

發現シタル變異体ハ突然變異体 (Mutant) ト區別スルタメ準突然變異菌 (Saltant) ト命名セリ。

**第 II 篇**＝於テハ，各菌＝於ケル突然變異的現象ヲ，變異ガ發現スル狀態即チ發現型＝基キ次ノ 4 型＝分類セリ。

1. **扇狀準突然變異型** (**Sector Type of Saltation**)
   扇狀準突然變異型トハ正常ナル菌叢上或ハ菌叢間＝準突然變異菌ガ扇狀 (楔狀) ヲナシテ發現スルモノナリ。
2. **島狀準突然變異型** (**Island Type of Saltation**)
   島狀準突然變異型トハ，正常ナル菌叢上＝準突然變異菌ガ島狀＝散生シテ發現スルモノナリ。
3. **全準突然變異型** (**All Saltating Type**)
   全準突然變異型トハ發育シタル全菌叢ガ，旣＝其特性ヲ永代傳ヘ得ル準突然變異菌トシテ發現スルモノナリ。
4. **恒準突然變異型** (**Ever Saltating Type**)
   恒準突然變異型トハ菌叢發育シテヨリ，一定期間＝達セシ後ハ常＝準突然變異菌ヲ發現スルモノナリ。

**第 III 篇**＝於テハ扇狀準突然變異型＝屬スル，*Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE ノ，稻，「ギャウギシバ」並＝「コゴメガヤツリ」等ヨリ分離セシ 3 系統，粟緣葉枯病原菌 (*Brachysporium ovoideum* HIROE et WATANABE)

並ニ稻胡麻葉枯病原菌（*Ophiobolus Miyabeanus* ITO et KURIBAYASHI），梨黑斑病原菌（*Alternaria Kikuchiana* TANAKA）等ノ各菌ニ於ケル突然變異的現象ヲ記載セリ。

以上各菌ノ突然變異的現象ヲ遺傳學的，生理學的並ニ病理學的ニ詳細比較研究ノ結果，扇狀準突然變異型ニハ A，B 兩型存シ，各次ノ如キ特性ヲ有スルヲ明カニセリ。

**I. 扇狀準突然變異型（A 型）**ハ次ノ如キ特性ヲ有ス。

1. 變異菌叢ハ母菌ノ黑色ナルニ對シ正反對ナル白色ヲ呈シテ發現スルガ如ク，變異ノ程度著シ。
2. 變異ノ發現極メテ稀ニシテ，人工的ニ其發現ヲ左右シ得ズ。
3. 變異菌ハ單ニ母菌ノ有スル黑色性ヲ消失スルノミニテ，其他ノ形態學的性狀ニ變化無シ。
4. 變異菌ハ母菌ニ比シ生理學的諸性質ニ於テ小異ヲ示スニ過ギズ。
5. 變異菌ハ其特性ノ遺傳性極メテ確實ニシテ絕對ニ母菌ニ復歸スルコト無シ。

**II. 扇狀準突然變異型（B 型）**ハ，次ノ如キ特性ヲ有ス。

1. 變異菌叢ハ母菌ノ黑色ナルニ對シ，其程度ヲ弱メタル灰乃色至灰白色或ハ反對ニ灰色ナルニ對シテ，黑色ヲ呈シテ發現スルガ如ク，變異ノ程度著シカラズ。
2. 變異ノ發現比較的多ク，人工的ニ其發現ヲ左右シ得。
3. 變異菌ハ母菌ニ比較シテ色ノミナラズ屢々其他ノ形態學的並ニ生理學的諸性質ニモ變化ヲ來ス。
4. 變異菌ハ其特性ノ遺傳性不定ニシテ，或ル場合ハ永久ニ遺傳スルモ，一定期間後直チニ母菌ニ復歸スル場合アリ。

**第 IV 篇**ニ於テハ島狀準突然變異型ニ屬スル，稻胡麻葉枯病原菌（*Ophiobolus Miyabeanus* ITO et KURIBAYASHI），粟綠葉枯病原菌（*Brachysporium ovoideum* HIROE et WATANABE），稻苗「ブラキスポリウム」病原菌（*Brachysporium Tomato*（ELL. et BARTH.）HIROE et WATANABE, *Bra. ovoideum* HIROE et WATANABE, *Bra. senegalense* SPEGAZZINI），稻苗ニ病原性ヲ有スル（*Helminthosporium Oryzae-microsporum* HIROE n. sp.，蕃椒擬黑黴病原菌（*Brachysporium Capsici* HIROE et WATANABE）並ニ梨黑斑病原菌（*Alternaria Kikuchiana* TANAKA）等ノ各菌ニ於ケル突然變異的現象ヲ記載セリ。

以上各菌ノ突然變異的現象ヲ遺傳學的，生理學的並ニ病理學的ニ詳細比較研究ノ結果，島狀準突然變異型ハ次ノ如キ特性ヲ有スルヲ明カニセリ。

1. 變異ノ發現極メテ普通ニシテ多キコト。





2. 變異菌ハ生理學的性質ノミニ止ラズ形態學的ニ全ク母菌ト異ナル性質ヲ示スコト。
3. 變異菌ハ其ノ特性ノ遺傳性不定ニシテ，或モノハ一定期間後直チニ或ハ次第ニ母菌ニ復歸スルモ，他ノモノハ永久ニ其特性ヲ遺傳シ母菌ニ復歸スルコトナシ。
4. 人工的ニ容易ニ發現ヲ左右シ得ルコト。

**第 V 篇**ニ於テハ全準突然變異型ニ屬スル稻胡麻葉枯病原菌（*Ophiobolus Miyabeanus* ITO et KURIBAYASHI）ニ於ケル突然變異的現象ヲ記載セリ。

全準突然變異型ノ發現ニハ常ニ適當ナル環境ノ存在ヲ必要トスルモノニシテ此適當ナル環境要件ノ一ヲ缺クモ發現セザルモノナリ。故ニ全準突然變異型ハ或ル菌ガ突然變異的現象ヲ發現スルニ最適ナル環境ニ於テ發現スル現象ト看做シ得ベシ。本型ニ屬スルモノハ次ノ如キ特性ヲ示セリ。

1. 變異菌ハ特性ノ遺傳性確實ナリ。
2. 其他ハ島狀準突然變異型ト同樣ナリ。

**第 VI 篇**ニ於テハ恒準突然變異型ニ屬スル稻胡麻葉枯病原菌（*Ophiobolus Miyabeanus* ITO et KURIBAYASHI）ニ於ケル突然變異的現象ヲ記載セリ。

恒準突然變異型ハ接種源菌叢ノ培養基上ニ於ケル發育狀態ニハ何等ノ變化ナキモ，接種源菌叢ノ內部ニ何等カノ變化發生セシモノノ如ク，次代ニ於テ常ニ突然變異的現象ヲ發現スルモノナリ。本型ニ屬スルモノハ次ノ如キ特性ヲ有ス。

變異菌ノ特性ハ島狀準突然變異型ノ場合ニ同ジ。

**第 VII 篇**ニ於テハ絲狀菌ニ於ケル彷徨變異ニ關スル實驗結果ヲ記載シ，突然變異的現象トノ比較考察ヲ試ミントセリ。

彷徨變異モ突然變異的現象ト同樣ニ其發現型ニヨリ，扇狀彷徨變異型，島狀彷徨變異型，全彷徨變異型並ニ恒彷徨變異型ノ 4 型ニ分類シ得。

各彷徨變異型ハ培養基上ニ發現スル狀態ハ各突然變異型ノ場合ニ殆ド同樣ナレドモ，變異菌ハ次代ニ於テ直チニ母菌ニ復歸スルヲ異ニス。

**第 1 章**ニ於テハ扇狀彷徨變異型ニ屬スル梨黑斑病原菌（*Alternaria Kikuchiana* TANAKA），西瓜蔓割病原菌（*Fusarium niveum* E. F. SMITH），稻ノ「ブラキスポリウム」病原菌（*Brachysporium Tomato*（ELL. et BARTH.）HIROE et WATANABE, *Bra. ovoideum* HIROE et WATANABE, *Bra. senegalense* SPEGAZZINI）等ノ各菌ニ於ケル彷徨變異ヲ記載セリ。

**第 2 章**ニ於テハ島狀彷徨變異型ニ屬スル稻胡麻葉枯病原菌，莞草葉枯病原菌 (*Brachysporium Yamadaeanum* MATSUURA)，梨黑斑病原菌，西瓜蔓割病原菌並ニ稻ノ「ブラキスポリウム」病原菌等各菌ニ於ケル彷徨變異ヲ記載セリ。

**第 3 章**ニ於テハ全彷徨變異型ニ屬スル稻胡麻葉枯病原菌並ニ「ノゲシ」類ノ黑斑病原菌 (*Alternaria Sonchus* DAVIS) ニ於ケル彷徨變異ヲ記載セリ。

**第 4 章**ニ於テハ恒彷徨變異ニ屬スル稻ノ「ブラキスポリウム」病原菌中 *Brachysporium senegalense* SPEGAZZINI ニ於ケル彷徨變異ヲ記載セリ。

**第 VIII 篇**ニ於テハ突然變異的現象發現ニ及ボス環境ノ影響ニ關スル實驗結果ヲ記載セリ。

**第 1 章**ニ於テハ「レントゲン」線，紫外線並ニ兩者ノ混合放射ノ影響ヲ記載セリ。

島狀準突然變異型ヲ發現スル稻胡麻葉枯病原菌 (*Ophiobolus Miyabeanus* ITO et KURIBAYASHI) ノ發育並ニ白色變異菌ノ發現ニ對スル影響ヲ考察スルニ，「レントゲン」線ハ兩者ニ對シ共影響極メテ僅少ニシテ，紫外線ハ其程度稍々高ク，菌叢ノ發育ヲ阻止シ，白色變異菌叢ノ發現ヲ減少セシム。而シテ是等兩者ヲ混合放射セシモノニ於テハ，其影響極メテ甚大ニシテ菌叢ノ發育ヲ阻止スル度極メテ高ク，又白色變異菌ノ出現ヲ著シク減少セシム。

上記ト殆ド同樣ノ變化ヲ受クルモノニ Bacteriophagy 並ニ酵素アリ。Bacteriophage 並ニ酵素ハ Bacteria ノ永久的變異ノ原因ヲナスヲ報ゼラル。故ニ上記ノ實驗結果ハ突然變異的現象ノ機構究明上重大ナル意義ヲ有スルモノナリ。

扇狀準突然變異型ヲ發現スル「ギャウギシバ」葉枯病原菌 (*Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE) ニ對シテハ「レントゲン」線ヲ放射セシモノニ於テハ若干ノ發育ヲ促進シ，紫外線ヲ照射シタルモノニ於テハ，弱度ノ場合ハ菌ノ發育ヲ促進セシモ，强度ノ場合ニハ發育ヲ害セリ。而シテ兩者共扇狀準突然變異型ノ A 型ノ發現ニハ何等ノ影響ヲモ與ヘザリキ。

「レントゲン」線ハ兩菌菌叢ノ發育性狀ニ大ナル影響ヲ與ヘザルモ紫外線ハ若干ノ影響ヲ與ヘ，氣中菌絲ハ多量トナリ且ツ灰色ヲ呈シ，胞子形成能力ヲ減ゼシム。

扇狀準突然變異型ノ B 型ハ「レントゲン」線ニヨリテハ影響ヲ受ケザルモ紫外線ニヨリテハ大ナル影響ヲ受ケ其發現ヲ增太ス。

**第 2 章**ニ於テハ培養基ノ深淺並ニ位置ノ影響ヲ記載セリ。

培養基ノ深淺並ニ位置ハ島狀準突然變異型ノ發現ニ何等ノ影響ヲモ與ヘズ。

**第 3 章**ニ於テハ培養溫度ノ影響ヲ記載セリ。





稻胡麻葉枯病原菌 (*Ophiobolus Miyabeanus* ITO et KURIBAYASHI) ノ島狀準突然變異型ハ，齊藤氏醬油寒天培養基上ニ於テハ 32° 乃至 34°C ニ於テ最高ノ發現ヲ示シ，馬鈴薯煎汁寒天培養基上ニ於テハ 30° 乃至 32°C ニ於テ最高ノ發現ヲ示シ，培養溫度ニヨリ甚シキ影響ヲ受クルモノナリ。

各種「クヮホン」科植物ノ葉枯病並ニ蕃椒擬黑黴病ヲ基因スル *Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE ノ扇狀準突然變異型ノ A 型ハ，培養溫度ニヨリ共發現ヲ左右セラレズ。

稻胡麻葉枯病原菌ノ扇狀準突然變異型ノ B 型ハ培養溫度ニヨリ甚シキ影響ヲ受クルモノニシテ，30° 乃至 34°C ノ高溫ニ於テ發現スルモノナリ。

**第 4 章**ニ於テハ培養成分ノ影響ヲ記載セリ。

稻胡麻葉枯病原菌 (*Ophiobolus Miyabeanus* ITO et KURIBAYASHI.) ノ島狀準突然變異型ハ，培養成分ノ如何ニヨリ甚シク共發現ヲ左右セラレ，齊藤氏醬油寒天培養基並ニ馬鈴薯煎汁寒天培養基上ニ於テ最高ノ發現ヲ示ス。

各種「クヮホン」科植物並ニ蕃椒擬黑黴病ヲ基因スル (*Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE) ノ扇狀準突然變異型ノ A 型ハ培養成分ニヨリ其ノ發現ヲ左右セラレズ。

**第 5 章**ニ於テハ各種毒劑ノ影響ヲ記載セリ。

稻胡麻葉枯病原菌 (*Ophiobolus Miyabeanus* ITO et KURIBAYASHI) ノ島狀準突然變異型並ニ扇狀準突然變異型ノ B 型ハ各種毒劑ニヨリ，共發現ニ至大ノ影響ヲ受クルモノナリ。

西瓜蔓割病原菌 (*Fusarium niveum* E. F. SMITH)，梨黑斑病原菌 (*Alternaria Kikuchiana* TANAKA) 並ニ「ギャウギシバ」葉枯病原菌 (*Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE) 等ノ各菌ノ扇狀準突然變異型ノ A 型ハ，各種毒劑ニヨリ，共發現ニ何等ノ影響ヲモ受ケズ。

梨黑斑病原菌ノ扇狀準突然變異型ノ B 型ハ毒劑ニヨリ共發現ヲ左右セラル。

**第 XI 篇**ニ於テハ準突然變異菌ニ於ケル歸先遺傳ニ關スル實驗結果ヲ記載セリ。

扇狀準突然變異型ノ A 型ニヨリ發現シタル *Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE ノ 3 準突然變異菌ハ發現以來今日迄，稻ヨリ分離シタル菌系ヨリ發現セシモノハ滿 10 箇年，「ギャウギシバ」ヨリ分離セシ菌系ヨリノモノハ滿 7 箇年，「コゴメガヤツリ」ヨリ分離セシ菌系ヨリノモノハ滿 4 箇年ノ永キニ亘リ，特性ヲ遺傳シテ變化無ク，今後ト雖モ永ク共特性ヲ遺傳スルモノト思考セラル。

島狀準突然變異型=ヨリテ發現シタル稻胡麻葉枯病原菌 (*Ophiobolus Miyabeanus* Ito et Kuribayashi) ノ多數ノ準突然變異菌中第14號準突然變異菌ヨリ2例, 第7號並=第14號準突然變異菌ヨリ各1例宛ノ歸先遺傳ヲ發現セリ。

第7號準突然變異菌ヨリ歸先遺傳=ヨリ發現シタル菌ノ分生胞子ハ母菌ト大休同一ノ形態ヲ示シタルモ, 第14號準突然變異菌ヨリノモノハ甚シク異リタル形態ヲ示セリ。

歸先遺傳=ヨリ發現シタル兩菌ハ母菌ト大体同様ナル培養的性狀ヲ示シタレドモ, 黑色度極メテ强ク, 擬溶菌現象並=白色菌絲ノ發現極メテ僅少ナリ。而シテ第14號準突然變異菌ヨリノ菌ハ母菌=比シ發育速度極メテ遲シ。

歸先遺傳=ヨリ發現シタル兩菌ノ菌絲ノ發育=及ボス溫度ノ影響ハ大體=於テ母菌ト同様ナリ。

歸先遺傳=ヨリ發現シタル兩菌ノ病原性ハ殆ド相等シク稻葉並=稻苗=對シテハ母菌ヨリ弱ク, ⌊ミヅビエ⌉葉=對シテハ反對=强力ナリ。

**第XII篇**=於テハ突然變異的現象=ヨル病原性ノ變異=關スル實驗結果ヲ記載セリ。

稻胡麻葉枯病原菌 (*Ophiobolus Miyabeanus* Ito et Kuribayashi) ノ島狀準突然變異型ヨリ發現シタル多數ノ準突然變異菌ハ何レモ稻葉=對シ病原性ヲ示シ, 母菌ヨリモ强キモノ, 弱キモノ並=等シキモノノ3群=類別シ得タリ。

稻ノ⌊ブラキスポリウム⌉病原菌 (*Brachysporium Tomato* (Ell. et Barth.) Hiroe et Watanabe) ノ扇狀準突然變異型ノA型ヨリ發現シタル準突然變異菌ハ稻苗=對シ母菌ト同等ナル病原性ヲ示シ, ⌊ギャウギシバ⌉葉枯病原菌 (*Brachysporium Tomato* (Ell. et Barth.) Hiroe et Watanabe) ノ扇狀準突然變異型ノA型ヨリ發現シタル準突然變異菌ハ ⌊ギャウギシバ⌉ 葉並=稻葉=對シテハ母菌ヨリモ稍强ク, 稻苗=對シテハ母菌ヨリモ弱キ病原性ヲ示シタリ。

⌊コゴメガヤツリ⌉葉枯病原菌 (*Brachysporium Tomato* (Ell. et Barth.) Hiroe et Watanabe) ノ扇狀準突然變異型ノA型ヨリ發現シタル準突然變異菌ハ母菌ノ寄主植物タル ⌊イネ⌉ =對シ病原性ヲ增太セシノミナラズ, 母菌ノ侵害シ得ザリシ, ⌊ノビエ⌉ 並= ⌊ギヤウギシバ⌉ 等=對シテモ亦强力ナル病原性ヲ示シ, 明カ=他種植物=對スル寄生性ヲ增太セリ。

稻胡麻葉枯病原菌ノ島狀準突然變異型ヨリ發現シタル, 第7號並=第14號準突然變異菌ヨリ, 歸先遺傳=ヨリテ母菌=近キ性狀=復歸シタル兩菌ハ, 稻葉=對シテハ母菌ヨリモ弱ク, 反對= ⌊ミヅビエ⌉葉=對シテハ母菌ヨリモ甚シク强力ナル病原性ヲ示シタリ。





上記ノ如ク突然變異的現象=ヨリテ病原性=變異ヲ來シ, 病原性ヲ增太スルノミ=止ラズ, 更=他種植物=對スル寄生性ヲモ新=獲得スル=至リタルハ, 植物病理學並=育種學上重視スベキ點ナリトス。

**第XI篇**=於テハ突然變異的現象發現型ノ種類ト變異菌特性トノ關係=就キ記載セリ。

突然變異的現象ハ發現型=ヨリ分類スルトキハ扇狀準突然變異型, 島狀準突然變異型, 全準突然變異型並=恒準突然變異型=分類シ得ルモノナルガ, 之ヲ遺傳學的, 生理學的並=病理學的=詳細比較檢討スルトキハ, 其變異現象並=變異菌ノ性狀ヲ甚シク異=スル扇狀準突然變異型ノ A型並= B型, 並=島狀準突然變異型ノ3型ノ存在ヲ肯定シ得ルモノ=シテ, 發現型ノ種類ト突然變異的現象間=ハ一定ノ關係ヲ保持スルモノナリ。

即チ異リタル發現型ヨリノ變異菌ハ各異リタル性質ヲ具有スル事實ヲ示スモノ=シテ, 是等ハ異ル原因=ヨリ發現セシモノ=非ラザル無キヤヲ推定セシム。

以上ノ事實ヨリ, 予ハ絲狀菌ノ突然變異的現象就中發現ノ原因ヲ論議スル=當リテハ先ヅ變異菌ノ性狀ヲ異=スル各ノ發現型=就キテ比較考究シ, 然ル後一般絲狀菌=及ボス可キヲ主張セリ。

**第XII篇**=於テハ稻胡麻葉枯病原菌 (*Ophiobolus Miyabeanus* Ito et Kuribayashi) =於ケル擬溶菌現象=關スル實驗結果ヲ記載セリ。

**第1章**=於テハ擬溶菌現象ノ發現狀態ヲ記載スルト共=次ノ如キ定義ヲ與ヘタリ。

**擬溶菌現象**トハ純粹培養セル絲狀菌ノ極メテ若キ菌叢=發現スルモノ=シテ, 一見溶菌セルカノ如キ觀ヲ呈スルモ, 該部ヨリハ間モ無ク發育旺盛ナル新生菌絲ヲ發育スルモノ=シテ, 發達ノ過程=ヨリ, 之ヲ初期, 中期並=終期ノ3期=分チ得ルモノナリ。

**第2章**=於テハ擬溶菌現象部菌絲ノ形態學的研究結果ヲ記載セリ。

擬溶菌現象發現直前ノ氣中菌絲ハ形態學的=何等ノ變化無キモ, 基中菌絲ハ菌絲ノ癒着ヲ生ジタルモノ極メテ多シ。

擬溶菌現象**初期**=於ケル氣中菌絲ハ未ダ形態學的=何等ノ變化無キモ, **中期**=於テハ甚大ナル變化ヲ來ス。**終期**=於ケル氣中菌絲ノ形態ハ, 擬溶菌現象發現部上=發育スル白色變異菌叢ノ菌絲ノ形態ト殆ド同様=シテ, 白色變異菌叢ハ擬溶菌現象=ヨリ液中=沈下, 形態學的=種々ノ變化ヲ受ケタル氣中菌絲ガ再ビ氣中=發育セシモノト認メ得ベシ。

**第3章**=於テハ擬溶菌現象發現=關スル實驗結果ヲ記載セリ。

擬溶菌現象ハ, 接種源トシテ使用スル菌叢ノ如何=拘ラズ, 培養基面ノ位置如何=拘

ラズ，2％蔗糖加用馬鈴薯煎汁寒天培養基上ニ於テ極メテ容易ニ發現スルモノナリ。

**第4章**ニ於テハ擬溶菌現象ノ生物學的性狀ニ關スル實驗結果ヲ記載セリ。

本現象ハ 20° ～ 36°C ニ於テ發現シ，23° ～ 28°C 就中 24°C 前後ニ於テ最良ノ發現ヲナシ，16°C 以下ニ於テハ全ク發現セズ。

本現象ノ發現ハ培養成分ニヨリ甚大ナル影響ヲ蒙ルモノニシテ2％蔗糖加用馬鈴薯煎汁寒天培養基上ニ於テハ其發現最良ナリ。

本現象ハ 23°C ニ於テ1時間 0.496 ～ 5.106 $mm^2$，平均 3.511 $mm^2$ ノ擴大速度ヲ示ス。

本現象ハ1分間 0.083 ～ 0.5 $\mu$，平均1分間 0.291 $\mu$ ノ速度ヲ以テ增大ス。

本現象ハ 32°C ノ恒溫ニ於テ，早キハ 54 時間，遲キハ 74 時間，平均 64 時間目ニ發現シ，23°C ノ恒溫ニ於テハ早キハ 49 時間，遲キハ 69 時間，平均 59 時間目ニ發現ス。

本現象ハ發現後平均 20 時間ニシテ終期ニ達シ，本現象ヲ全ク認メ得ザルニ至ル。

本現象ハ蔗糖濃度ニヨリ著シク其發現ヲ左右セラルルモノニシテ，馬鈴薯煎汁寒天培養基上ニ於テハ，5％以下ノ蔗糖濃度ニ於テ容易ニ發現スルモ，10％以上ノ蔗糖濃度ニ於テハ發現セズ。

本現象ハ白色島狀變異菌叢ノ發現ト或ル種ノ因果關係ヲ有スルモノノ如ク，本現象ヲ發現セザル 10％並ニ 20％蔗糖加用馬鈴薯煎汁寒天培養基上ニ於テハ白色變異菌叢ヲ發現セザレドモ，2％並ニ5％蔗糖ノ場合ハ常ニ本現象ヲ發現シテ，多數ノ白色島狀變異菌叢ヲ發現ス。

本現象ハ蔗糖以外ノ糖類ヲ培養基中ニ含有スル場合ニ於テモ亦發現ス。

**第5章**ニ於テハ擬溶菌現象發現ノ機構ニ關スル實驗結果ヲ記載セリ。

本現象ノ初期ニ現ハルル菌叢下面ノ水液ハ，基中菌絲ノ癒着ニ伴フ各種分泌作用ガ，菌絲ノ癒着完了後ト雖モ，菌絲特有ノ原形質流動ニ基キテ惰性的ニ繼續セラルル結果，形成セラルルモノナリ。

本現象ノ中期ニ現ハルル，氣中菌絲ガ水液中ニ沈下スル現象ハ，水液ノ表面張力ニ基キ，物理的ニ現ハルルモノナリ。

本現象ノ中期ニ現ハルル水液中ニ沈下セシ氣中菌絲ノ膨太ハ水液ノ劣浸透壓ニ基クモノナルモ原形質分離，捲縮等ノ形態學的變化ハ，水液ノ滲透壓，水素［イオン］濃度以外ノ菌自身ノ代謝產物ニ基ヅクモノナリ。

本現象ノ中期ニ現ハルル水液中ニ沈下セシ氣中菌絲ノ細胞膜ノ溶解ハ菌ノ分泌セシ Chitinase, Pectinase, Cellulase 等ノ如キ酵素ノ作用ニ基クモノナリ。

本現象ノ終期ニ現ルル水液中ニ沈下セシ氣中菌絲ノ再生ハ，水液中ニ於テ種々ノ作用ヲ





受ケタル氣中菌絲ノ或ルモノガ，其遺傳質ニ變化ヲ來シ，抗水液性ノ性質ヲ獲得シ，再生スルモノナリ。

**第XIII篇**ニ於テハ島狀準突然變異型發現ノ機構ニ關スル實驗結果ヲ記載セリ。

**第1章**ニ於テハ島狀準突然變異型ニヨリ發現セシ變異菌ノ特性遺傳率ニ就テ記載セリ。

白色變異菌ノ特性遺傳率ハ培養成分ニヨリ甚大ナル影響ヲ受クルモノニシテ，5％並ニ2％蔗糖加用馬鈴薯煎汁寒天培養基上ニ於テハ遺傳率多ク，最モ少キ場合ニテモ 3.3–7％ガ特性ヲ遺傳スレドモ，蔗糖ヲ添加セザリシモノニ於テハ全ク特性ヲ遺傳セズ。

**第2章**ニ於テハ馬鈴薯煎汁寒天培養基上ニ於ケル島狀準突然變異型ノ發現過程ヲ記載セリ。

白色島狀變異菌叢ハ，擬溶菌現象ニヨリテ，菌叢下面ノ水液中ニ沈下浸漬セラレタル氣中菌絲ガ，種々ノ作用ヲ受ケテ變性シタル後，擬溶菌現象ノ終期ニ於テ再生セシモノナリ。

**第3章**ニ於テハ擬溶菌現象發現部上ノ白色變異菌叢ノ特性ノ遺傳性ニ關スル實驗結果ヲ記載セリ。

2％或ハ5％蔗糖馬鈴薯煎汁寒天培養基上ニ於ケル擬溶菌現象發現部上ノ白色變異菌叢ハ其特性ヲ遺傳スレドモ，擬溶菌現象發現部以外ノ白色變異菌叢ハ其特性ヲ遺傳セズ。

擬溶菌現象發現部上ノ白色菌叢ト雖モ，液中ニ沈下，浸漬セラレタル時間ノ永キモノ程變化著シク，特性ノ遺傳性强固ナリ。

**第4章**ニ於テハ島狀準突然變異型ノ發現並ニ擬溶菌現象ノ發現ト酸化酵素トノ關係ニ關スル實驗結果ヲ記載セリ。

突然變異的現象ヲ發現スルコト多キ培養基上ニ於テハ少キ培養基上ヨリモ酸化酵素作用力著シク强大ナリ。

突然變異的現象ヲ發現スルコト多キ菌種ハ少キ菌種ヨリモ，强キ酸化酵素作用力ヲ示ス。

突然變異的現象ヲ發現スルコト多キ蔗糖濃度ニ於テハ，少キ蔗糖濃度ノ場合ヨリモ强キ酸化酵素作用力ヲ示ス。

突然變異的現象ヲ發現スルコト多キ培養溫度ハ少キ培養溫度上ヨリモ，概シテ强キ酸化酵素作用力ヲ示ス。

以上ノ諸實驗結果ヨリ突然變異的現象ト酸化酵素間ニハ密接ナル關係ヲ有スルコト明カナリ。

酸化酵素ノ發現ハ必ズ擬溶菌現象ノ發現ニ伴フモノニシテ，擬溶菌現象ト酸化酵素間

ニハ極メテ密接ナル關係ヲ有ス。

以上ノ2事實ヨリ突然變異的現象ト擬溶菌現象間ニ存スル密接ナル關係ハ，酸化酵素ヲ通ジテ化學的ニモ亦證明シ得ルモノナリ。

**第5章**ニ於テハ島狀準突然變異型發現ノ機構ニ就テ論及セリ。

島狀準突然變異型ノ多クハ擬溶菌現象ナル過程ヲ經テ發現スルモノニシテ，兩者間ニ存スル密接ナル關係ハ，之ヲ形態學的，遺傳學的並ニ化學的ノ3方面ヨリモ證明シ得ルモノナリ。島狀準突然變異型ハ極メテ密接ナル關係ヲ有スル擬溶菌現象ト同様ニ，菌自身ノ代謝產物ニヨリ發現スルモノナリ。

**第6章**ニ於テハ島狀準突然變異型發現ニ關スル予ノ代謝產物說ノ實驗的證明ニ關シ記載セリ。

擬溶菌現象發現部ノ水液ヲ純粹ニ取出シ，之ニ白色變異菌叢ヲ發現スルコト無キ菌叢ヲ浸漬シ，一定時間後取出シ培養ヲ試ミルニ多數ノ白色島狀準突然變異菌ヲ發現セリ。而シテ浸漬セシ時間ノ永キモノ程白色變異菌叢ノ發現多ク，且ツ特性ノ遺傳性强ク，菌ノ代謝產物ガ白色島狀準突然變異菌發現ノ主因ヲナスコトヲ實驗的ニ證明シ得タリ。

各種ノ酵素ヲ含有スル酵素液中ニ浸漬シタル菌叢ハ白色島狀準突然變異菌ヲ發現スルモ，擬溶菌現象發現部ノ水液ニ浸漬シタルモノニ比シ其程度僅少ナリ。

高濃度蔗糖液（2 mol.）ニ浸漬シタル菌叢ハ，白色島狀變異菌叢ヲ殆ド發現セズ。

**第7章**ニ於テハ母菌タル稻胡麻葉枯病原菌（*Ophiobolus Miyabeanus* Ito et Kuribayashi）ノ細胞學的研究ノ結果ヲ記載セリ。

母菌ノ菌絲並ニ分生胞子ハ多核細胞ヨリナル。

菌絲先端細胞並ニ菌絲先端ニ形成セラルル分生胞子ハ形成初期ニ於テハ單核ナリ。

菌絲並ニ分生胞子ノ多核ハ，單核ノ分裂ニ基因スル同形質ノ細胞核ヨリナル。

**第8章**ニ於テハ菌絲ノ癒着ニ關スル實驗結果並ニ考察ヲ記載セリ。

菌絲ノ癒着ハ同一種間ノ同一系統ニ於テハ極メテ容易ニ起ル現象ナルモ，異種間ニ於テハ極メテ稀ナル現象ナリ。

從來唱ヘラレタル菌絲ノ癒着ニ基ヅク異形質ノ細胞質並ニ細胞核ノ混入ハ，單ナル推定ニ基ヅクモノ極メテ多ク之ヲ實驗的ニ證明セシモノ甚ダ僅少ナリ。

菌絲ノ癒着ニ基ヅク異形質ノ細胞質並ニ細胞核ノ混入ハ極メテ稀ナル現象ナリ。

**第 XIV 篇**ニ於テハ絲狀菌ノ永久的變異ニ關スル諸說ノ實驗的批判ヲ試ミ，之ニ結論ヲ與ヘタリ。





**第1章**ニ於テハ Mixochimaera (Heterocaryosis) 說ニ對スル批判ヲ與ヘ，本說ハ絲狀菌ノ永久的變異ノ一部ヲナス場合アレドモ，極メテ稀ナルヲ結論セリ。

**第2章**ニ於テハ雜婚並ニ雜種ノ分離（Hybridization or Segregation）說ニ對スル批判ヲ與ヘ，本說ハ有性生殖ヲ營ミタル場合ノ永久的變異ノ原因トシテ重視スベキモノナレドモ，無性的生殖ノ營マレタル際即チ絲狀菌ノ分生胞子時代ニ於ケル變異ノ原因ナラザルヲ結論セリ。

**第3章**ニ於テハ永續變異並ニ細胞質遺傳（Dauermodifikation, Semi-permanent Variation, Cytoplasmic Inheritance）說ニ對スル批判ヲ與ヘ，本說ハ絲狀菌ノ永久的變異ノ內次第ニ母菌ニ復歸スルガ如キ變異ノ主因ヲナスモ，永代ニ亘リ特性ヲ遺傳シ，變化スルコト無キ變異現象ノ原因ニ非ラザルヲ結論セリ。

**第4章**ニ於テハ突然變異（Mutation）說ニ對スル批判ヲ與ヘ，本說ハ特ニ無性生殖ノ場合ニ於ル絲狀菌ノ永久的變異ノ主因ヲナスヲ結論セリ。

**第5章**ニ於テハ突然變異的現象（Saltation）說ニ對スル批判ヲ與ヘ，突然變異的現象ハ突然變異ト殆ド同様ナル現象ニシテ，突然變異ト同様ニ絲狀菌ニ於ケル無性生殖ノ場合ノ永久的變異ノ主因ヲナスヲ論ジ，予ノ得タル，本報告所載ノ各菌ニ於ケル永久的變異ハ，突然變異的現象ニヨリ發現セシヲ結論セリ。

**第6章**ニ於テハ一般絲狀菌ノ永久的變異ヲ考察シ次ノ如キ結論ヲ與ヘタリ。

絲狀菌ノ永久的變異ハ（**1**）Mixochimaera（**2**）Hybridization or Segregation（**3**）Dauermodifikation 並ニ（**4**）Mutation or Saltation 等種々ノ原因ニヨリテ發現スルモノニシテ有性生殖ノ營レタル場合ノ變異ハ Hybridization or Segregation，無性生殖ノ場合ノ變異ハ Mutation or Saltation ニヨルモノ多シ。

**第7章**ニ於テハ，突然變異的現象中島狀準突然變異型ノ發現ニ關シテナセル予ノ代謝產物說 (1932) [228] ハ其後ニ於ケル Paxton (1932) [265] 並ニ Hansen 並ニ Smith (1935) [155] 等ノ實驗結果ヨリ考察シ其眞ナルヲ論ゼリ。

**第8章**ニ於テハ本報告所載ノ實驗結果ヨリ次ノ如キ結論ヲ與ヘタリ。

**I.** 絲狀菌ニ於ケル永久的變異ハ（**1**）Mixochimaera (Heterocaryosis)，（**2**）Hybridization or Segregation（雜婚或ハ雜種ノ分離），（**3**）Dauermodifikation（永續變異）並ニ（**4**）Mutation（突然變異）或ハ Saltation（突然變異的現象）等各異ナル原因ニヨリ發現シ，有性生殖ノ營レタル場合ノ永久的變異ハ Hybridization 或ハ Segregation 其主因ヲナシ，無性生殖ノ營レタル場合ハ Mutation 或ハ Saltation 其主因ヲナスモノナルガ本報告所載ノ各菌ニ於ケル永久的變異ハ突然變異的現象（Saltation）ニヨリ發現

セシモノナリ。

**II**. 突然變異的現象ハ其發現型ニヨルトキハ（**1**）扇狀準突然變異型（**2**）島狀準突然變異型（**3**）全準突然變異型並ニ（**4**）恒準突然變異型ノ4型ニ分類スルヲ得。

**III**. 突然變異的現象ヲ變異菌ノ特性ヨリ分類スルトキハ（**1**）扇狀準突然變異型ノA型（**2**）扇狀準突然變異型ノB型並ニ（**3**）島狀準突然變異型ノ**3**型ニ分類シ得ラレ，全準突然變異型並ニ恒準突然變異型ハ，變異菌ノ發現狀態ニ於テ，變異菌ノ特性ニ於テ共ニ島狀準突然變異型ト同樣ナリ。

**IV**. 稻胡麻葉枯病原菌（*Ophiobolus Miyabeanus* Ito et Kuribayashi）ノ島狀準突然變異型ノ或モノハ予ノ發見シタル擬溶菌現象ヲ經テ發現ス。

**V**. 擬溶菌現象ハ菌自身ノ代謝產物ニヨリテ發現ス。

**VI**. 稻胡麻葉枯病原菌ノ島狀準突然變異型ノ或モノハ菌自身ノ代謝產物ニヨリテ發現シ，菌ノ代謝產物中酵素並ニ化學物質ハ其ノ主因ヲナスモノナリ。

**VII**. 全準突然變異型並ニ恒準突然變異型ハ共ニ島狀準突然變異型ト同樣ナル原因ニヨリテ發現ス。





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# EXPERIMENTAL STUDIES ON THE SALTATION IN FUNGI, PARASITIC ON PLANTS

By

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(Résumé)

In the present paper the writer intends to report on the results of the author's past ten years experiments on the saltation in fungi, with special reference to *Helminthosporium* and its related genus, *Brachysporium*.

All strains of fungi used in these experiments, were started from single spores. This paper is divided into twelve parts.

## PART I. THE DEFINITION OF SALTATION

The term saltation, instead of mutation, was first proposed by Stevens [324] to parmanent variations in fungi, for the following reasons:-
the existing differences in definition and usage of the term mutation, also our very limited knowlege of cytological conditions in the genus *Helminthosporium* and our ignorance as to whether it has a sexual stage.

In the present paper the term saltation is newly defined by the author as follows : The term saltation denotes the same variation as mutation in fungi where the cytological constituent is obscure,or is distinct, however, the results of breeding experiments are unknown.

## PART II. VARIOUS TYPES OF SALTATION [228]

After detailed morphological and physiological researches on many saltants in various fungi, the author distinquished the following four types, according to their external appearance :

1. **Sector type of saltation.**
2. **Island type of saltation.**
3. **All saltating type.**
4. **Ever saltating type.**

**I. Sector type of saltation** : the fan or wedge-shaped mycelial patches of saltants are separated from the parent mycelial colonies.

Examples : *Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE on rice plant, the same on *Cynodon Dactylon* PERS., and the same on *Cyperus Iria* L., *Bra. ovoideum* HIROE et WATANABE on Italian millet, *Ophiobolus Miyabeanus* ITO et KURIBAYASHI on rice plant and *Alternaria Kikuchiana* TANAKA on Japanese pear.

**II. Island type of saltation** : the mycelial patches of the saltants are produced, scattered on the original mycelial colonies, appearing like an island on the ocean.

Examples : *Ophiobolus Miyabeanus* ITO et KURIBAYASHI (its conidial stage is *Helminthosporium Oryzae* BR. de HAAN) on rice plant, *Brachysporium ovoideum* HIROE et WATANABE on Italian millet, *Bra. Tomato* (ELL. et BARTH.) HIROE et WATANABE on rice plant, *Bra. ovoideum* HIROE et WATANABE on rice plant, *Bra. senegalense* SPEGAZZINI on rice plant, *Helminthosporium Oryzae-microsporum* HIROE n. sp. on rice plant and *Bra. Capsici* HIROE et WATANABE on chilli etc..

**III. All saltating type** : the mycelial colonies of the original fungus change wholly to that of the saltants.

Examples : *Ophiobolus Miyabeanus* ITO et KURIBAYASHI on rice plant.

**IV. Ever saltating type** : after a certain period of its development on culture medium the original fungus always produces the saltants.

Examples : *Ophiobolus Miyabeanus* ITO et KURIBAYASHI on rice plants.

## PART III. SALTATIONS IN VARIOUS FUNGI BELONGING TO SECTOR TYPE OF SALTATION

This part, which records the results of experiments on sector type of saltations in various fungi, is divided into six chapters.





### Chapter 1. On the saltation of Brachysporium Tomato, causal fungus of Brachysporiose of rice plant [284]

The causal fungus of Brachysporiose of rice plant was first observed by the writer in 1925, and as a scientific name *Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE, was proposed for this fungus. [171]

*Brachysporium* is a genus of Dematiaceae, and is characterized by dark brown mycelium and conidia. The parental form was isolated from an infected seedlings of rice plant in April, 1925. In October of the same year the author found that from the lower portion of the slant culture medium of apricot decoction agar, a white fertile sector grew out among its parent blackish mycelial colony. (cf. pl. 1)

Subcultures were made from the contrasting area of this culture, by transfering some of the white mycelial patch to other culture media.

Repeated single spore isolations have been made, and these cultures remain always constant for the character of albinism, as do the cultures made by isolating bits of mycelium, and this albino saltant has consistently maintained its albino character during elven years up to the present time.

Comparative studies of the saltant and its parental fungus were made and are summarized as follows :

I. The effect of temperatures on the mycelial growth of saltant and also of its parental fungus has been studied. But we could not find any remarkable difference between them. The optimum temperature for the mycelial growth of them seems to lie at about 28°C.

II. In order to ascertain whether there are any differences in degree of virulence of saltant and its parental fungus, comparative inoculation experiments were made on the rice seedlings. The results obtained indicated, however, that they have almost the same degree of virulence.

III. The conidia produced by albino saltant correspond in size and shape with those of the parent, moreover, other morphological differences between albino saltant and its parent also could not be recognized, with an exceptional case of albinism of saltant.

IV. The general cultural reactions of albino saltant correspond in every way with those of the parent but the saltant was absolutely devoid of the dark color of the parent.

V. Comparative studies on the toxic action by their metabolic products to cuttings of horse-beans, showed no distinct differences.

## Chapter 2. On the saltation of Brachysporium Tomato, causal fungus of a leaf blight of Cynodon Dactylon Pers.

*Brachysporium Tomato* is omnivorous, and also parasitic on *Cynodon Dactylon* PERS. as well as rice plants. Material used in these experiments was isolated from severely affected leaves of *Cynodon Dactylon* PERS.

In May of 1928, there appeared a white fan-shaped sector from the normal dark mycelial colony, on plate culture of synthetic agar medium with asparagin. (cf. pl. 4)

The same experiments as mentioned in chapter I were undertaken. The results of this experiment were almost the same as those mentioned in chapter I, with the exception of their virulence.

There are differences in their virulence, saltant was more virulent with respect to leaves of rice plants and *Cynodon Dactylon* PERS. than parent, on the contrary, to rice-seedlings it was less virulent.

## Chapter 3. On the saltation of Brachysporium Tomato, causal fungus of a leaf blight of Cyperus Iria L.

The present fungus is not only parasitic on rice plant but also on many species of the Gramineae. Leaves of *Cyperus Iria* L. are also affected by the fungus. The strain used in this experiment was isolated from severely affected leaves of *Cyperus Iria* L. on August 23, 1928.

On May 23, 1931, the same saltant as above mentioned, was found on slant cultures of apricot decoction agar, therefore the same experiments





as above mentioned were undertaken. The results of these experiments are summarized as follows:

I. The results of these experiments were almost the same as in the above mentioned experiments, however, saltant and its parent differ greatly in virulence.

II. The saltant is decidedly more virulent than the parent with respect to leaves of *Cyperus Iria* L., moreover, the saltant infected severely leaves of *Echinochloa crusgalli* BEAUV. subsp. *submutica* HONDA var. *typica* HONDA and *Cynodon Dactylon* PERS. on which, however, the parent is not parasitic.

III. Such change, in parasitism, of the saltant as above mentioned is tremendously important from the standpoint of phytopathology and plant breeding.

## Chapter 4. On the saltation of Ophiobolus Miyabeanus Ito et Kuribayashi

When the fungus, (its conidial stage is *Helminthosporium Oryzae* BR. de HAAN), has been cultured on SAITO's onion soy agar at the temperature above 28°C, white or grey floccose sterile sectors appeared frequently on its parent blackish fertile mycelial colony. The subsequent cultures from these sectors showed that some of them remained constant and always appear the same under identical conditions, while others revert to their parental type at the first transfer (this type is apparently a typical modification and is not considered here) or after several transfers.

## Chapter 5. On the saltation of Alternaria Kikuchiana Tanaka, causal fungus of black spot disease of Japanese pear

When the fungus was incubated at 24°C. or 28°C. on various culture media, among them on apricot decoction agar, SAITO's onion soy agar and potato juice agar, dark colored sectors developed on the parental rather light colored (Drab greenish olive) mycelial colony. (cf. pl. 18)

Subsequent transfers from these sectors showed the same results as those of chapter 4.

### Chapter 6. Summary of part III, characteristics of sector type of saltation

Sector type of saltation can be divided into two types, A and B, according to their morphological and physiological behavior.

In the sector type of saltation, **type A,** its saltating degree is remarkably great as described in chapter 1 to 3, and sectors appeared as white in color among its parent blackish mycelial colony.

In the sector type of saltation, **type B**, its saltating degree is not so great, as described in chapter 4 to 5, and the sectors appeared rather darker or lighter in color on its parent lighter or darker mycelial colony.

The sector type of saltation, type A showed the following characteristics:

I. The occurrence of saltation is very rare, and is not affected by any artificial treatments.

II. Saltants do not differ from their parents in morphological and cultural characteristics, however, wholly lost their color.

III. Saltants remain constant their characteristics for a long period, and never revert to their parents.

The sector type of saltation, type B showed the following characteristics:

I. The occurrence of saltation is relatively abundant, and is affected by certain artificial treatments.

II. Saltants differ from their parents not only in color but also in morphological characteristics.

III. All saltants do not remain constant in their characteristics, some of them remain constant, while other ones suddenly or gradually revert to their parents, after a certain period.

It seems to be a considerably important fact in discussing saltations that there are both type A and B in sector type of saltation, moreover, they differ greatly from each other, both in external appearance and their





saltant's characteristics.

## PART IV. SALTATIONS IN VARIOUS FUNGI BELONGING TO ISLAND TYPE OF SALTATION

This part, which deals with the results of experiments on island type of saltations in various fungi, is divided into three chapters.

### Chapter 1. On the saltation of Ophiobolus Miyabeanus Ito et Kuribayashi

*Ophiobolus Miyabeanus* Ito et Kuribayashi, the ascigerous stage of *Helminthosporium Oryzae* Br. de Haan, saltates abundantly on various culture media not only as sector type but also as island type, showing white small cottony appearance. (cf. pl. 6, 7, 8, 10 and 11)

Numerous subculturing tests showed that some of them revert at once to parental form at the first transfer (this is apparent modification), while others were greatly or relatively stable for long period.

#### A. On the relation of cultural characteristics and saltation, to time

The cultural characteristics of the fungus are much influenced by the age of inoculum, that is the oldest one, grown for about eight months, produced almost reddish mycelia, the next oldest one, grown for about five months, almost white mycelia, a younger one, grown for about three months, grey and black mycelia and the youngest one, grown for twelve days, almost black mycelia.

The occurrence of saltation is also much influenced by the age of inoculum used, namely, the oldest one produced reddish saltants and variants, the next oldest one, almost white saltants and variants, a younger one, many white island type of saltants and variants and the youngest one, little white island type of saltants and variants.

It is the writer's opinion that in the investigation of cultural characteristics of fungi, especially the age of inoculum is very considerable.

## B. Characteristics of saltants

### 1. Cultural characteristics of saltants

As mentioned above, the fungus saltates so abundantly that thousands of saltants have been obtained. To investigate all of them, which appeared, was obviously impossible, therefore, 244 typical saltants were chosen and studied.

**a.** On KNOP's agar with 5 % sucrose.

It is evident from this experiment that the saltants studied were divided into the following nine groups according to their cultural characteristics. The results of these experiments are summarized in Table XXXII.

**Group I.** Aerial and submerged mycelium is almost white in color. 34 % of saltants used are belong to this group.

**Group II.** Aerial mycelium is almost white but submerged mycelium is more or less white in color. 15.9 % of saltants used are belong to this group.

**Group III.** Aerial mycelium is white, while submerged mycelium is reddish purple white. 18.3 % of saltants belong to this group.

**Group IV.** Aerial mycelium is white but submerged mycelium is white and reddish purple white. 8.5 % of saltants belong to this group.

**Group V.** Aerial mycelium is white and black, but submerged mycelium is reddish purple. 13.4 % of saltants belong to this group.

**Group VI.** Aerial mycelium is almost white and submerged mycelium is black. 4.9 % of saltants belong to this group.

**Group VII.** Aerial mycelium is reddish purple. 12 % of saltants belong to this group.

**Group VIII.** Aerial mycelium is black and submerged mycelium is lighter than former. 1.2 % of saltants belong to this group.

**Group IX.** Aerial mycelium is grey and submerged mycelium is black. 2.4 % of saltants belong to this group.





**b.** On SAITO's onion soy agar

Saltants studied were divided into the following eleven groups according to their cultural characteristics on this medium. Data on these experiments are given in Table XXXIII.

**Group I.** Aerial mycelium is white and pink but submerged mycelium is dark blue. 16. 4 % of saltants used belong to this group.

**Group II.** Aerial mycelium is white and submerged mycelium is dark blue. To this group belong 1.6 % of saltants.

**Group III.** Aerial mycelium is white and pink but submerged mycelium is black. 12.3 % of saltants belong to this group.

**Group IV.** Aerial mycelium is white and submerged mycelium is black. 7.4 % of saltants belong to this group.

**Group V.** Both aerial mycelium and submerged mycelium are grey. 0.8 % of saltants belongs to this group.

**Group VI.** Aerial mycelium is almost white but submerged mycelium is black. To this group belong 12.7 % of saltants.

**Group VII.** Aerial mycelium is greyish white and submerged mycelium is black (the appearance is almost the same as that of parent form, but this group has more greyish white aerial mycelium).

**Group VIII.** Aerial mycelium is grey and dark olive and submerged mycelium is black. 11.4 % of saltants belong to this group.

**Group IX.** Aerial mycelium is black and powdered, and darker than that of parental form.

**Group X.** Aerial mycelium is considerably black, however, not powdered, and there is no growth of aerial mycelium. 0.4 % of saltants belongs to this group.

**Group XI.** Aerial mycelium is quite dark, more so than that of group X. 0.8 % of saltants belongs to this group.

### II. Pathogenicity of saltants

In order to ascertain whether there are any differences in the degree of pathogenicity of saltants and their parental form, comparative tests were made on 80 typical saltants, and leaves of rice plants and rice seedlings were used.

a. Experiments on leaves of rice plants

Data on these experiments are given in Table XXXIV. It seems evidently from these experiments that there are wide differences in the pathogenicity of saltants.

**Group I** is as virulent as the parent and to this group belong 48.9 % of saltants, used.

**Group II** is more vilurent than the parent and 8.9 % of saltants used, belong to this group.

**Group III** is less vilurent than the parent and includes 42.2 % of saltants, used.

b. Experiments on rice seedlings

The results, showing comparative vilurence of saltants used on rice seedlings, are summarized in Table XXXV.

It is obvious from these experiments that there are also wide differences in the pathogenicity of saltants.

**Group I** is as vilurent as the parent and includes 16.3 % of saltants used.

**Group II** is more vilurent than the parent and occupies 11.3 % of saltants used.

**Group III** is less vilurent than the parent and 72.5 % of saltants used belong to this group.

### III. Characteristics of saltant No. 1

Saltant No. 1 is so remarkably stable that its characteristics have not changed during the past 8 years, therefore, it seems to be typical of all saltants which appeared.

Saltant No. 1 cultured on potato juice agar with 2 % sucrose, grows an entirely white cottony mycelial colony at 28°C., however, both above or below this temperature it shows blackish submerged mycelium.

It is apparent from subculturing tests, from such blackish submerged mycelium, that it is a case of clear modification.

When saltant No. 1 cultured on potato juice agar with 2 % sucrose at 28°C., has been carried suddenly into a cold room (about 10°C to 15°C), it shows shrimp pink I color scattered on its white mycelial





colony. Subculturing tests from such reddish mycelium showed apparently that it is also of apparent modification.

### IV. Comparative studies on saltant No. 1 and its parent

Saltant No. 1 differs remarkably from its parent in several respects.

Saltant No. 1 differs decidedly in morphological characteristics. (cf. pl. 9)

Saltant No. 1 differs decidedly in cultural characteristics, including general appearance, and pigmentation of mycelial colonies, and also rate of mycelial growth, namely, parent colonies may consist of dark conidia and dark aerial mycelium, and shows vigorous and rapid mycelial growth. On the contrary, the saltant may consist of only white aerial mycelium, and shows more or less feeble and tardy growth.

Temperature relations for mycelial growth of both parent and saltant show little differences.

Both the saltant and parent, cultured on Knop's solution with 5 % sucrose, increased hydrogen ion concentration and osmotic pressure of the solution.

There is evidence that pathological physiological changes also may occurr, that is, toxic action of filtrate of Knop's solution with 5 % sucrose where parent and saltant were cultured alone for about three months, to cuttings of horse-beans inserted in the filtrate, shows decided differences.

Virulence of saltant No. 1 to rice seedlings was more than that of parent, while in other cases was less than that of parent.

## Chapter II. On the saltation of Brachysporium ovoideum Hiroe et Watanabe, causal fungus of leaf blight disease of Italian millet

This fungus produced frequently white island type mycelial patches on dark colored original mycelial colonies on such culture media as Miyoshi's onion soy agar, potato juice agar with 2 % sucrose and synthetic agar medium with asparagine.

Numerous subculturing tests showed that some of them revert at once at the first transfer to parental form which phenomenon is apparently one of modification, while others remain constant in their characteristics for long period of time, or suddenly or gradually revert to parent form after several generations.

Saltants occurred frequently on synthetic agar medium with asparagine, and at a temperature between 16° and 36°C., especially more frequently at 28°C.

## Chapter III. On the saltation of the causal fungi of seedling blight of rice plants

The seedling blight of rice plants was first found by the writer. After detailed experiments were undertaken, the author proposed the following four species of fungi as the causal agent, namely, *Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE (=*Bra. Oryzae* ITO et ISHIYAMA), *Helminthosporium Oryzae-microsporum* n. sp., and *Bra. senegalense* SPEGAZZINI [171–173].

Either fungus cultured on SAITO's onion soy agar at 32°C, 34°C and 36°C, produced white sterile patches on their original dark aerial mycelium.

Subsequent cultures showed that among them, only those of *Bra. senegalense* SPEGAZZINI revert at once at the first transfer, while those of other three fungi acted in the same way as those described at chapter 2.

## Chapter IV. On the saltation of the causal fungi of fruit rot of chilli

Evidence was first reported by the writer that the causal fungi of the fruit rot of chilli can be classified into the following four species, that is, *Brachysporium Tomato*, *Bra. ovoideum*, *Bra. senegalense* and *Bra. Capsici*. [170]

Among these four fungi cultured on apricot decoction agar at 24°C., *Bra. Capsici* produced white island type patches on original black mycelial colony. Subculturing tests showed that one of them reverted to parent form, while one of others remained constant in its characteristics and others produced white and black aerial mycelium.

Aerial mycelium of the stable saltant is white and slender as de-





scribed in chapter 1.

The fungus cultured on synthetic agar with peptone produced white large island type patches on its original black mycelial colony.

Numerous subculturing tests were undertaken from these white patches.

It is especially interesting to note that the white patches, in the external appearance, revert at once at the first transfer to parental form, however, wonderful to say, microscopic examination showed that the conidia was very long and it seems to belong apparently to the genus *Helminthosporium*. ( cf. pl. 14 )

The second subculturing tests showed the same results as the first, however, in the third subculturing tests the conidia revert suddenly to parental form. It seems analogous to *Stemphylium-Alternaria* saltation reported by WILTSHIRE. [36]

## Chapter V. Characteristics of island type of saltation (Summary of part IV)

The island type of saltation shows the following characteristics :

I. The occurrence of saltation is so abundant.

II. Saltants differ from their parent not only in morphological characteristics, but also in many physiological respects.

III. All saltants remain not constant in their characteristics, some of them do, while others suddenly or gradually revert to their parental form after a certain period.

IV. The occurrence of saltation is affected greatly by certain artificial treatments.

As above mentioned, saltants derived from island type of saltation are decidedly different from those of sector type of saltation in many respects.

## PART V. SALTATIONS BELONGING TO ALL SALTATING TYPE OF SALTATION

### Chapter I. On the saltation of Ophiobolus Miyabeanus Ito et Kuribayashi

If the fungus was cultured when the age of inoculum used is more than four months from the time cultures were started, and culture medium used is potato juice agar with 2 % sucrose, and the temperature at which cultures are undertaken is 28°C. it produced always wholly white sterile saltated mycelial colonies on the medium. (cf. pl. 15 )

### Chapter II. Characteristics of all saltating type of saltation

**I.** In order to produce the all saltating type, we must have three conditions as above mentioned.

**II.** The characteristics of saltants derived from this type are almost analogous to those of island type of saltation.

## PART VI. SALTATIONS BELONGING TO EVER SALTATING TYPE OF SALTATION

It was observed in the foregoing numerous experiments that the fungus *Ophiobolus Miyabeanus* Ito et Kuribayashi always produced abundant saltants when, as inoculum, mycelium aged more than two months was used.

It seems to be analogous to Das Gupta's investigation [98]

The characteristics of saltants derived from this type are almost the same as those of island type of saltation.

## PART VII. STUDIES ON MODIFICATIONS

There are numerous reports on modifications or so-called fluctuations





or variations in fungi, which are not parmanent.

The writer started a comparative investigation with saltation to ascertain the principle of saltation.

Modification could be found abundantly in the foregoing numerous experiments in such fungi as *Ophiobolus Miyabeanus* Ito et Kuribayashi, *Brachysporium Yamadaeanum* Matsuura, *Alternaria Kikuchiana* Tanaka, *Alternaria Sonchus* Davis, *Fusarium niveum* E. F. Smith, *Brachysporium Tomato* (Ell. et Barth.) Hiroe et Watanabe, *Bra. ovoideum* Hiroe et Watanabe, *Bra. senegalense* Spegazzini, *Bra. Capsici* Hiroe et Watanabe and *Helminthosporium Oryzae-microsporum* n. sp. etc..

It is considered that the external appearances of modification are about the same as those of saltation, accordingly the following four types could be distinquished.

**I. Island type of modification**
**II. Sector type of modification**
**III. All modificating type**
**IV. Ever modificating type**

## PART VIII. STUDIES ON THE ENVIRONMENTAL FACTORS AFFECTING THE OCCURRENCE OF SALTATION

There were numerous evidences from abundant experiments and observations that such environmental factors as Röntgen's and ultraviolet rays, temperature, amount of nutrition, and chemicals etc. exert a profound effect on the occurrence of saltation.

The writer studied this problem to ascertain not only the effect of such factors but also the comparative behavior of saltants from both sector and island type, to such environmental factors.

### Chapter I. Effect of Röntgen's and ultraviolet rays, and their combined eradiation

#### A. On island type of saltation

Effects of RÖNTGEN's ray eradiation on the occurrence of saltation or cultural characteristics of *Ophiobolus Miyabeanus* ITO et KURIBAYASHI were very little.

Effects of ultra-violet ray eradiation on those of the same fungus were more than that of RÖNTGEN's ray, decreasing the rate of mycelial growth and the occurrence of saltation.

Effects of both of RÖNTGEN's and ultra-violet rays combined eradiation on those of the same fungus is so great that not only the occurrence of saltation remarkably decreased but also the rate of mycelial growth.

### B. On sector type of saltation

Effects of ultra-violet eradiation and RÖNTGEN's ray eradiation on the occurrence of sector type of saltation will be considered.

There are some of effects of RÖNTGEN's and ultra-violet ray eradiation on the rate of mycelial growth of the same fungus, that is, in the case of RÖNTGEN's ray eradiation, it is more or less stimulated, and in the case of ultra-violet ray eradiation, it is stimulated at weak eradiation, while at strong eradiation, it is decreased.

It seems that the fungus, eradiated by ultra-violet ray, produced much grey colored aerial mycelium, having little sporulation.

## Chapter II. Effects of amount of nutrition and the position of mycelial colony

For the purpose of these experiments, cultures were made as follows: Newly poured agar plates were placed on a slight incline so that the upper side was covered with a thin layer of the medium and the lower with considerably thicker layer.

These slant media, inoculated in the center in the usual manner, and the plate culture were kept under various positions as shown in Fig. 2 of page 104.

Using *Ophiobolus Miyabeanus*, which produced numerous island types of saltation, these tests were made, but the results were inconclusive.

The rate of growth of this fungus was more vigorous on the thicker





side than on that of thin layer. The characteristics of mycelial colony of the under side were the same as those of the upper one.

## Chapter III. Effect of temperatures

There was abundant evidence from numerous workers that temperatures at which cultures were made, exert a profound effect on the frequency of saltation or the so-called mutation.

In order to ascertain this problem, several fungi which belong either to island or sector type of saltation, were used, namely as island type of saltation, *Ophiobolus Miyabeanus* and as sector type of saltation, seven strains of *Brachysporium Tomato*, 5 strains of *Bra. ovoideum*, 5 strains of *Bra. senegalense*, *Bra. Capsici*, *Helminthosporium Oryzae-microsporum*, *Bra. Yamadaeanum*, *Bra. trifolii*, *Fusarium niveum* and *Alternaria Kikuchiana*.

### A. On island type of saltation

There were indications that temperatures affect remarkably the frequency of island type of saltation of *Ophiobolus Miyabeanus*.

On SAITO's onion soy agar, saltation appeared at wide range of tempratures (16°C to 34°C).

The higher the temperature was raised above 28°C, the more the saltation.

The optimum temperature for the occurrence of saltation lies at 32° to 34°C.

On potato juice agar with 2 % sucrose the greater occurrence of saltation was noted at 30° to 32°C, no saltation was noted at 36°C.

On apricot juice agar the occurrence of saltation was considerably less at each of these temperatures.

### B. On sector type of saltation

There is decided evidence that the sector type of saltation type A of several fungi, as above mentioned, could not be noted at either temperature, while type B of *Ophiobolus Miyabeanus* could be noted at 30°C to 34°C, but at the temperature below 28° C, no salation was noted.

## Chapter IV. Effect of nutrients

For the problem several fungi, the same as described in chapter III, were used.

### A. On island type of saltation

Nutrients appear to affect the occurrence of island type of saltation, it was observed on potato juice agar with 2 % sucrose, SAITO's onion soy agar and synthetic solution agar with asparagine, especially on the first two, while on MIYOSHI's onion soy agar, rice plant decoction agar, synthetic agar with peptone and corn meal agar did not appear.

### B. On sector type of saltation

It was decidedly considered that nutrients do not appear to affect the occurrence of both type A and B of sector type of salatation.

## Chapter IV. Effect of toxic chemicals

There are relatively less informations in fungi along this line, while the problem seemed to be the most important one, from the genetic point of view. Therefore, experiments were made for the purpose of obtaining data along this line.

The following fungi were used : *Ophiobolus Miyabeanus* as island type, and as sector type *Alternaria Kikuchiana*, *Fusarium niveum*, *Brachysporium Tomato* on *Cynodon Dactylon* etc..

These fungi were cultured at 32°C on SAITO's onion soy agar with the addition of 0.01 % Kalium bi-chromate, 0.05 % Zinc sulphate, 0.01 % Merchulic chloride, 0.05 % Carbolic acid, 0.01 % Hydrofluoric acid, 0.02 % Copper sulphate, 0.03 % Kalium permanganate, 1 % or 0.5 % Boric acid and 0.85 % Citric acid, respectively.

### A. On island type of saltation

It is evident that the occurrence of island type of saltation and pseudo-





myceliolyse of *Ophiobolus Miyabeanus* is stimulated by the addition of small amounts of Kalium bi-chromate, Kalium permanganate or Hydrofluoric acid etc. alone.

It is interesting evidence that in these experiments the pseudo-myceliolyse also appeared on SAITO's onion soy agar, and by the addition of Zinc sulphate, Murchulic chloride, Carbolic acid, Copper sulphate, Boric acid or Citric acid etc. respectively, no saltation and no pseudo-myceliolyse were observed.

### B. On sector type of saltation

In *Fusarium niveum* E. F. SMITH no sector type of saltation appeared on SAITO's onion soy agar, containing the above mentioned toxic chemicals.

It is considerably interesting from the phytopathological point of view, to note that the growth of the fungus was wholly checked by the addition of a small amount of Boric acid (0.5 %)

In *Alternaria Kikuchiana* TANAKA no sector type of saltation, type A appeared on various media, on the contrary, type B appeared on a medium containing 0.02 % Copper sulphate.

It is especially interesting to note that white all modificating type appeared on media containing 1 % or 0.5 % Boric acid.

In *Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE on *Cynodon Dactylon* PERS. no saltation appeared on any media.

Sector type of saltation, type B of *Ophiobolus Miyabeanus* ITO et KURIBAYASHI appeared on media containing 0.01 % Kalium bi-chromate, 0.01 % Hydrofluoric acid or 0.3 % Kalium permanganate.

It seems evident from these experiments that the occurrence of island type of saltation was considerably affected by toxic chemicals, some of them stimulate it and others check it.

Sector type of saltation, type A which appeared very rare, could not be affected by any toxic chemicals used, while type B could be stimulated by certain toxic chemicals.

## PART IX. CHANGE OF PATHOGENICITY BY SALTATIONS

The fact that the pathogenicity of saltants may differ from their parental form, have called attention by CHRISTENSEN [72] and others. It has been shown by the forgoing investigators that there are three categories : ( 1 ) saltants as virulent as the parent, ( 2 ) saltants less virulent than the parent, ( 3 ) saltants more virulent than the parent. In the author's experiments as above mentioned, it is also clearly recognized that there are three categories of pathogenicity of saltants appeared.

Moreover, the saltant derived from *Brachysporium Tomato* on *Cyperus Iria* L. aquired newly such remarkable virulence that it not only affected more severely the leaves of its host plant, *Cyperus Iria* L. and rice plants than the parent, but also leaves of *Echinochloa crusgalli* BEAUV. subsp. *submutica* HONDA and *Cynodon Dactylon* PERS. which could not be affected by the parent fungus.

The facts that certain saltants are adopted to affect newly certain plants which could not have been affected by their parent, suggest one way in which investigation of saltation in fungi, parasitic on plants, may be of paramount importance, because it complicates the study of genetic inheritance and the development of resistant variety.

## PART X. REVERSIONS IN SALTANTS

It is highly desirable, in order to throw some light on the principles of saltation, to clear up reversion phenomenon. Therefore, experiments were made for the purpose of obtaining data along this line.

Reversions appeared in a few cases in saltants belonging to island type of saltation, and sector type of saltation, type B, while in those of sector type of saltation, type A, did not.

The writer investigated in detail, especially with reference to two cases on saltant No. 7 and No. 14 of *Ophiobolus Miyabeanus*, derived from island type of saltation.





Morphology of conidia of reversion form from saltant No. 7 is almost the same as the parent, while that of saltant No. 14 differs remarkably at the first transfer from its parent, however, this change of conidial form gradually reverts to parental form after several transfers (cf. pl. 20)

Both reversion forms showed almost the same appearance as parental form, however, the blackness of mycelial colony was remarkably great and the pseudo-myceliolyse did not appear, accordingly white mycelial patches could not be observed, moreover, one of them shows very slow growth rate.

Effect of temperatures on the mycelial growth of reversion forms and on their parental form was almost the same.

The virulence of both reversion forms is almost the same in each and less virulent than their parent, to leaves of rice seedlings, while more virulent than their parent to leaves of *Echinochloa crusgalli* BEAUV. subsp. *genuina* HONDA var. *echinata* HONDA.

## PART XI. RELATION BETWEEN TYPE OF SALTATION AND THEIR CHARACTERISTICS (SUMMARY OF PART I TO X)

As described in part II, saltations in fungi are divided into the following four types : sector type of saltation (type A and B), island type of saltation, all saltating type and ever saltating type.

These four types of saltation have been investigated in such great detail as described in part III to X, that the following conclusions could be obtained.

According to the external appearance of saltations they could be divided into the above mentioned four types, while according to the genetic and pathological point of view concerning saltant's characteristics, into the following three types : (1) sector type of saltation type A, ( 2 ) sector type of saltation type B, and ( 3 ) island type of salation.

It seems probably that there exist a certain relationship between the type of saltation and the characteristics of saltants, therefore, it is highly desirable, that when discussing the principle of saltation, first to investigate to what type the saltation belongs.

## PART XII. STUDIES ON PSEUDO-MYCELIOLYSE

### Chapter I to III

The term **pseudo-myceliolyse** was first suggested by the writer (228) to designate the following phenomenon in hyphomycetous fungi:-

It is often observed that when hyphomycetous fungi are cultured during long period on the same culture medium, parts of the aerial mycelia fall down, showing a waterly lustre. Such a phenomenon has been observed by STEVENS (324), in the genus *Helminthosporium*, and was called the senescence phenomenon of aerial mycelium. The writer has observed also in the same genus *Helminthosporium* (*Ophiobolus Miyabeanus* ITO et KURIBAYASHI, ascigerous stage of *Helminthosporium Oryzae* BR. de HAAN), a similar phenomenon, however, not in the old culture, but in that only 2 to 3 days old.

In the latter case, the writer observed the following facts:- On the potato juice agar with 2 % sucrose in PETRI dish, when the mycelia of the fungus grow to about 1.5 to 2.5 cm in diameter, from the under surface of the aerial mycelia, a little quantity of liquid is secreted at first, and then, as it stands longer, a large quantity of liquid is secreted during about only one day, and all the aerial mycelia on the liquid, sank down, one after another.

Microscopic examination showed that such submerged mycelia had become slender and weak and at first sight their appearance was just "bacteriolyse" in bacteria. Such a phenomenon is called "pseudo-myceliolyse" by the writer.

This phenomenon can be divided into three stages, the incipient, the middle and the final stage, according to the process of its development.

The incipient stage of the phenomenon, shows a formation of some quantity of liquid on the under surface of the mycelial colony.





At the middle stage of the phenomenon, the following changes occur, at first the aerial mycelia where liquid is secreted, sank down into the liquid, and then showed certain morphological changes such as the plasmolysis, or shrinking of some hyphae and the dissolving of cellmembrane of some hyphae.

At the final stage of this phenomenon, some of aerial mycelia, submerged in the liquid, regrow vigorously and covered, in sequence, all parts, where pseudo-myceliolyse occurred.

The term pseudo-myceliolyse is defined by the author as follows :-

The term pseudo-myceliolyse denotes the phenomenon which appears only on very young mycelia of hyphomycetous fungi in pure culture, and at first sight, it seems to be dissolved, however, in a short time, vigorous new grown aerial mycelia appear, where the phenomenon has occurred, and it goes through the following three stages, the initial, the middle, and the final stages, according to the process of its development.

### Chapter IV. Biological characteristics of the phenomenon (167)

The results of this experiments are summarized as follows :-

I. Temperature has a profound effect on the occurrence of pseudo-myceliolyse. The optimum temperature for pseudo-myceliolyse on potato juice agar lies at 23° to 28°C, especially at about 24°C.

II. No pseudo-myceliolyse occurred in cultures grown at 16°C or below, nor at 36°C or above.

III. Pseudo-myceliolyse occurred frequently on such various liquid or agar media as potato sucrose, rice straw decoction, synthetic media with asparagine, or peptone, corn meal, apricot decoction and SAITO's onion soy agar etc..

IV. No pseudo-myceliolyse occurred on MIYOSHI's onion soy agar.

V. Pseudo-myceliolyse increased its area at the rate of 0.496 to 5.106 mm square, the average being 3.511 mm square per minute at 23°C.

VI. In a certain part of the area of pseudo-myceliolyse it developed at the rate of 0.083 to 0.5 $\mu$, average 0.291 $\mu$ per minute at 17° to 20°C.

VII. The incipient stage of pseudo-myceliolyse appeared in 54 to 74 hours, (average 64 hours) at 32°C, and 49 to 69 hours, (average 59 hours) at 23°C after inoculation.

VIII. The final stage of pseudo-myceliolyse began 72 to 95 hours after cultures were started, and on the average, appeared 20 hours after its incipient stage.

IX. On potato juice agar, the concentration of sucrose has a profound effect on the occurrence of the phenomenon. The optimum concentration of sucrose is 2 %.

X. The pseudo-myceliolyse can not, therefore, be recognized unless a detailed and continuous observation is made.

## Chapter V. The mechanism of the occurrence of the phenomenon [169]

**I.** The incipient stage of the phenomenon, shows a formation of some quantity of liquid on the under surface of the mycelial colony, which is due to the secretion of liquid from the submerged mycelia.

The conclusion, above mentioned, resulted from the following three facts:-( 1 ) In the young culture of the fungus, the oxydase activity was not observed till the pseudo-myceliolyse appeared, and the more the occurrence of the pseudo-myceliolyse, the stronger oxydase activity was observed. It seems, therefore, that strong oxydation occurs where the pseudo-myceliolyse appears, and also strong oxydation occurs with the secretion of liquid from viscera of animals. ( 2 ) The anastomosis of submerged mycelia appears frequently where the pseudo-myceliolyse occurs, and the cause of anastomosis seems to be some chemical principles secreted from the mycelia itself. ( 3 ) The protoplasmic movement of mycelia shows so-called "flutende Bewegung" which is a peculiar protoplasmic movement.

**II.** At middle stage of the phenomenon, the following changes occur, at first the aerial mycelia, where some liquid was secreted, sank down into the liquid, and then showed some morphological changes such as the plasmolysis, shrinking or swelling of mycelia and the





dissolving of cellmembrane of hyphae. The sinking of aerial mycelia into the liquid was introduced physically. The plasmolysis or shrinking of aerial mycelia is based on the action of some chemical principles, secreted from the submerged mycelia itself, instead of some change of hydrogen-ion concentration or osmotic equilibrium of the liquid, secreted from the fungus. The swelling of mycelia resulted from the low osmotic pressure of liquid secreted, namely, the osmotic pressure of the mycelial cells (0.45 mol.$KNO_3$) is higher than that of liquid ( 0.065 mol. $KNO_3$), formed at the under surface of the mycelial colony. The dissolving of cellmembrane of aerial mycelia is due to some enzymes such as chitinase, pectinase etc., secreted from the submerged mycelia.

**III.** At the final stage of the phenomenon, some of the aerial mycelia, submerged in the liquid, acquire new characteristics which resist the liquid, and then new filiformed aerial mycelia regrow vigorously from the morphologically changed mycelia, submerged in the liquid.

# PART XIII. STUDIES ON THE MECHANISM OF THE OCCURRENCE OF ISLAND TYPE OF SALTATION [228]

## Chapter I. Degree of constancy of white island-like mycelial patches

The degree of constancy of white island-like mycelial patches of *Ophiobolus Miyabeanus* ITO et KURIBAYASHI, was remarkably affected by the environmental factors, with the range up to 46 %.

The degree of constancy of white island like mycelial patches of the fungus is most stable when, on SAITO's onion soy agar, as inocula, long aged and greyish white mycelia were used, and on potato juice agar it is considerably influenced by the quantities of sucrose added, viz. 0.5 % sucrose, shows 0 %, while 2 % sucrose and 5 % sucrose show the most stability.

The degree of constancy of white island-like mycelial patches was remarkably affected by the nutrients mentioned above.

From detailed experiments concerning this problem it seems probable that the degree of constancy of white island like mycelial patches are considerably affected by such environmental factors as nutrients, due to the differences of metabolic products in each case.

## Chapter II. The process of the occurrence of island type of saltation

It is obvious, in the case of island type of saltation of *Ophiobolus Miyabeanus* on the potato juice agar with 2 % sucrose in PETRI dish, that island type saltants appear where pseudo-myceliolyse occurred.

As above mentioned, in the occurrence of island type saltants in *Ophiobolus Miyabeanus*, the writer observed the following facts:-

At first aerial mycelia where liquid has been secreted, sink down in the liquid, and then after a certain period of time, vigorous new white aerial mycelia grow out from where the former aerial mycelia sank, and appear as white island like mycelial patches. Accordingly it is evident that the island type of saltation of *Ophiobolus Miyabeanus* on potato juice agar, appears to be a development from pseudo-myceliolyse.

From the above mentioned facts it seems that there is an exact relation between pseudo-myceliolyse and the occurrence of the island type of saltation.

Pseudo-myceliolyse apparently is due to the action of certain metabolic products of the fungus itself, accordingly the writer came to the conclusion that island type of saltation in *Ophiobolus Miyabeanus*, on potato juice agar, is due to the action of certain metabolic products of the fungus itself.

## Chapter III. Stability of white island-like mycelial patches formed, whether pseudo-myceliolyse occurred or did not

Detailed experiments along this line were undertaken on various culture media.

**A.** On potato juice agar with 2 % sucrose:-





1. White aerial mycelia, before the pseudo-myceliolyse occurs, revert to original form at once, at the first transfer.
2. White aerial mycelia, as soon as the pseudo-myceliolyse has occurred, after three days from cultures started, showed greyish white mycelia, at the subsequent transfers.
3. Where the pseudo-myceliolyse has occurred, white mycelia, after nine days from cultures started, showed white aerial mycelia, at the subsequent transfers.

**B.** On potato juice agar with 0.5 % sucrose:-

Where the pseudo-myceliolyse has occurred, white aerial mycelia, showed greyish white mycelia, at the subsequent transfers.

**C.** On potato juice agar (containing no sucrose):-

Where the pseudo-myceliolyse has occurred, white aerial mycelia, revert at once, at the first transfer.

**D.** On potato juice agar with 2 % sucrose, the quantity of potato being 1/10 of ordinal media:-

On this medium, the results of experiments were almost the same as in C.

From the above mentioned experiments, the fact, that there exists a decided relation between the pseudo-myceliolyse and the occurrence of island type of saltation, is genetically demonstrated.

## Chapter IV. On the relation between oxydase activity and saltation [166]

I. The filtrate of liquid cultures of certain strains of the fungus, saltating more frequently, shows a remarkably strong oxydase activity, whereas those of less frequent saltation show, only a feeble oxydase activity.

II. In the nutrient liquid media in which saltation occurs more frequently, remarkably strong oxydase activity can be observed, but in cases of less frequent saltation, only a feeble oxydase activity.

III. The filtrates of liquid cultures of certain species of fungi, saltating more frequently, and belonging to the genera of *Helminthosporium*, *Brachysporium*, *Fusarium and Alternaria*, show stronger oxydase activity than those of the other fungi, saltating less frequently.

IV. In potato juice, containing a certain quantity of sucrose, at the concentration of sucrose, when saltation occurs more frequently, stronger oxydase activity can be observed than in cases of less frequent saltation.

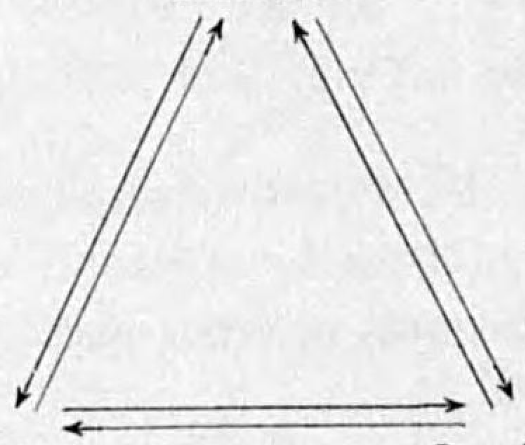
V. At the temperature of more frequent saltation, stronger oxydase activity can be observed, than at the temperature of less frequent saltation.

VI. From the above mentioned facts, it may readily be concluded that there exists a certain relation between the oxydase activity and the saltation of the fungus.

VII. In the young culture of the fungus, the oxydase activity was not observed till the pseudo-myceliolyse appeared, the oftener the pseudo-myceliolyse, occurred the stronger the oxydase activity seemed to be. It seems, therefore, that there exists a certain relation between the oxydase activity and the pseudo-myceliolyse of the fungus.

VIII. The distinct relationship of the pseudo-myceliolyse to the saltation has been clearly demonstrated by the author in Chapter II.

IX. From the above mentioned three facts, the following relationship between the pseudo-myceliolyse and the saltation to the oxydase activity may be recognized.




X. It is concluded, therefore, that the relation of the pseudo-myceliolyse to the saltation can be demonstrated, not only morphologically, but also chemically, through the oxydase activity. Accordingly the





author's theory concerning the mechanism of the occurrence of saltation can be demonstrated, not only morphologically, but also, through the oxydase activity, chemically.

## Chapter V. Mechanism of the occurrence of island type of saltation

As above mentioned, the writer came to the conclusion that island type of saltation in *Ophiobolus Miyabeanus* ITO et KURIBAYASHI on potato juice agar is due to certain metabolic products of the fungus itself.

As mentioned in Chapter I to IV it seems that the relation between the occurrence of island type of saltation and the pseudo-myceliolyse can be demonstrated from the morphological, genetic and chemical point of view. Accordingly it seems evident that the writer's theory, concerning the occurrence of island type of saltation, that certain island type of saltation in *Ophiobolus Miyabeanus* ITO et KURIBAYASHI, is due to the action of certain metabolic products of the fungus itself, contained in the liquid under question, can be demonstrated morphologically, genetically and chemically.

## Chapter VI. Experimental demonstration of the writer's theory concerning the occurrence of island type of saltation

Detailed experiments were made for the purpose of obtaining data concerning the above mentioned thesis.

Very young mycelia, grown on specially prepared potato juice agar containing no sucrose, which never saltates, were immersed in the liquid, secreted by the fungus, on sterilized concave slides in PETRI dishes, for a certain period of time, under sterile conditions, and the immersed mycelia were used as inocula.

This experiments apparently showed that numerous saltants appeared from such treated inocula.

The inocula immersed in enzyme solution, containing emulsion, trypsin, pepsin, arbutin and papayotin etc., showed numerous saltants, but were fewer in number, than the inocula immersed in the liquid described above.

The inocula immersed in 2 mol. solution of sucrose, showed no saltant.

From the above mentioned experiments, it seems clearly that the writer's theory concerning the occurrence of island type of saltation, can be experimentally demonstrated.

### Chapter VII. Cytological studies on parental fungi, Ophiobolus Miyabeanus Ito et Kuribayashi

This experiment was started with the purpose of finding out whether all the nuclei in the mycelium and conidia are of the same genetic constitution.

For this purpose, a careful examination was undertaken of the development of the mycelium and the formation of the conidia, was undertaken.

The mycelium generally consisted of multinucleate segments making up the hyphae. The number of nuclei, in each cell, varied from 1 to 12 or even more.

The apical cell of the young vegetative hyphae has, as a rule, 2 to 6 nuclei in it, while very young ones have only one nucleus, and in somewhat later stages, the apical cell contained two nuclei, owing to the direct nuclear division.

The conidia are produced at the apex of mycelium (conidiophore), therefore, it is clear that all the nuclei in conidia and mycelia of the fungus originate from a single nucleus, namely they are genetically the same.

It is, therefore, concluded that heterocaryosis or so called mixochimaera is not in the fungus described in this paper.

### Chapter VIII. Experiments on the anastomosis of fungi

From the writer's experiments, it is concluded that true anastomosis





or so called hyphal fusion, pointed out by Buller [58] is observed commonly, in the same strains of the same fungus, while among the different strains or species, it was not observed.

It is, therefore, concluded that since heterocaryosis and anastomosis of different strains of the fungus have been disproved, and moreover it has been demonstrated that all the nuclei in conidia and mycelia are the same genetically, the permanent variation of fungi, reported in this paper, may be mutation, namely saltation.

## PART XIV. DISCUSSION AND CONCLUSION

Numerous theories concerning the cause of parmanent variations in fungi, reported previously, have been discussed in this paper.

The writer obtained the following conclusions from above mentioned experiments :-

**I.** Parmanent variations in fungi are caused by the following several phenomena, namely (1) **Mixochimaera** (Heterocaryosis) (2) **Hybridization or Segregation**, (3) **Mutation or Saltation and** (4) **Dauermodifikation**, and in the case of sexual reproduction, hybridization or segregation is the main cause, while in the case of asexual reproduction, mutation or saltation is the main cause.

**II.** Parmanent variation in fungi, reported in this paper is based on the saltation.

**III.** Saltation in fungi can be divided into four types according to the type of saltation :

(1) **Sector type of saltation**
(2) **Island type of saltation** (one of patch type)
(3). **All saltating type**
(4) **Ever saltating type**

**IV.** Saltations in fungi can be divided into the following three types according to saltant's characteristics :-

(1) Sector type of saltation, **type A**
(2) Sector type of saltation, **type B**
(3) Island type of saltation

The "all saltating type" and "ever saltating type" are the same as the island type of saltation.

It is demonstrated clearly that certain island type of saltation in *Ophiobolus Miyabeanus* ITO et KURIBAYASHI occur through its peculiar phenomenon, pseudo-myceliolyse.

VI. The phenomenon, pseudo-myceliolyse is due to certain metabolic products of the fungus itself.

VII. It is demonstrated experimentally and theoretically that certain island type of saltation occurred by certain metabolic products of the fungus itself, and especially certain enzymes and chemicals, contained in metabolic products, are the main principles.

VIII. Saltations, belonging to "all saltating type" and "ever saltating type" occurred by the same principle as island type of saltation.

In conclusion, the author wishes to express his heartiest thanks to Dr. M. Sô, Professor of Tokyo Imper. Univ. and Dr. K. Miyake, Prof. Emer. of Tokyo Imper. Univ., who have encouraged him in the accomplishment of the present work.

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第 1 圖 版

(Plate I)

## 第 1 圖 版 ノ 說 明

第 1 圖　稻種子ヨリ分離セシ *Brachysporium Tomato* ノ分生胞子.

第 2 圖　同上分生胞子ノ發芽.

第 3 圖　アスパラギン加用合成寒天培養基上ニ形成セラレタル Stalked Body.

第 4 圖　稻種子ニ形成セラレタル Stalked Body.

第 5 圖　稻種子ヨリ分離セシ *Brachysporium Tomato* ニ於ケル扇狀準突然變異型發現ノ起源.

a. 正常ナル發育狀態.

b. 下端ニ白色變異菌叢ノ出現セルヲ示ス.

c. b ノ白色變異菌叢ヲ移殖シタル結果.

d. e. f. g. h. c ノ白色變異菌叢ヲ移殖シタル結果, 全部白色ノ菌叢ノ發育セルヲ示ス.

## Explanation of Plate I.

Fig. 1. Photomicrograph of conidia of *Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE, isolated from rice grains.

Fig. 2. Germination of conidia of the fungus.

Fig. 3. Stalked bodies of the fungus, formed on synthetic culture media with asparagin.

Fig. 4. Stalked bodies of the fungus, forming on sterilized dehhulled rice grain.

Fig. 5. Slant cultures of *Brachysporium Tomato*, isolated from rice grains, showing origin of "Sector type of saltation".

a. Normal cultural characteristics of the fungus.

b. Upper part showing normal growth, lower part of white showing origin of saltation.

c. Result of culture from lower part of white of b.

d. e. f. g. h. Results of culture from C, showing white cottony mycelium.



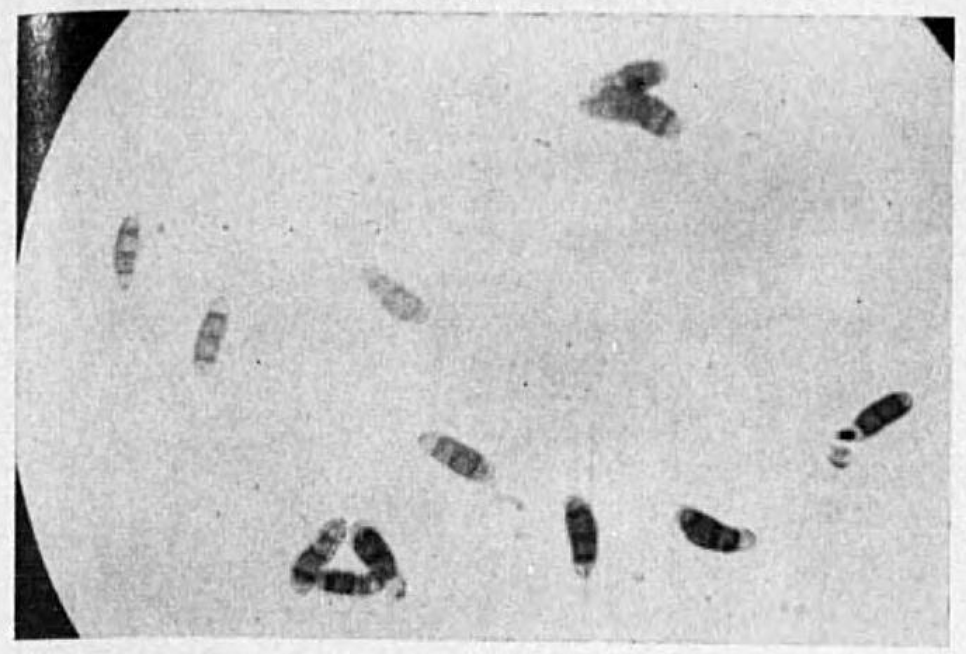


Fig. 1

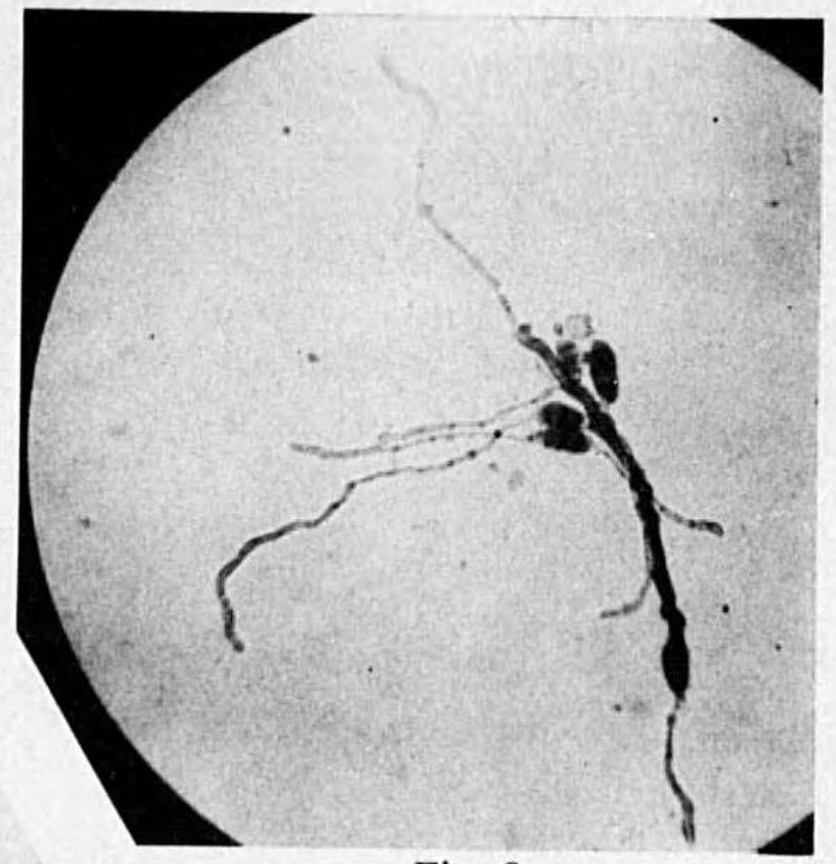


Fig. 2

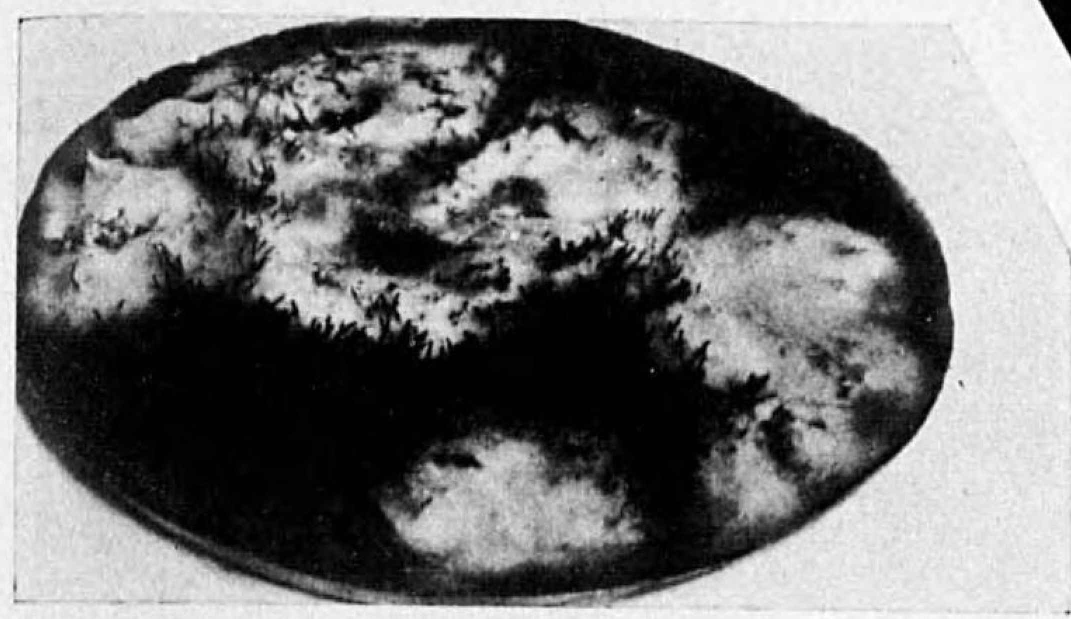
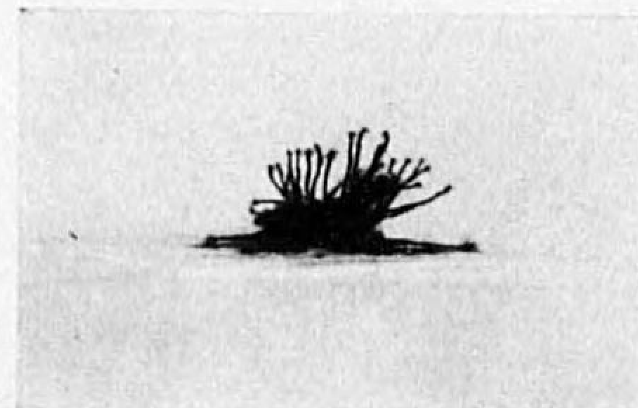


Fig. 3



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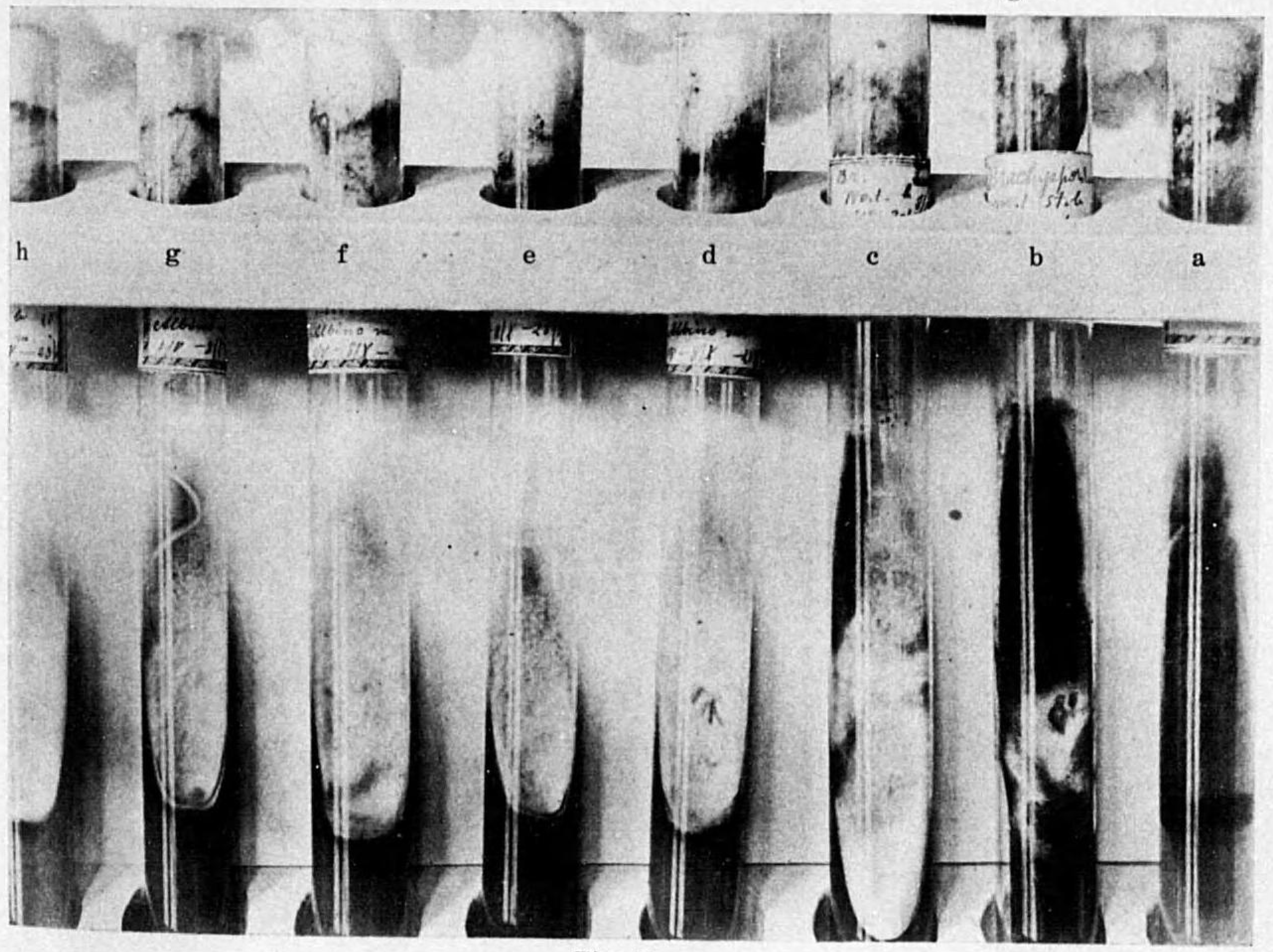



Fig. 5

第　2　圖　版
(Plate II)

## 第2圖版ノ說明

第1圖　アスパラギン加用合成寒天培養基上ニ發育セル準突然變異菌ノ白色菌叢ガ溫度ノ急降下ニヨリ輪狀ニ着色セルヲ示ス.

第2圖並ニ第3圖　稻種子ヨリ分離セシ *Brachysporium Tomato* 並ニ其準突然變異菌ガ稻苗ニ對スル病原性比較（無菌接種法ニヨル）

左，無接種．中央，準突然變異菌接種．右，母菌接種．

第3圖　同上，左，無接種．中央，母菌．右，準突然變異菌．

## Explanation of Plate II.

Fig. 1. White saltant of *Brachysporium Tomato*, growing on synthetic culture media with asparagin, showing a dark green mycelium, resulting from low temperature treatment.

Fig. 2. & 3. Rice seedlings showing comparative virulence of saltant and parent fungus.

Fig. 2. Left, Control.
Middle, Saltant.
Right, Parent.

Fig. 3. Left, Control.
Middle, Parent.
Right, Saltant.



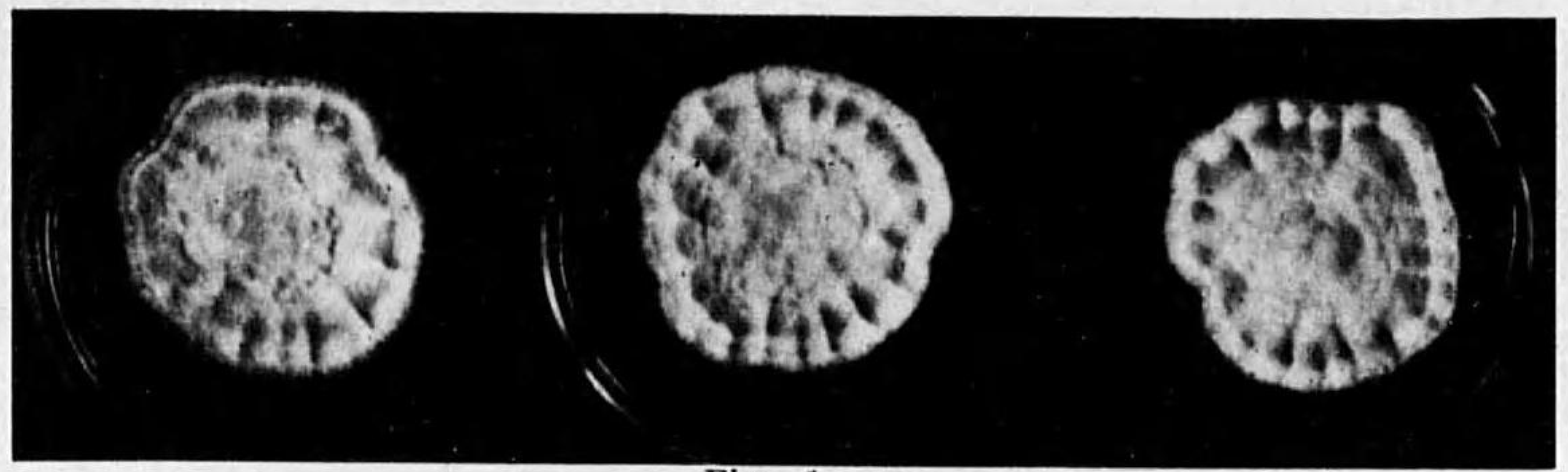


Fig. 1

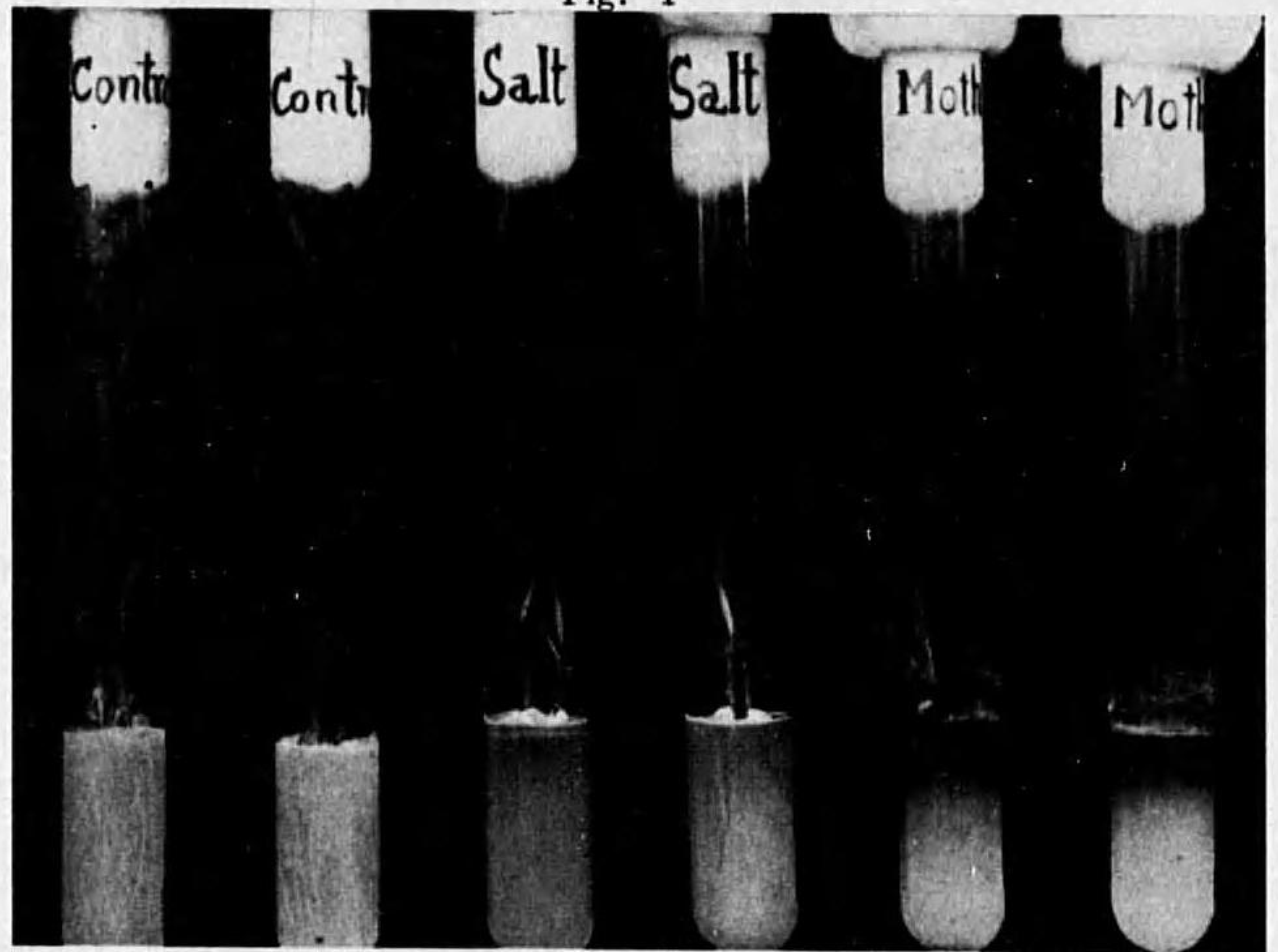



Fig. 2

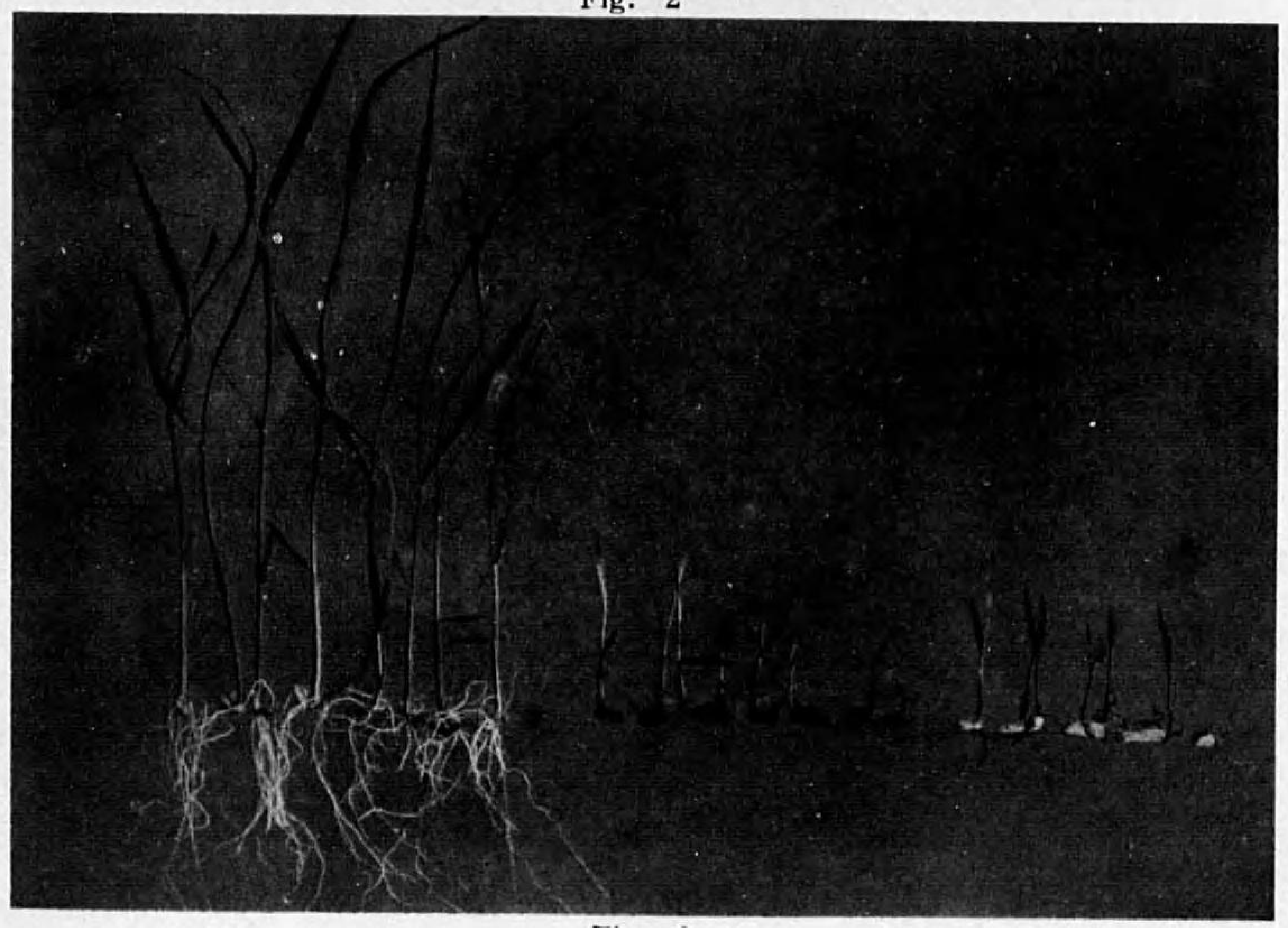


Fig. 3

第　3　圖　版
(Plate III)

## 第 3 圖 版 ノ 說 明

第 1 圖　稻種子ヨリ分離セシ *Brachysporium Tomato* ノ菌叢ノ發育ニ及ボス温度ノ影響.

上段左ヨリ　10°C−15°C,　± 16°C,　± 20°C

下段左ヨリ　± 24°C,　± 28°C,　± 32°C

第 2 圖　準突然變異菌ノ菌叢ノ發育ニ及ボス温度ノ影響.

上段左ヨリ　10°C−15°C,　± 16°C,　± 20°C

下段左ヨリ　± 24°C,　± 28°C,　± 32°C

第 3 圖　乾杏煎汁寒天培養基上ノ母菌（右）ト其ノ準突然變異菌.

## Explanation of Plate III.

Fig. 1. Effect of temperature on rate of mycelial growth of *Brachysporium Tomato*, isolated from rice grains.

Top row, left to right.

10°C−15°C, 16°C, 20°C

Bottom row, left to right,

24°C, 28°C, 32°C

Fig. 2. Effect of temperature on rate of mycelial growth of albino saltant of *Brachysporium Tomato*, isolated from rice grains.

Top row, left to right

10°−15°C, 16°C, 20°C

24°C, 28°C, 32°C

Fig. 3. Cultural differences between albino saltant and its parent.

Left, Albino saltant

Right, Parent



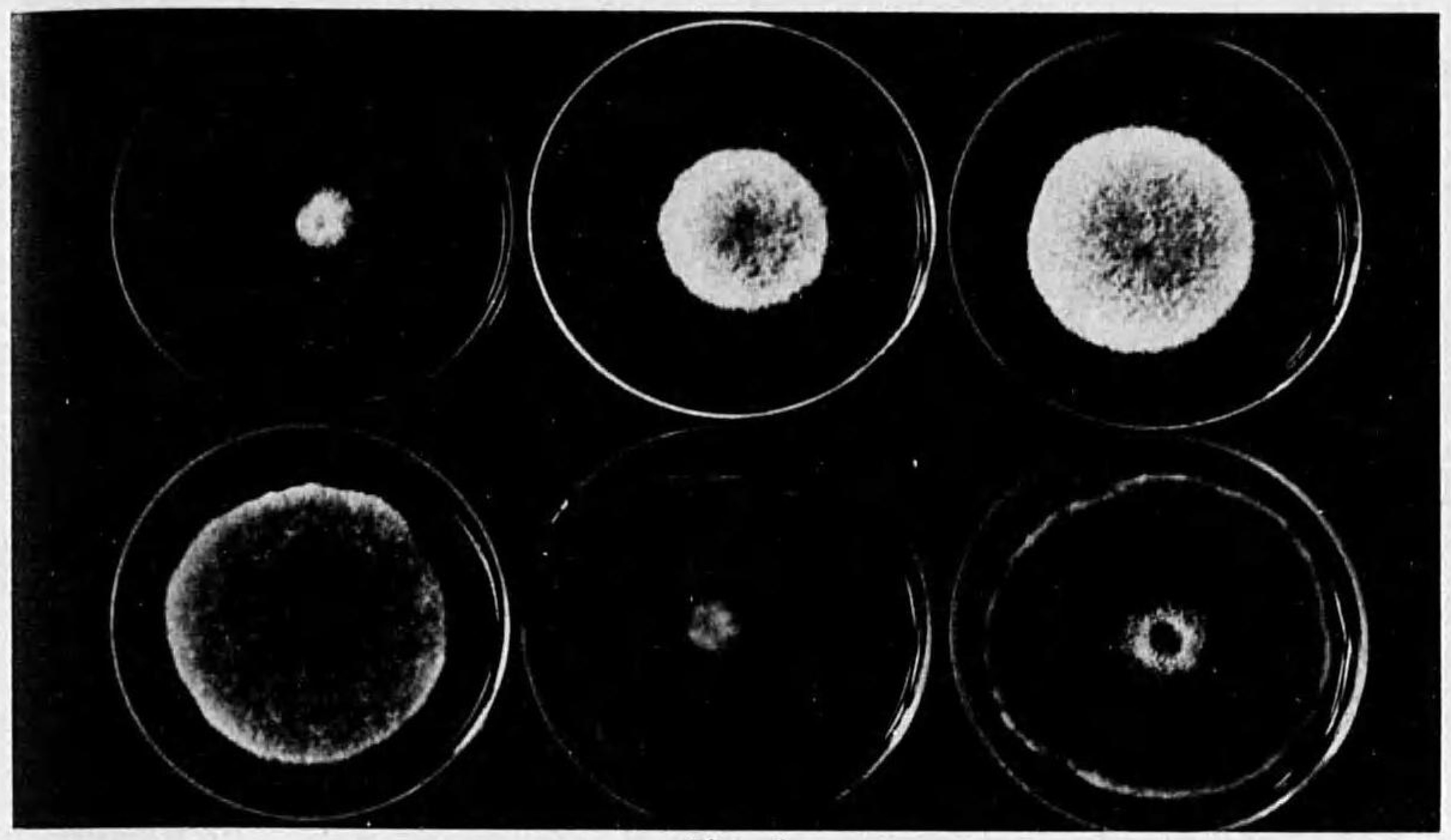


Fig. 1

Fig. 2

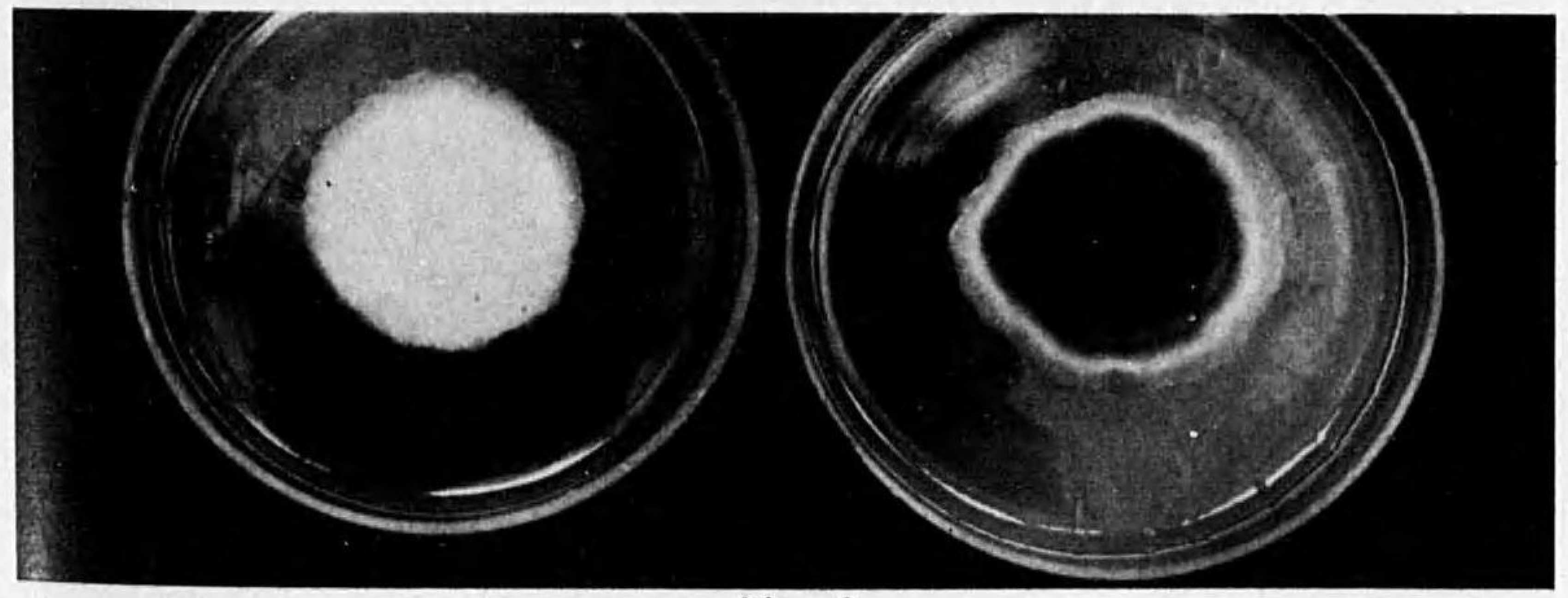


Fig. 3

第　4　圖　版

(Plate IV)

# 第 4 圖 版 ノ 說 明

第 1 圖　乾杏煎汁寒天培養基上＝對峙培養セル母菌（左）並＝準突然變異菌（右）.

第 2 圖　ぎやうぎしば葉枯病原菌（*Brachysporium Tomato*）ノ扇狀準突然變異型（$M_2$）發現ノ起源.（裏面）

第 3 圖　ぎやうぎしば葉枯病原菌（*Brachysporium Tomato*）ノ扇狀準突然變異型（$M_3$, $M_4$ 並＝ $M_5$）發現ノ起源.

上段右　母菌ノ正常ナル發育狀態.
上段左　$M_3$ ノ發現狀態.
下段左　$M_4$ ノ發現狀態.
下段右　$M_5$ ノ發現狀態.

第 4 圖　ぎやうぎしば葉枯病原菌並＝其準突然變異菌培養濾液＝ヨル蠶豆ノ病的變化比較.

上　母　　菌
下　準突然變異菌

第 5 圖　母菌並＝準突然變異菌ノ稻苗＝對スル病原性（無菌接種法＝ヨル）

## Explanation of Plate IV.

Sector Type of saltation in *Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE

Fig. 1. Albino saltant growing with its parent, *Brachysporium Tomato*, isolated from *Cynodon Dactylon* PERS.

Fig. 2. Under surface of plate culture of the fungus, showing origin of albino saltant 2.

Fig. 3. Upper surface of plate culture of the fungus, showing origin of albino saltant 3, 4 and 5.

Top row, Left,　Albino saltant 3.
Top row, Right,　Normal cultural characteristics of the fungus.
Bottom row, Left,　Albino saltant 4.
Bottom row, Right,　Albino saltant 5.

Fig. 4. Pathological physiological differences between albino saltant and its parent. Upper one showing effect of the filtrate from a liquid culture of parent on leaves of horse bean. Lower one showing effect of albino saltant.

Fig. 5. Showing comparative virulence of albino saltant and its parent.

Left,　Parent.
Right,　Albino saltant.




Fig. 1

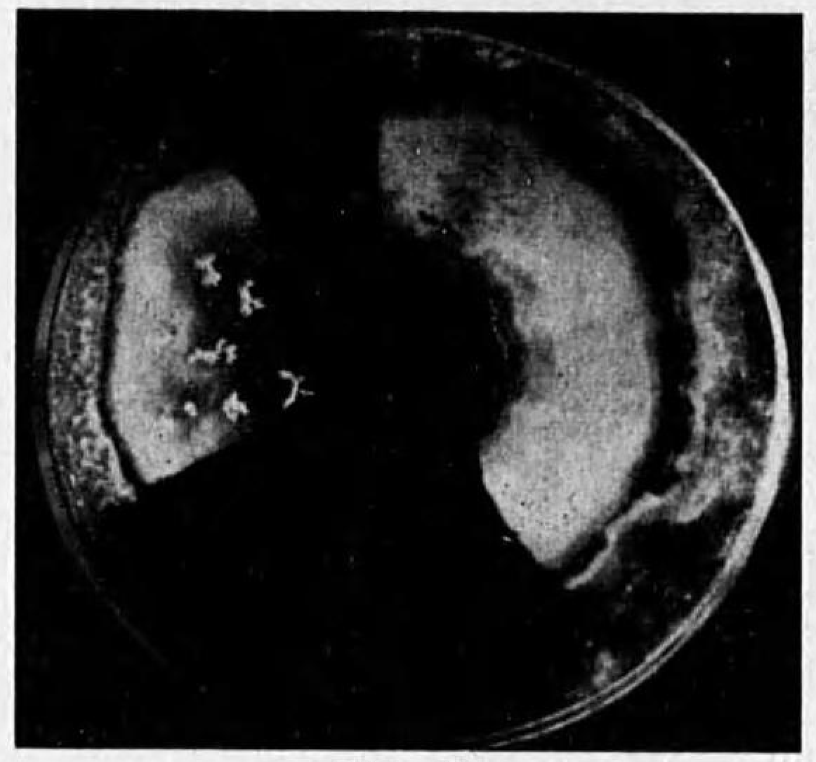


Fig. 2

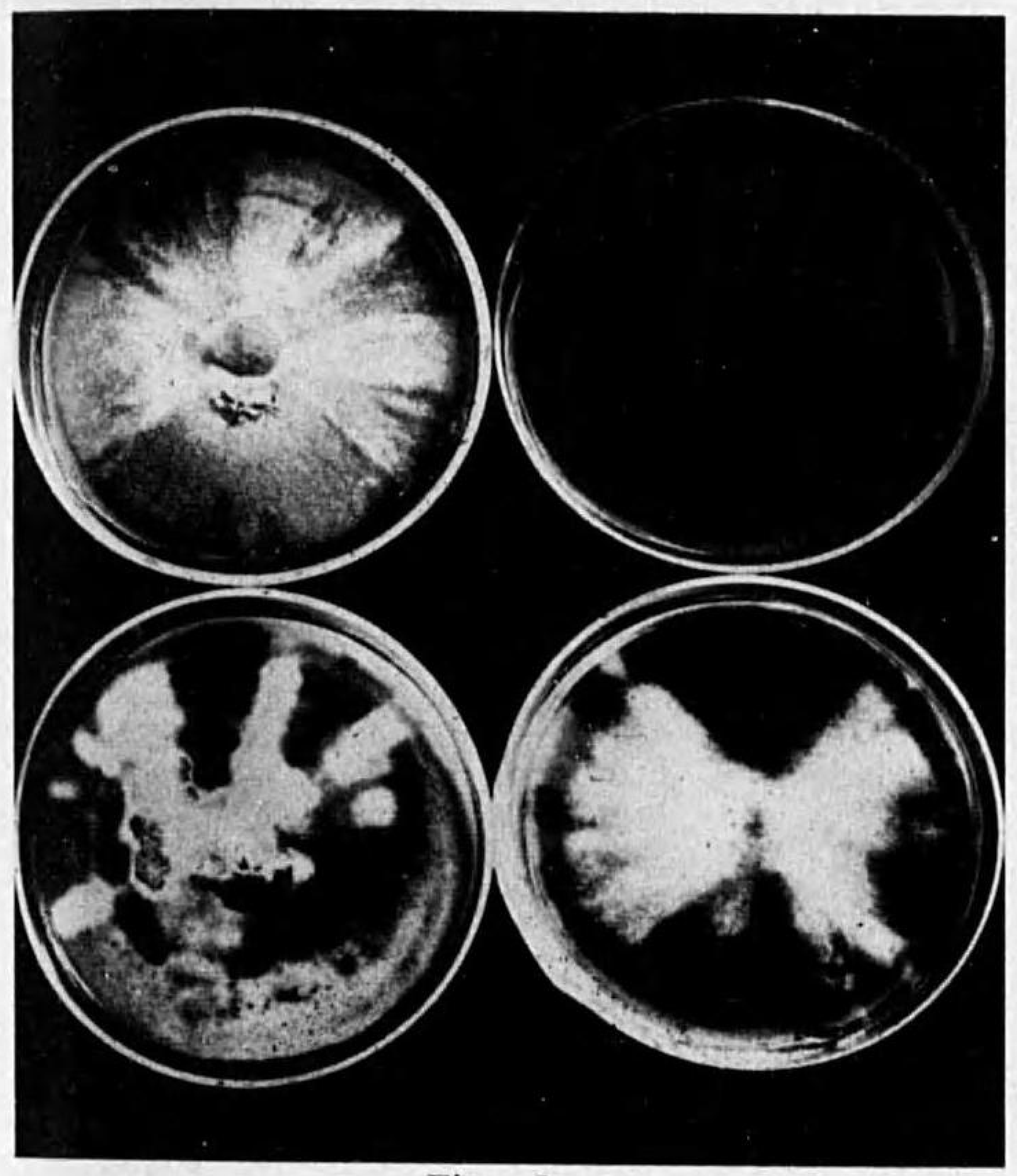


Fig. 3


Fig. 4

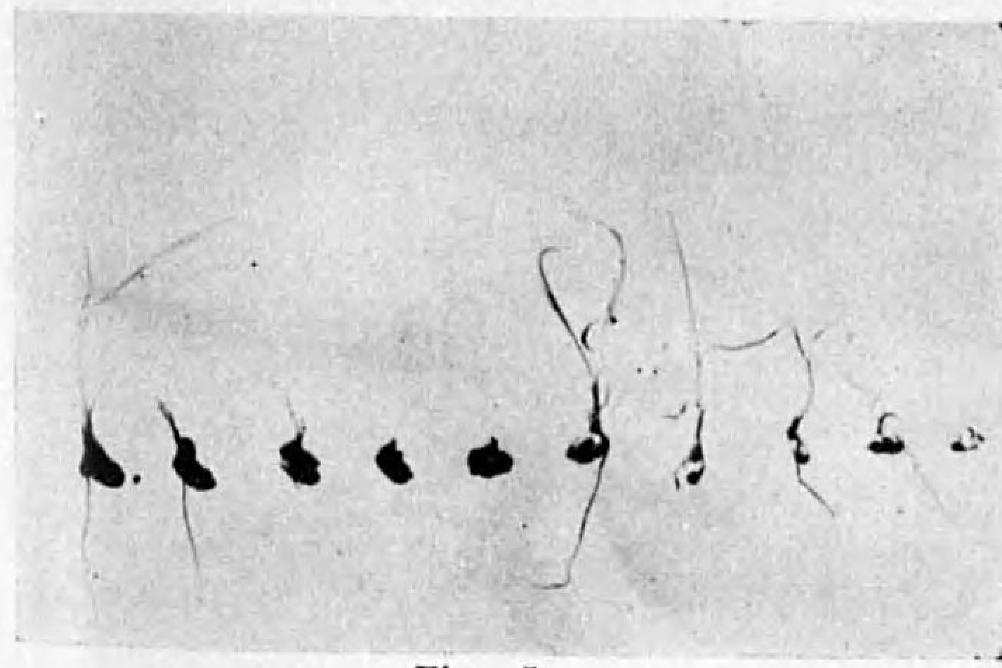


Fig. 5

第　5　圖　版

(Plate V)

## 第 5 圖 版 ノ 説 明

第 1 圖　ぎやうぎしば葉枯病原菌ノ準突然變異菌ノ發育ニ及ボス温度ノ影響（乾杏煎汁寒天培養基上）

左ヨリ　10°C　15°C　20°C　24°C

28°C　32°C　36°C　40°C

第 2 圖　母菌並ニ準突然變異菌ノ發育ニ及ボス温度ノ影響（乾杏煎汁寒天培養基）

左ヨリ　10°C　15°C　20°C　24°C

上　段　準突然變異菌

下　段　母　　菌

第 3 圖　こごめがやつり 葉枯病原菌（*Brachysporium Tomato*）ノ分生胞子（乾杏煎汁寒天培養基上）× 540

第 4 圖　こごめがやつり 葉枯病原菌ノ準突然變異菌ノ分生胞子（乾杏煎汁寒天培養基上）× 540

## Explanation of Plate V.

Fig. 1. Effect of temperature on rate of mycelial growth of albino saltant of *Brachysporium Tomato*, isolated from *Cynodon Dactylon* PERS. (On apricot decoction agar)

Top row, Left to right

10°C, 15°C, 20°C, 24°C

Botton row, Left to right

28°C 32°C 36°C 40°C

Fig. 2. Effect of temperature on rate of mycelial growth of albino saltant and its parent, *Brachysporium Tomato*, isolated from *Cynodon Dactylon* PERS. (On apricot decoction agar)

Left to right, 10°C, 15°C, 20°C, 24°C

Top row, Albino saltant

Bottom row, Parent

Fig. 3. Photomicrograph of conidia of *Brachysporium Tomato*, isolated from *Cyperus Iria* L. (× 540)

Fig. 4. Photomicrograph of conidia of albino saltant of the fungus. (×540)



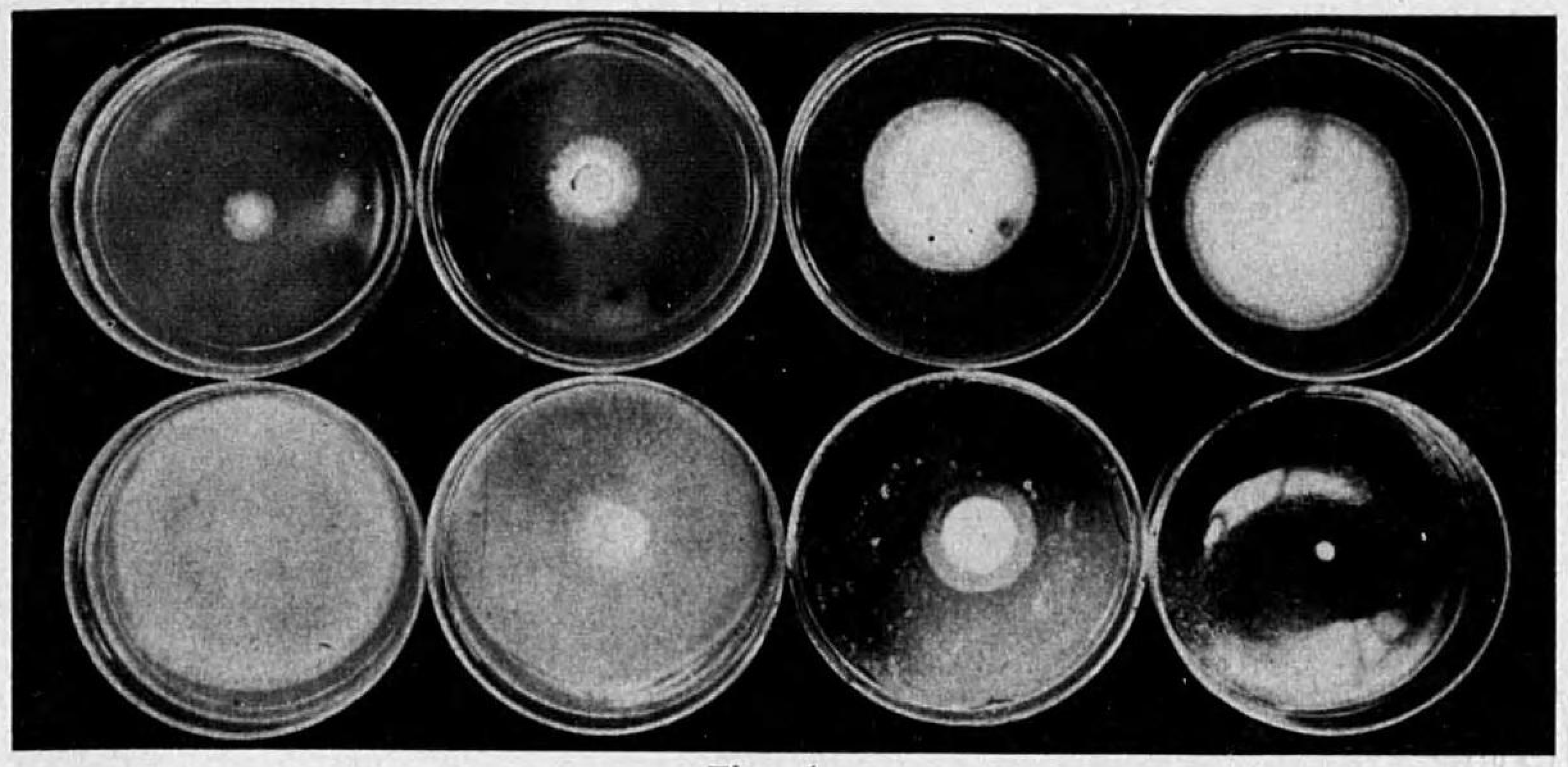


Fig. 1

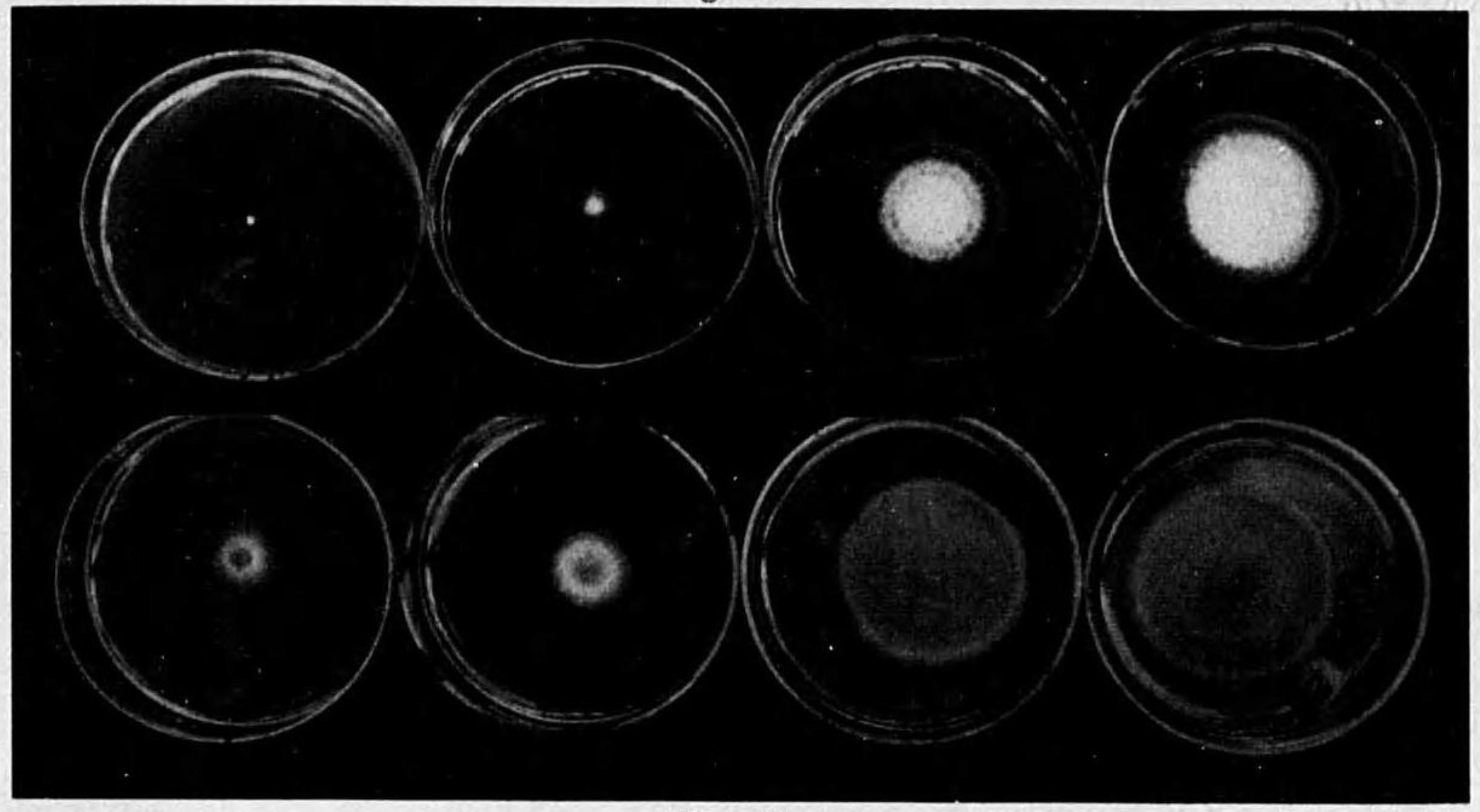


Fig. 2

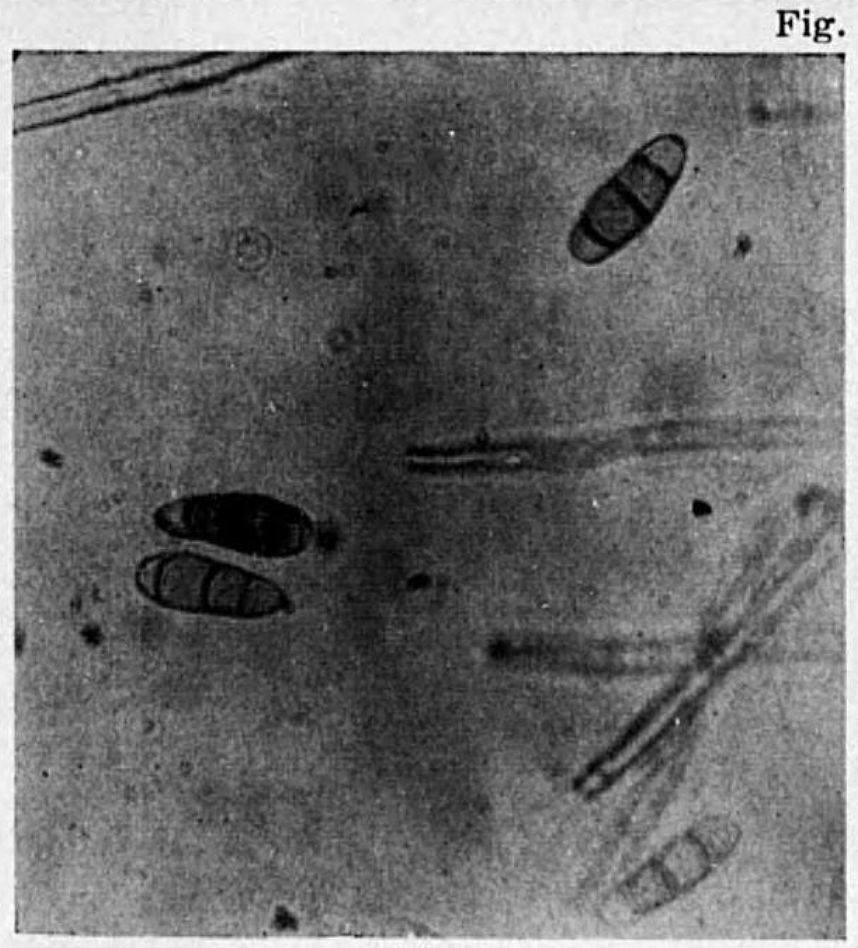


Fig. 3

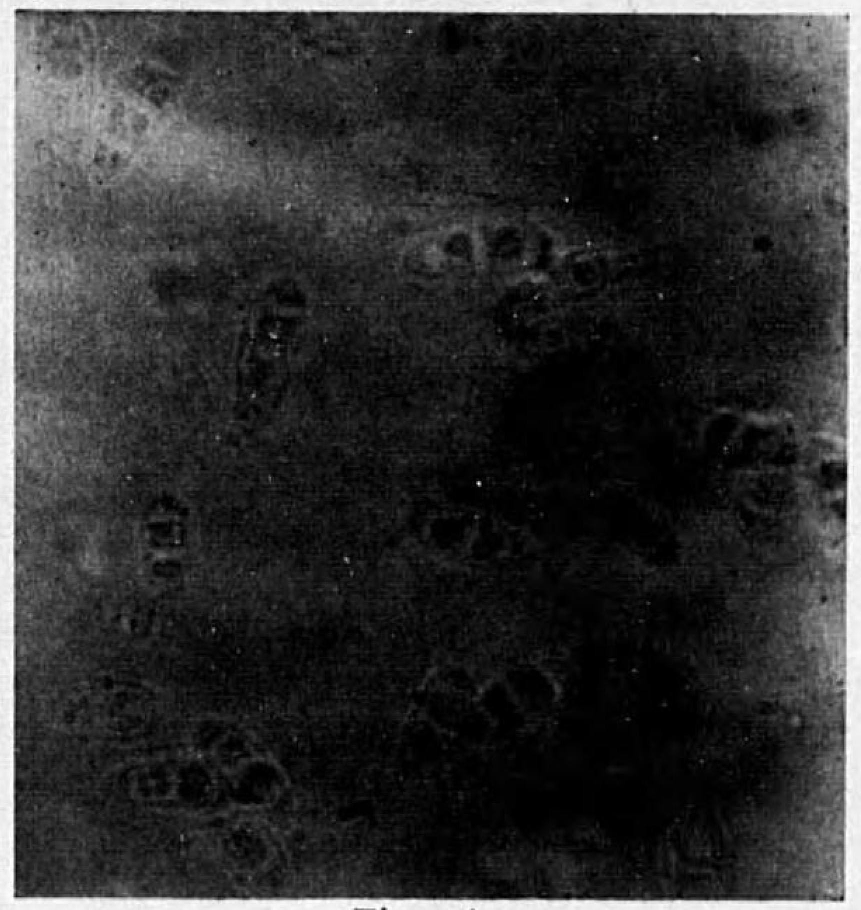


Fig. 4

第　6　圖　版
(Plate VI)

## 第 6 圖 版 ノ 説 明

稻胡麻葉枯病原菌ノ示ス突然變異的現象（齋藤氏醬油寒天培養基，培養溫度 36°C）

第 1 圖　I.　扇狀準突然變異型，B 型ノ發現狀態　(I)
　　a　白色菌叢，b　黑色菌叢，c　灰色菌叢
　II.　b 部ヨリ培養セシモノ　III. a 部ヨリ培養セシモノ　IV. c 部ヨリ培養セシモノ（各其特性ヲ遺傳ス）

第 2 圖　I.　扇狀準突然變異型，B型ノ發現狀態　(II)
　　a　白色菌叢，b　黑色菌叢，c　灰色菌叢
　II.　a 部ヨリ培養セシモノ　III. c 部ヨリ培養セシモノ　IV. b 部ヨリ培養セシモノ

第 3 圖　I.　扇狀準突然變異型，B 型ノ發現狀態　(III)
　　a　白色菌叢，b　黑色菌叢，c　灰色菌叢
　II. V, VI.　b 部ヨリ培養セシモノ
　III' IV.　c 部ヨリ培養セシモノ

第 4 圖 並 ＝ 第 5 圖　稻胡麻葉枯病原菌ノ島狀準突然變異型ノ發現狀態（齋藤氏醬油寒天培養基上）

## Explanation of Plate VI.

*Ophiobolus Miyabeanus* (*Helminthosporium Oryzae*), producing different saltants. (On SAITO's onion soy agar, at 36°C)

Fig. 1. I. Showing "sector type of saltation, type B" (I)
a, White mycelial colony, b. Black mycelial colony. c, Grey mycelial colony.
II. Culture from b.
III. Culture from a.
IV. Culture from c.

Fig. 2. I. Showing "sector type of saltation, type B" (II)
a, White mycelial colony. b, Black mycelial colony. c. Grey mycelial colony.
II. Culture from a,
III. Culture from c.
IV. Culture from b.

Fig. 3. I. Showing "sector type of saltation, type B" (III)
a. White mycelial colony. b. Black mycelial colony, c. Grey mycelial colony.
II. V, VI. Cultures from b.
III. IV. Cultures from c.

Fig. 4 and 5. Showing "island type of saltation"



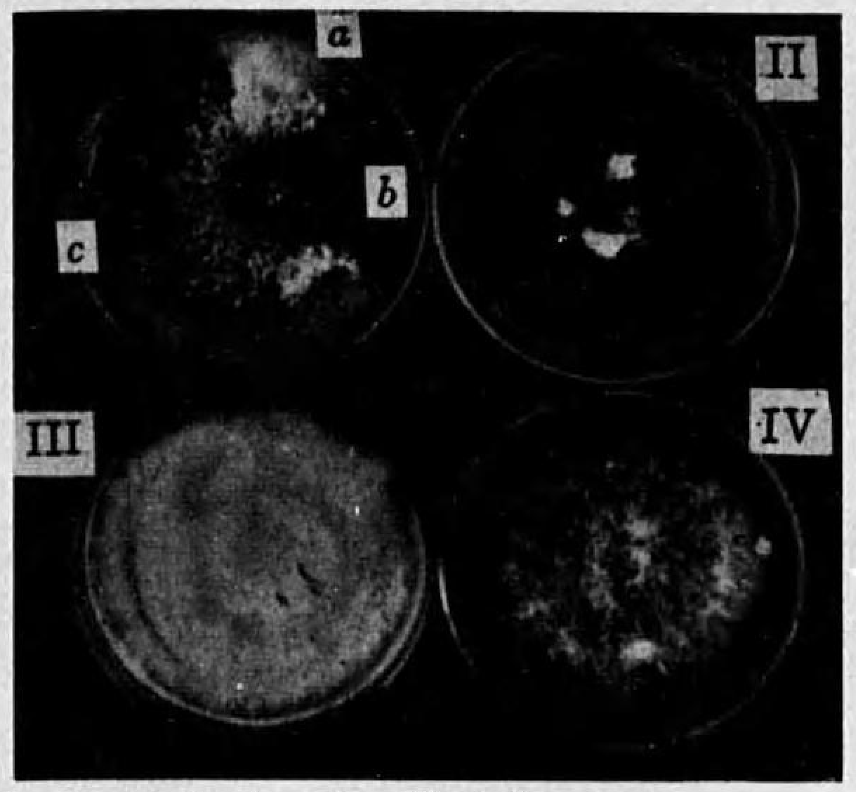



Fig. 1

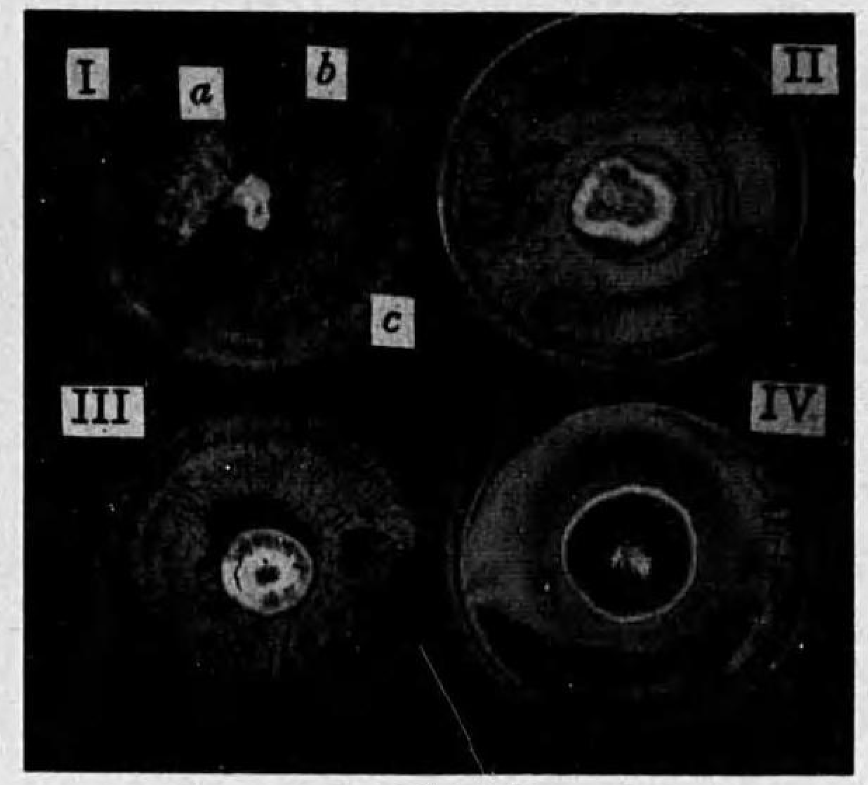



Fig. 2

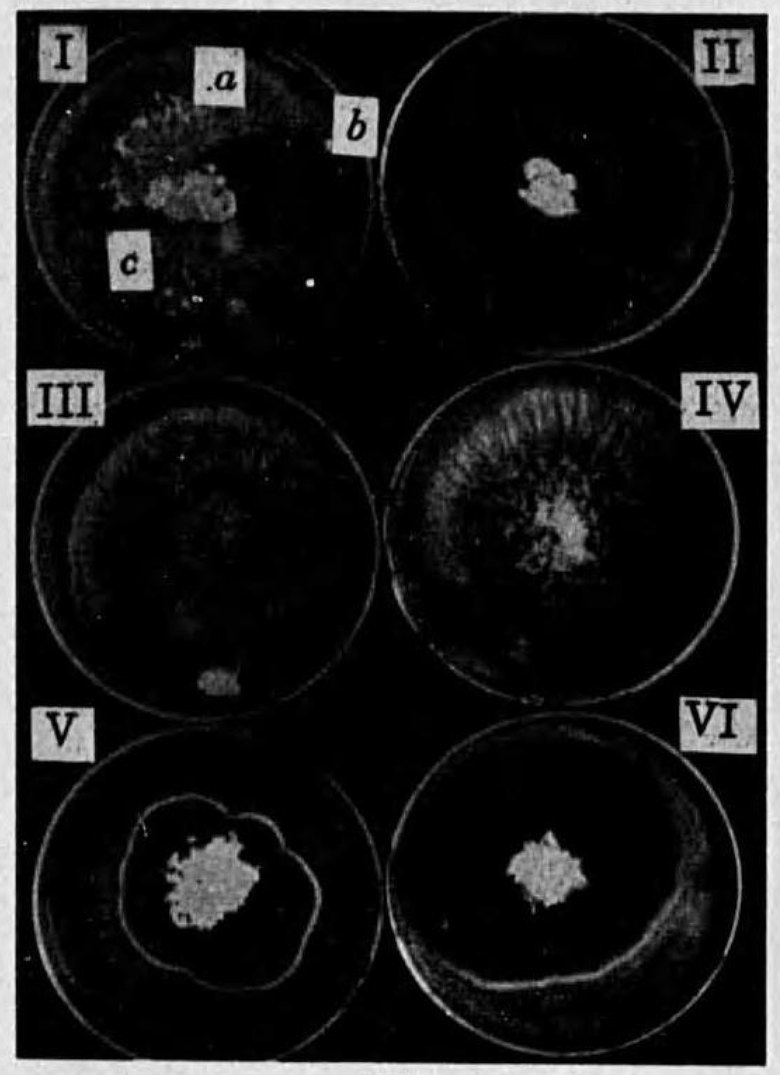



Fig. 3

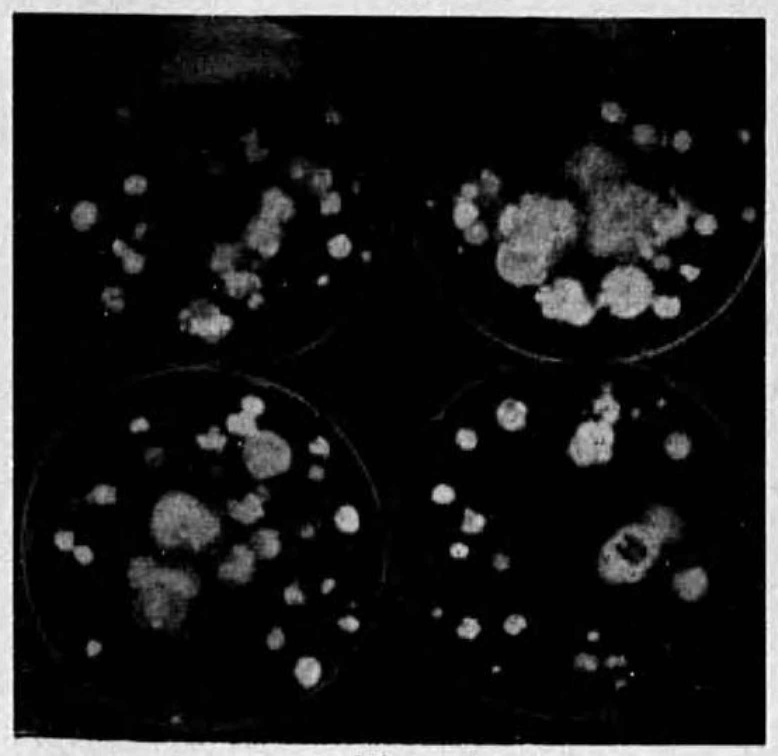



Fig. 4

Fig. 5

第　7　圖　版

(Plate　VII)

## 第 7 圖版ノ説明

稲胡麻葉枯病原菌ヨリ發生セル準突然變異型ノ種類ト其ノ發現狀態 (I)

第 1 圖 I. 齋藤氏醤油寒天培養基上＝52日間 28° C ＝テ培養セシモノヲ接種源トセル場合 Saltant (No. 3.451 − No. 3.500)

II. 齋藤氏醤油寒天培養基上＝ 92 日間室温＝テ培養ノモノヲ接種源トセル場合 (No. 3.651 − No. 3.700)

第 2 圖 I. 5 % 蔗糖加用馬鈴薯煎汁寒天培養基上＝ 24° C ＝テ培養 (No. 2,201 − No. 2,250)

II. 5 % 蔗糖加用馬鈴薯煎汁寒天培養基上＝ 28° C ＝テ培養 (No. 2,251 − No. 2,300)

## Explanation of Plate VII.

Island type of saltation in *Ophiobolus Miyabeanus* on plate culture, showing origin of various saltants. (I)

Fig. 1. I. 55−day old culture of the fungus on SAITO'S onion soy agar at 28°C, was used as inoculums.
Origin of saltants No. 3451 to No. 3500.

II. 92−day old culture of the fungus on SAITO'S onion soy agar at room temperature, was used as inoculums.
Origin of saltants No. 3651 − No. 3700.

Fig. 2. I. Cultures on potato juice agar with 5 % sucrose at 24° C, producing numerous saltants (No. 2201 − No. 2250)

II. Cultures on potato juice agar with 5 % sucrose at 28° C, producing numerous saltants (No. 2251 − No. 2300)



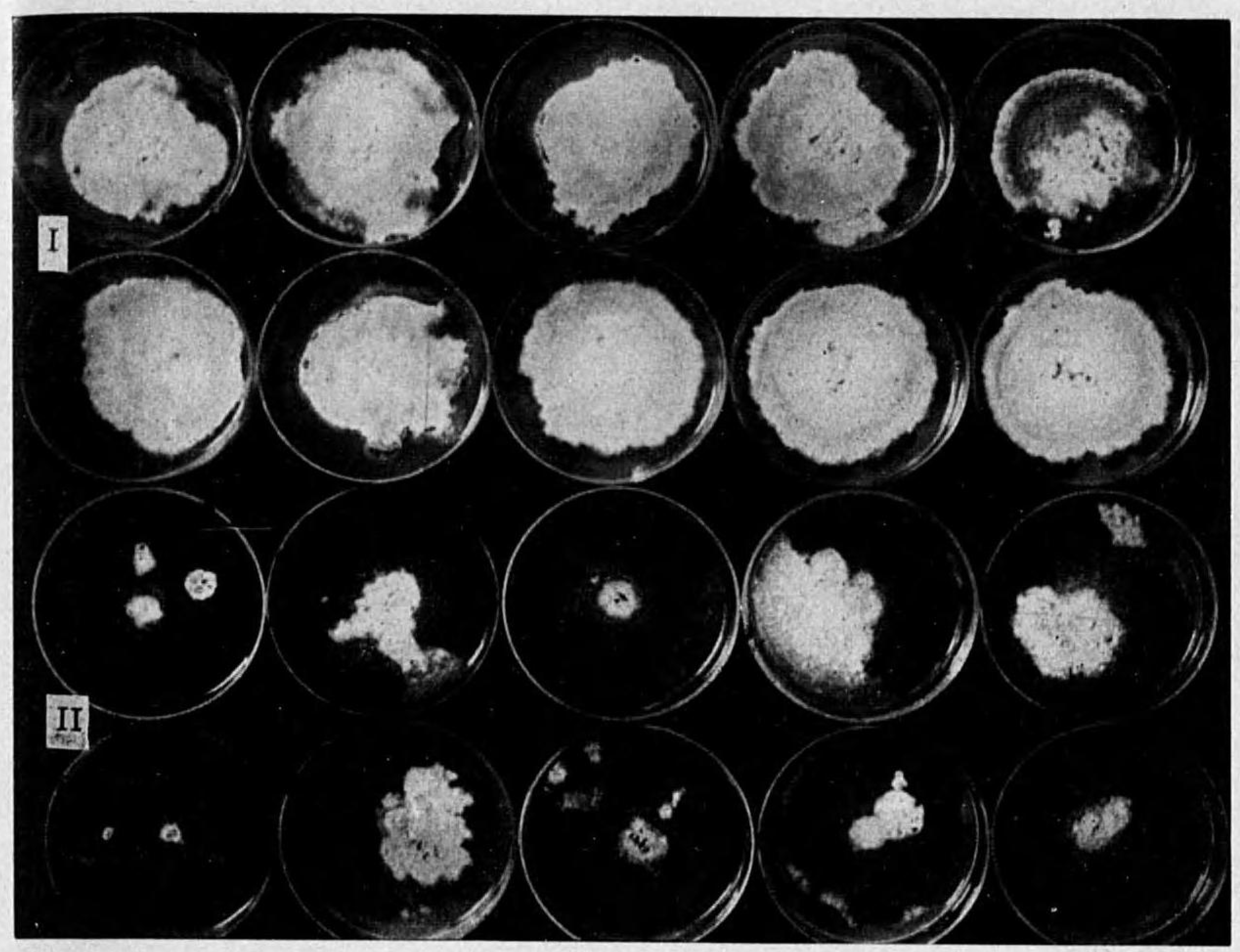



Fig. 1


Fig. 2

第　8　圖　版

(Plate　VIII)

## 第 8 圖 版 ノ 説 明

稻胡麻葉枯病原菌ヨリ發生セル準突然變異菌ノ種類ト其ノ發現狀態 (II)
齋藤氏醬油寒天培養基上＝ 22 日間 28° C ＝テ培養セシモノヲ接種源トセル場合

第 1 圖 I. 24° C ＝テ培養 (No. 3,001 – No. 3,050)
II. 28° C ＝テ培養 (No. 3,051 – No. 3,100)

第 2 圖 I. 32° C ＝テ培養 (No. 3,101 – No. 3,156)
II. 34° C ＝テ培養 (No. 3,151 – No. 3,200)

## Explanation of Plate VIII.

Island type of saltation in *Ophiobolus Miyabeanus* on SAITO's onion soy agar showing origin of various saltants (II).

22-day old culture of the fungus on SAITO's onion soy agar at 28°C, was used as inoculums.

Fig. 1. I. Origin of saltants No. 3001 to No. 3050 at 24° C
II. Origin of saltants No. 3051 to No. 3100 at 28° C

Fig. 2. I. Origin of saltants No. 3101 to No. 3105 at 32° C
II. Origin of saltants No. 3151 to No. 3200 at 34° C



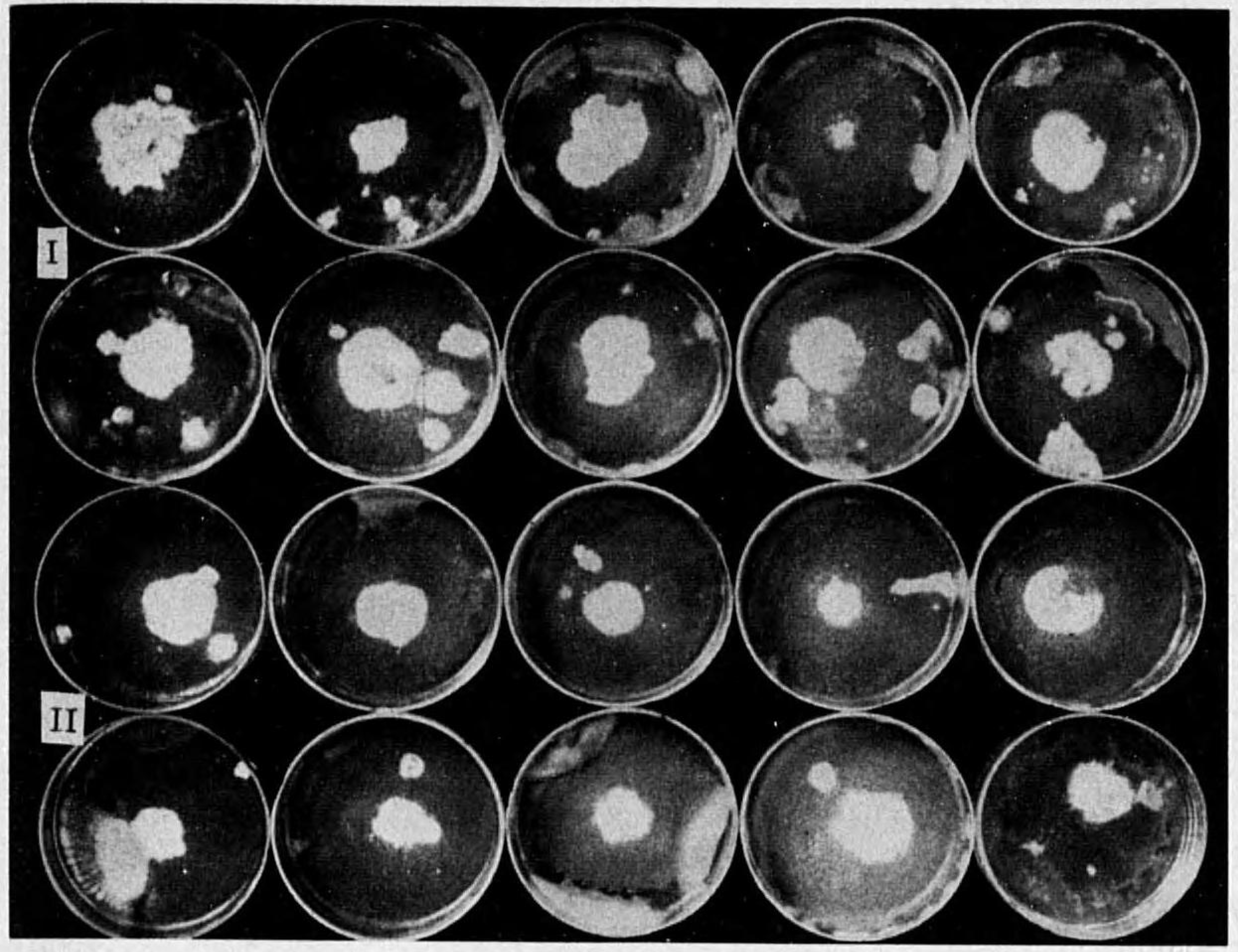



Fig. 1

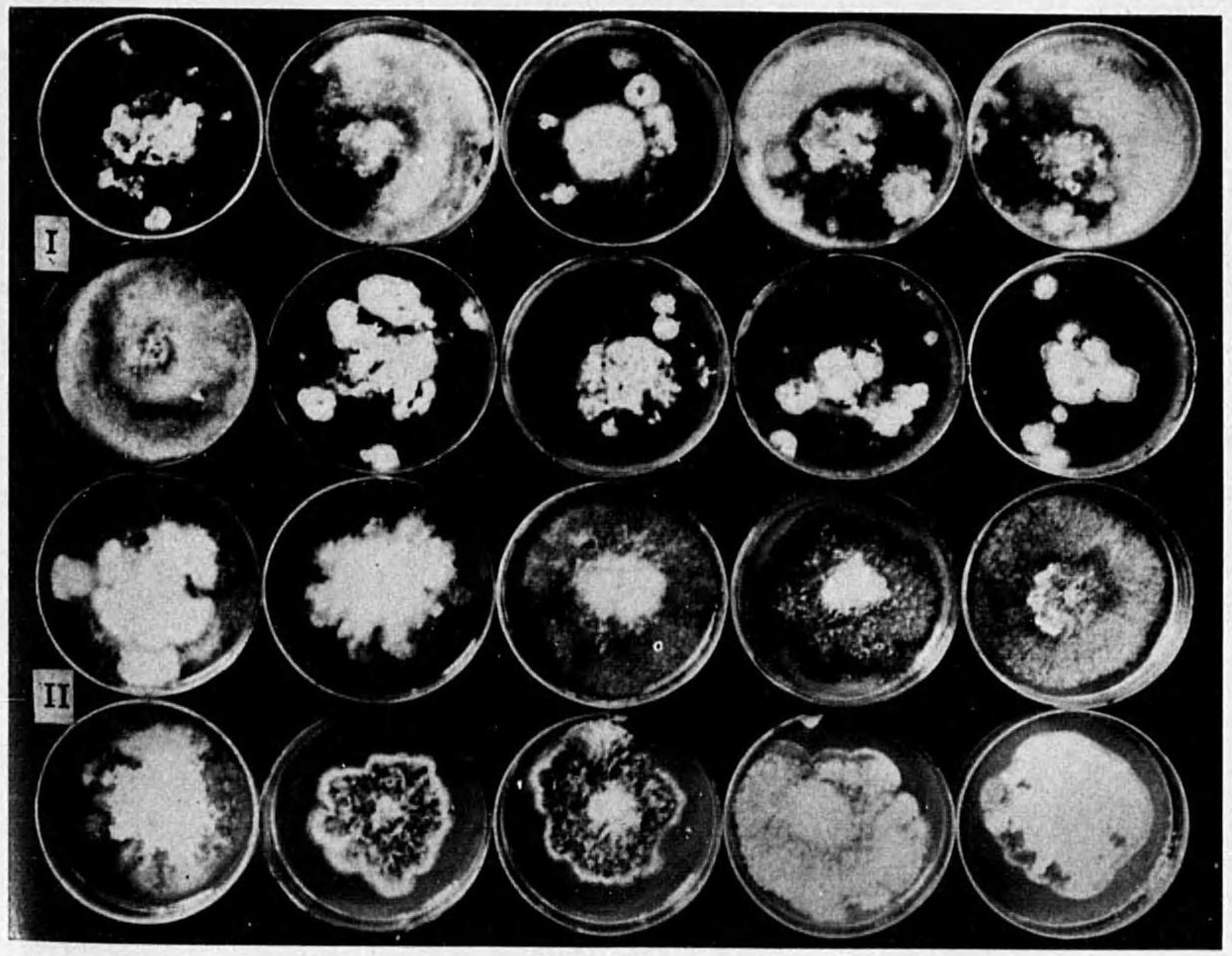



Fig. 2

第　9　圖　版
(Plate IX)

## 第 9 圖 版 ノ 説 明

稻胡麻葉枯病原菌並ニ其第1號準突然變異菌ノ形態比較.

左 母 菌. 右 準突然變異菌.

第 1 圖 ツァペック氏寒天培養基上.

第 2 圖 ペプトン加用合成寒天培養基上.

第 3 圖 リチャーズ氏寒天培養基上.

## Explanation of Plate IX.

Morphological differences between *Ophiobolus Miyabeanus* and its saltant No. 1 on various culture media. (Photomicrographed)

Left, Parent. Right, Saltant

Fig. 1. On CZAPECK'S agar.

Fig. 2. On synthetic agar with peptone.

Fig. 3. On RICHARD'S agar.

(Note the decided differences between saltant and parent.)



Fig. 1

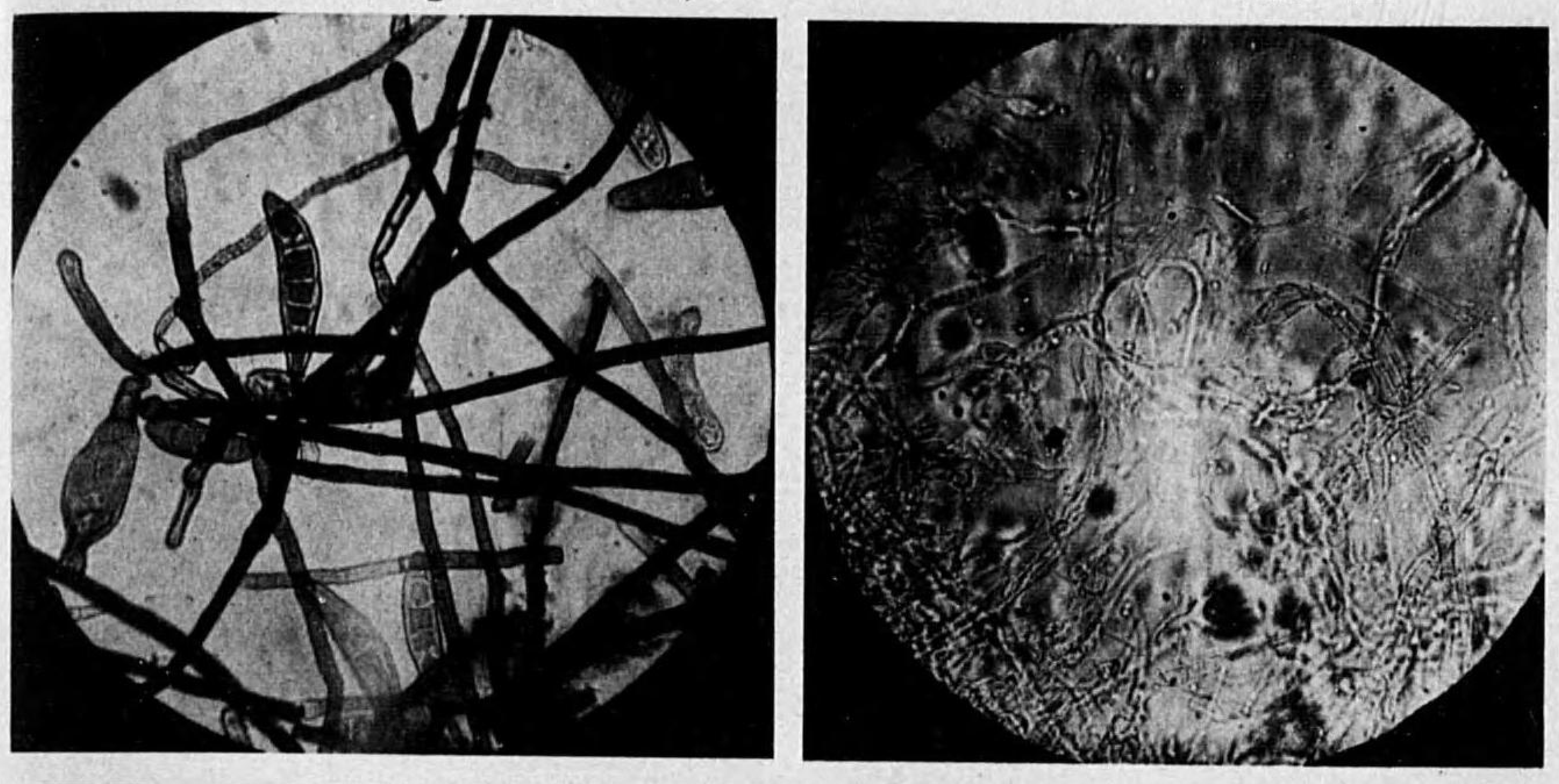


Fig. 2

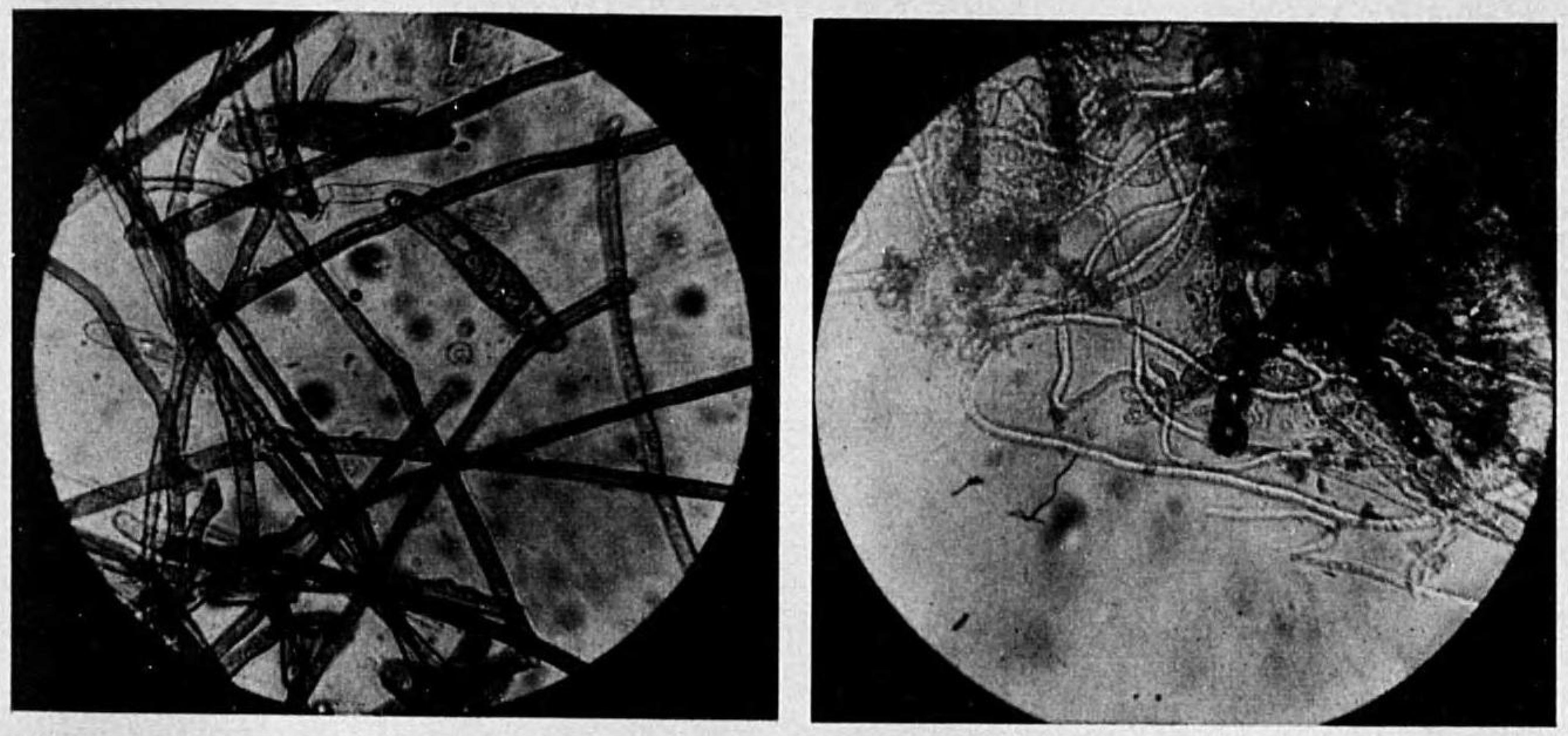
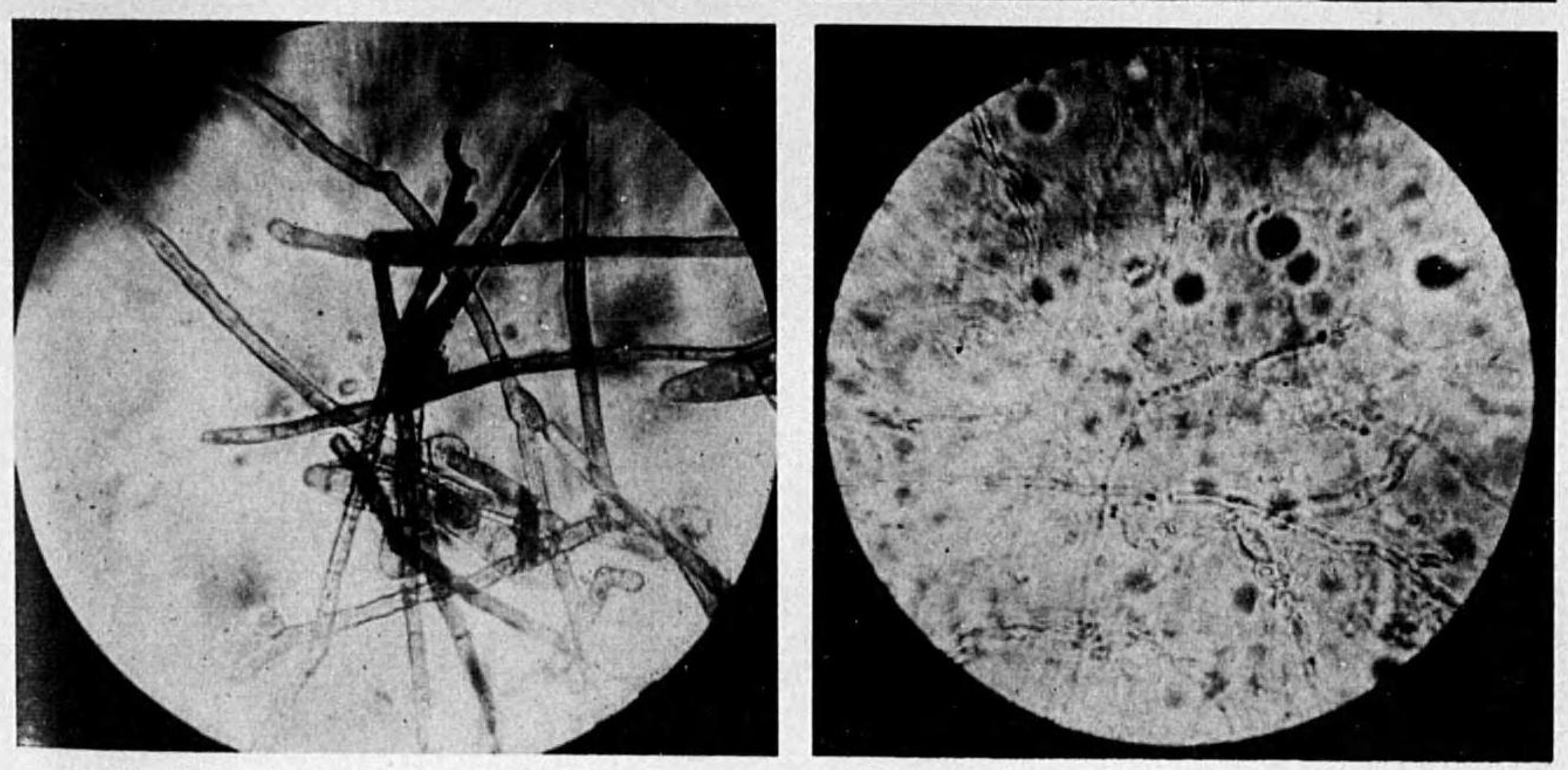


Fig. 3



第　10　圖　版
(Plate　X)

## 第 10 圖 版 ノ 說 明

第 1 圖　稻胡麻葉枯病原菌並ニ其第 1 號準突然變異菌ノ培養基上ニ於ケル性質比較.
I. 第 1 號準突然變異菌. II. 母菌.
ツァペック氏寒天培養基, ペプトン加用合成寒天培養基, リチャーズ氏寒天培養基, アスパラギン加用合成寒天培養基, 稻葉煎汁寒天培養基. (左ヨリ右ニ)

第 2 圖　馬鈴薯煎汁寒天培養基上ニ於ケル稻胡麻葉枯病原菌ノ突然變異的現象ノ發現ト温度トノ關係. (I)
左ヨリ, 28°C, 30°C, 32°C, 34°C.

第 3 圖　馬鈴薯煎汁寒天培養基上ニ於ケル稻胡麻葉枯病原菌ノ突然變異的現象ノ發現ト温度トノ關係. (II)
左ヨリ 28°C, 30°C, 32°C, 34°C, 36°C.

第 4 圖　乾杏煎汁寒天培養基上ニ於ケル稻胡麻葉枯病原菌ノ突然變異的現象ノ發現ト温度トノ關係. 左ヨリ 28°, 30°, 34°, 36°C.

第 5 圖　馬鈴薯煎汁寒天培養基上ニ於ケル稻胡麻葉枯病原菌ノ第 1 號準突然變異菌ノ發育狀態.
I. 表面. II. 裏面.
28°, 30°, 32°, 36°, 40°C.

## Explanation of Plate X.

Island Type of Saltation in *Ophiobolus Miyabeanus* (=*Helminthosporium Oryzae*)

Fig. 1. Cultural differences between saltant No. 1 and its parent.
Upper row, Saltant. Lower row, Parent. Left to right, CZAPECK's agar, synthetic agar with peptone, RICHARD's solution, Synthetic agar with asparagin and rice straw decoction agar.

Fig. 2, 3 and 4. Effect of temperature on the occurrence of saltation.
Left to right, 28°C, 30°C, 32°C, 34°C, 36°C, and 40°C.
Fig. 2. On potato juice agar with 2% sucrose.
Fig. 3. Ditto.
Fig. 4. On apricot decoction agar.

Fig. 5. Effect of temperature on the appearance of mycelial colonies of saltant No. 1 on potato juice agar with 2% sucrose.
Top row, Upper surface, Bottom row, Under surface.
Left to right, 28°C, 30°C, 32°C, 36°C and 40°C. (Note the blackness of under surface of mycelial colonies at temperatures above 28°C which apparently reverts to the original albino saltant.)



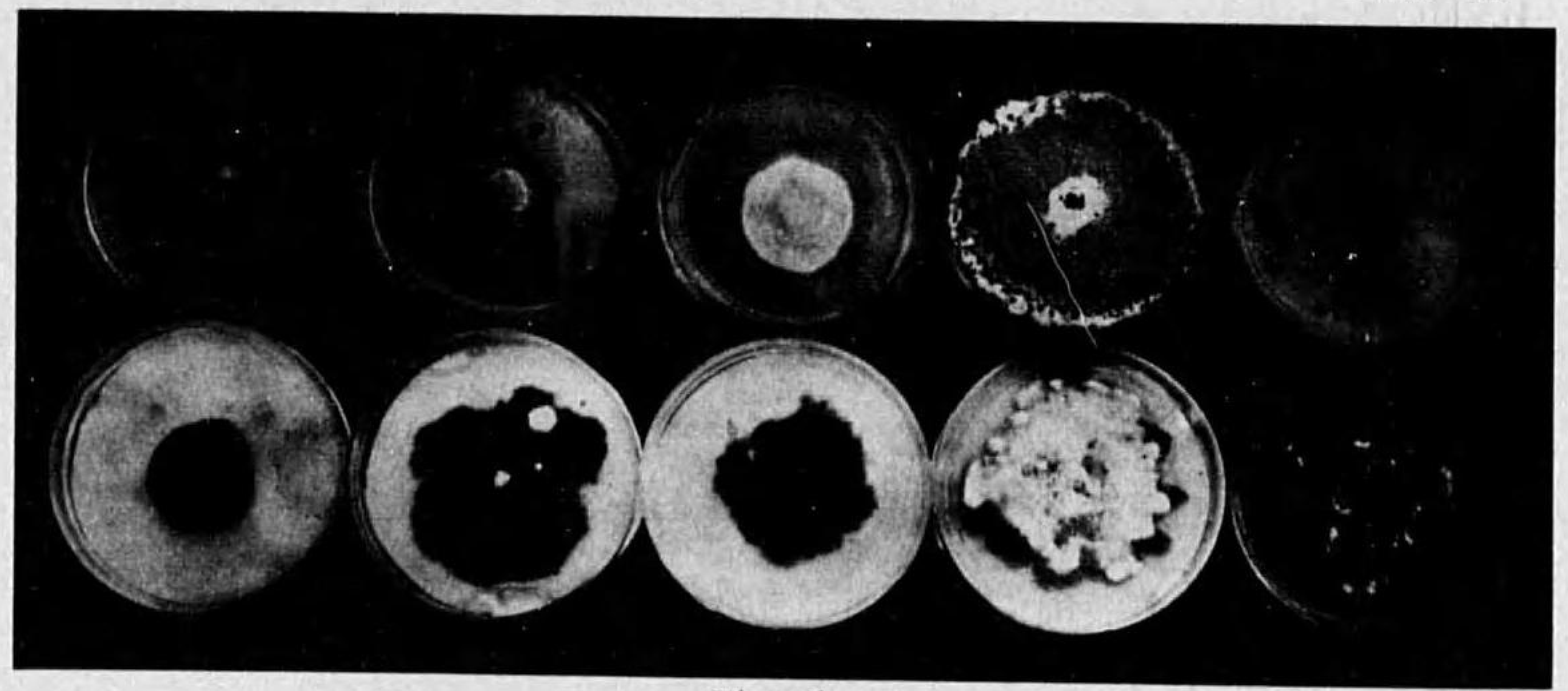


Fig. 1

Fig. 2

Fig. 3

Fig. 4

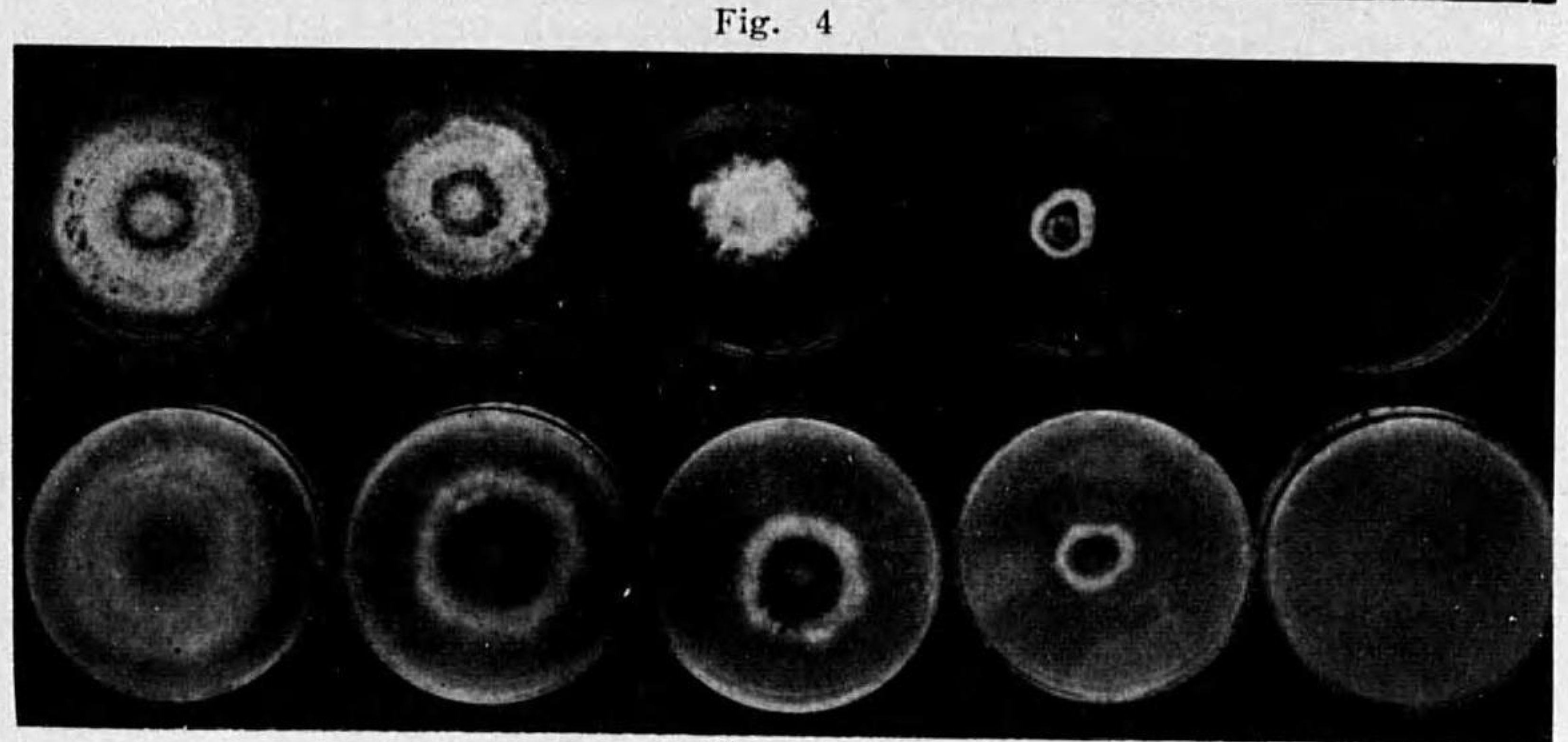


Fig. 5

第　11　圖　版

(Plate　XI)

## 第 11 圖 版 ノ 説 明

第1圖, 第2圖　稻胡麻葉枯病原菌ト其第1號準突然變異菌ノ發育ニ及ボス温度ノ影響 (1) 齋藤氏醬油寒天培養基上.

　第1圖　上, 母菌.　下, 變異菌.　左ヨリ, 8°C, 16°C, 20°C, 24°C.

　第2圖　上, 母菌.　下, 變異菌.　左ヨリ, 28°C, 30°C, 32°C, 36°C, 40°C.

第3圖, 第4圖　馬鈴薯煎汁寒天培養基上ニ於ケル稻胡麻葉枯病原菌ト其第1號準突然變異菌ノ發育ニ及ボス温度ノ影響.

　第3圖　下, 變異菌.　上, 母菌.　左ヨリ, 8°C, 16°C, 20°C, 24°C.

　第4圖　I. 變異菌.　II. 母菌.　左ヨリ, 28°C, 30°C, 32°C, 34°C, 36°C.

## Explanation of Plate XI.

Difference in temperature effect of *Ophiobolus Miyabeanus* and its saltant No. 1.

Fig. 1. and 2. On SAITO's onion soy agar.

Top row, Parent. Bottom row, Saltant.

Fig. 1. Left to right, 8°C, 16°C, 20°C, 24°C.

Fig. 2. Left to right, 28°C, 30°C, 32°C, 36°C, 40°C.

Fig. 3. On potato juice agar with 2% sucrose.

Top row, Parent. Bottom row, Saltant.

Left to right, 8°C, 16°C, 20°C, 24°C.

Fig. 4. On potato juice agar with 2% sucrose.

Top row, Saltant. Bottom row, Parent.

Left to right, 28°C, 30°C, 32°C, 34°C, 36°C.



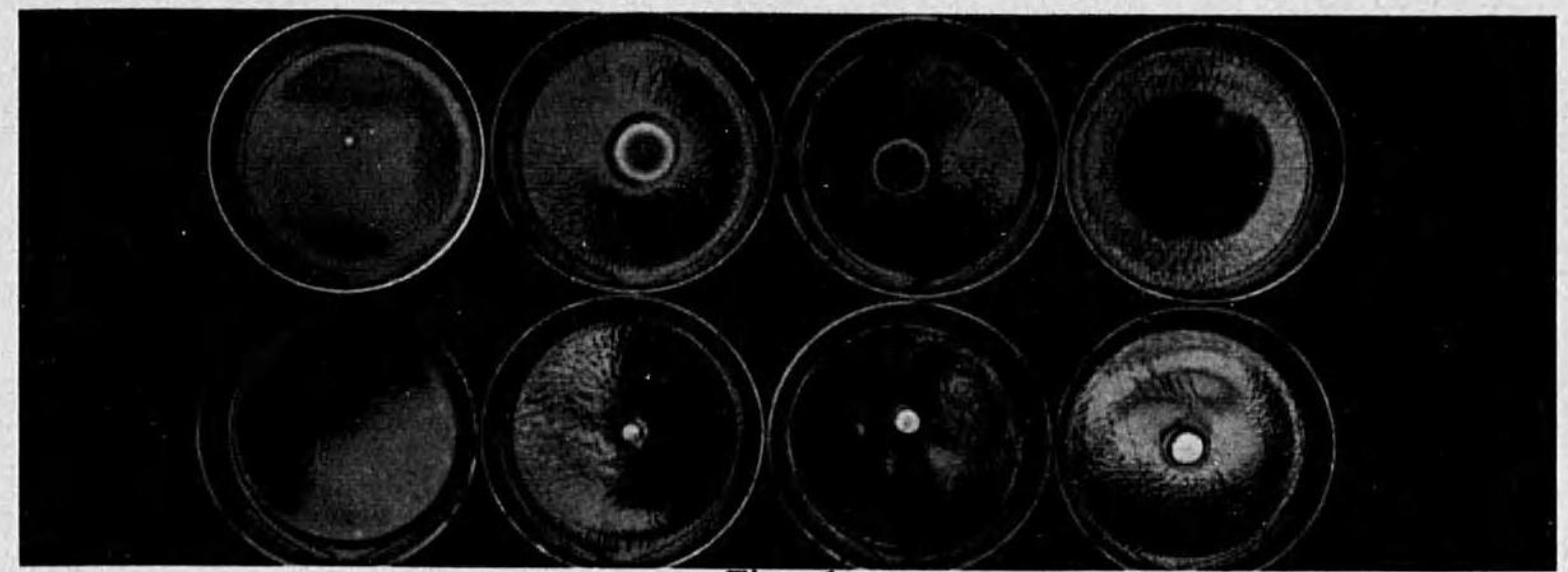


Fig. 1

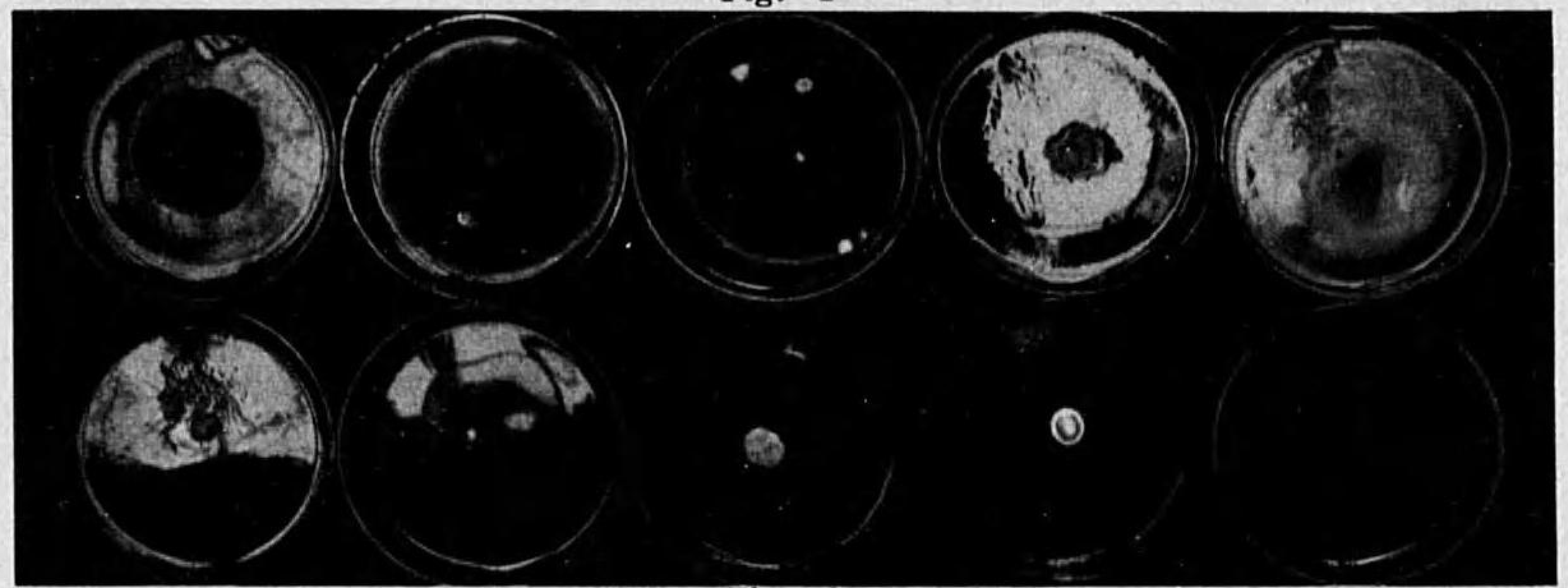


Fig. 2

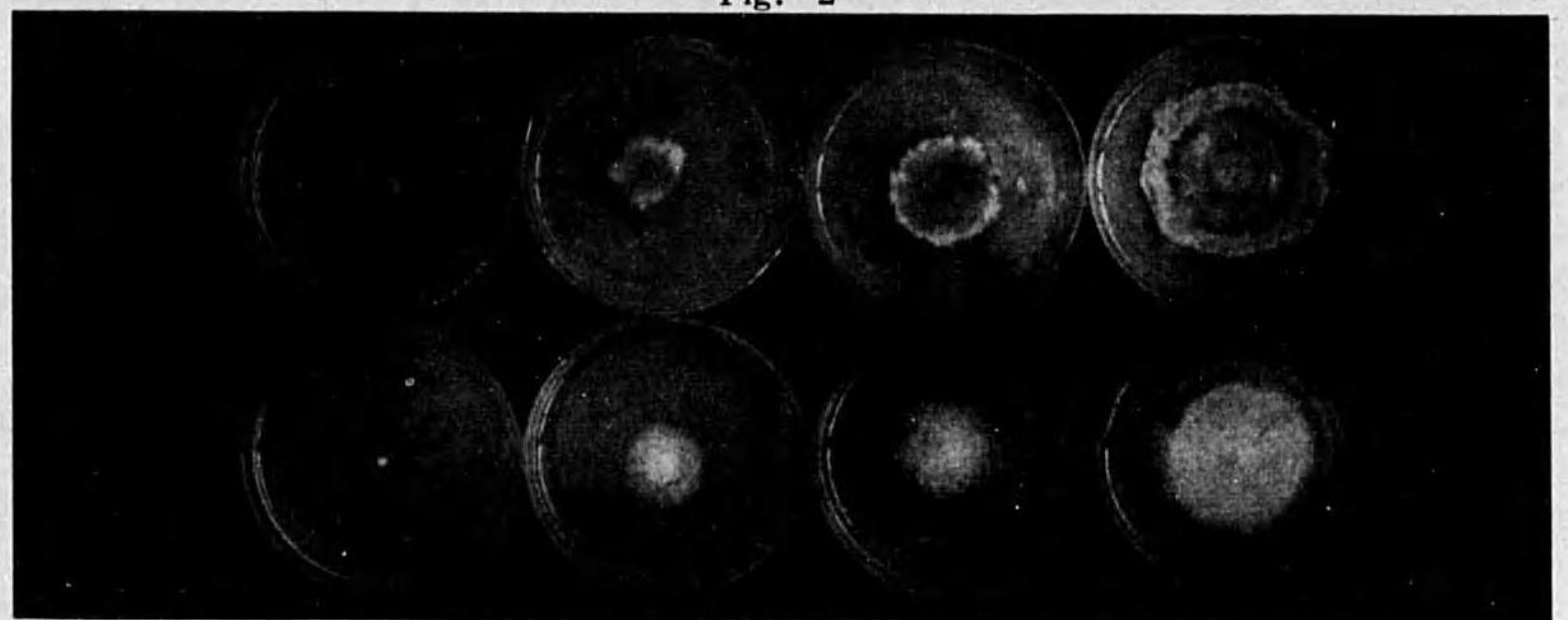


Fig. 3

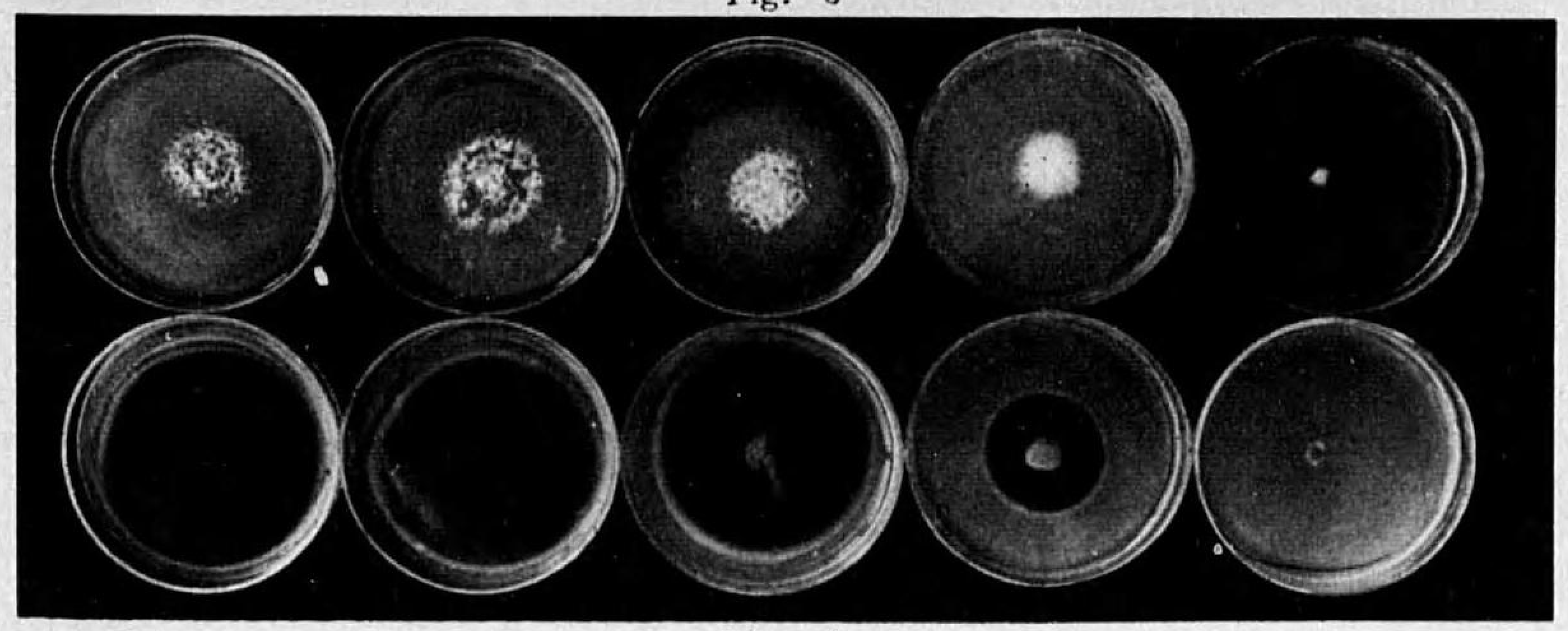


Fig. 4

第　12　圖　版
(Plate　XII)

# 第 12 圖 版 ノ 説 明

稻苗ニ病原性ヲ有スル4絲狀菌ニ於ケル突然變異的現象ノ發現狀態 (I)

I. *Brachysporium Tomato.*

II. *Helminthosporium Oryzae-microsporum* n. sp.

III. *Brachysporium ovoideum.*

IV. *Brachysporium senegalense.*

第 1 圖　齋藤氏醬油寒天培養基上 (培養溫度 36°C)

第 2 圖　乾杏煎汁寒天培養基上 (培養溫度 38°C)

## Explanation of Plate XII.

Saltation in the causal fungi of seedling blight of rice plant. (I)

I. *Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE.

II. *Helminthosporium Oryzae-microsporum* HIROE n. sp. (not reported)

III. *Brachysporium ovoideum* HIROE et WATANABE.

IV. *Brachysporium senegalense* SPEGAZZINI.

Fig. 1. On SAITO'S onion soy agar at 36°C.

Fig. 2. On apricot decoction agar at 38°C.



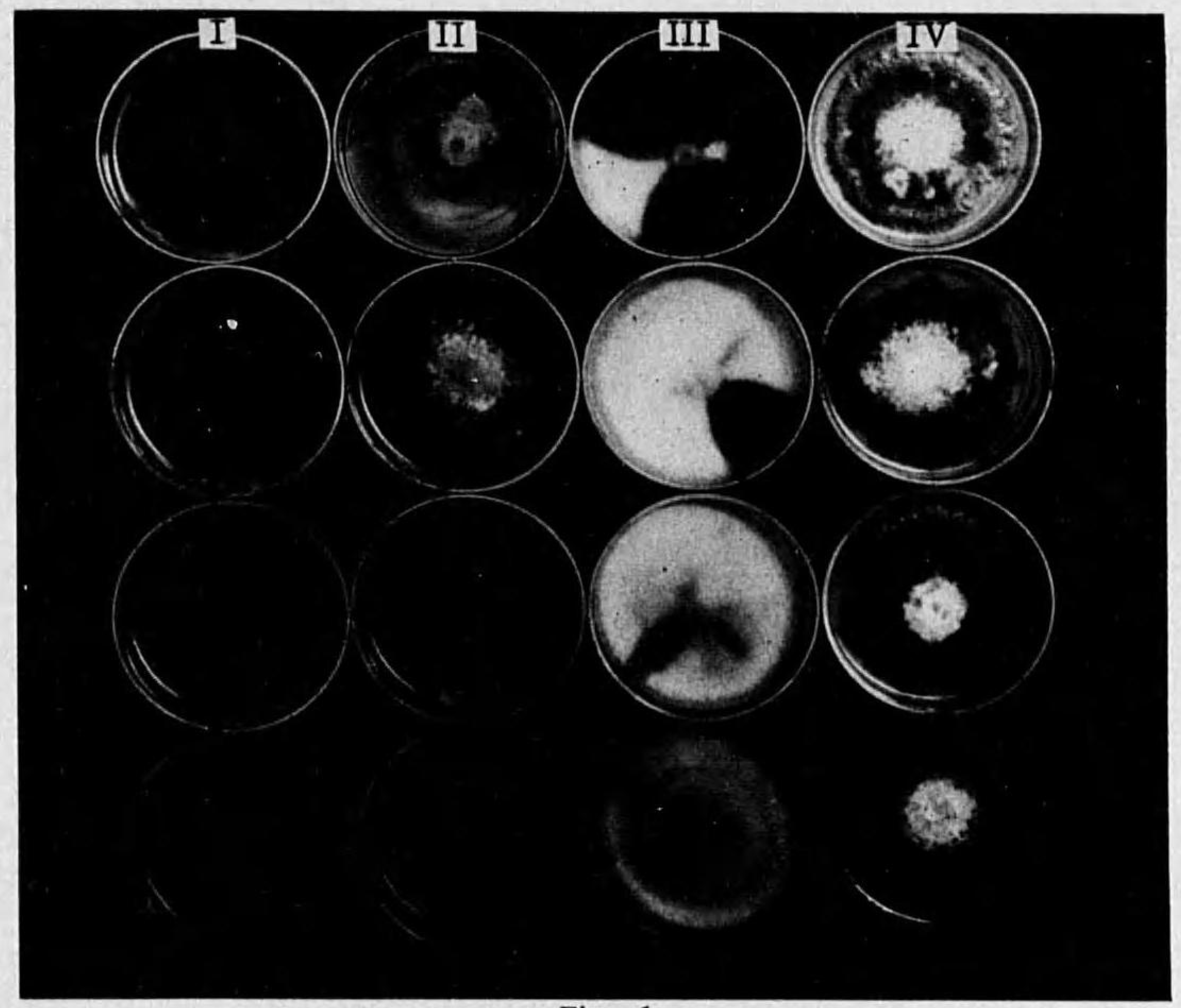



Fig. 1

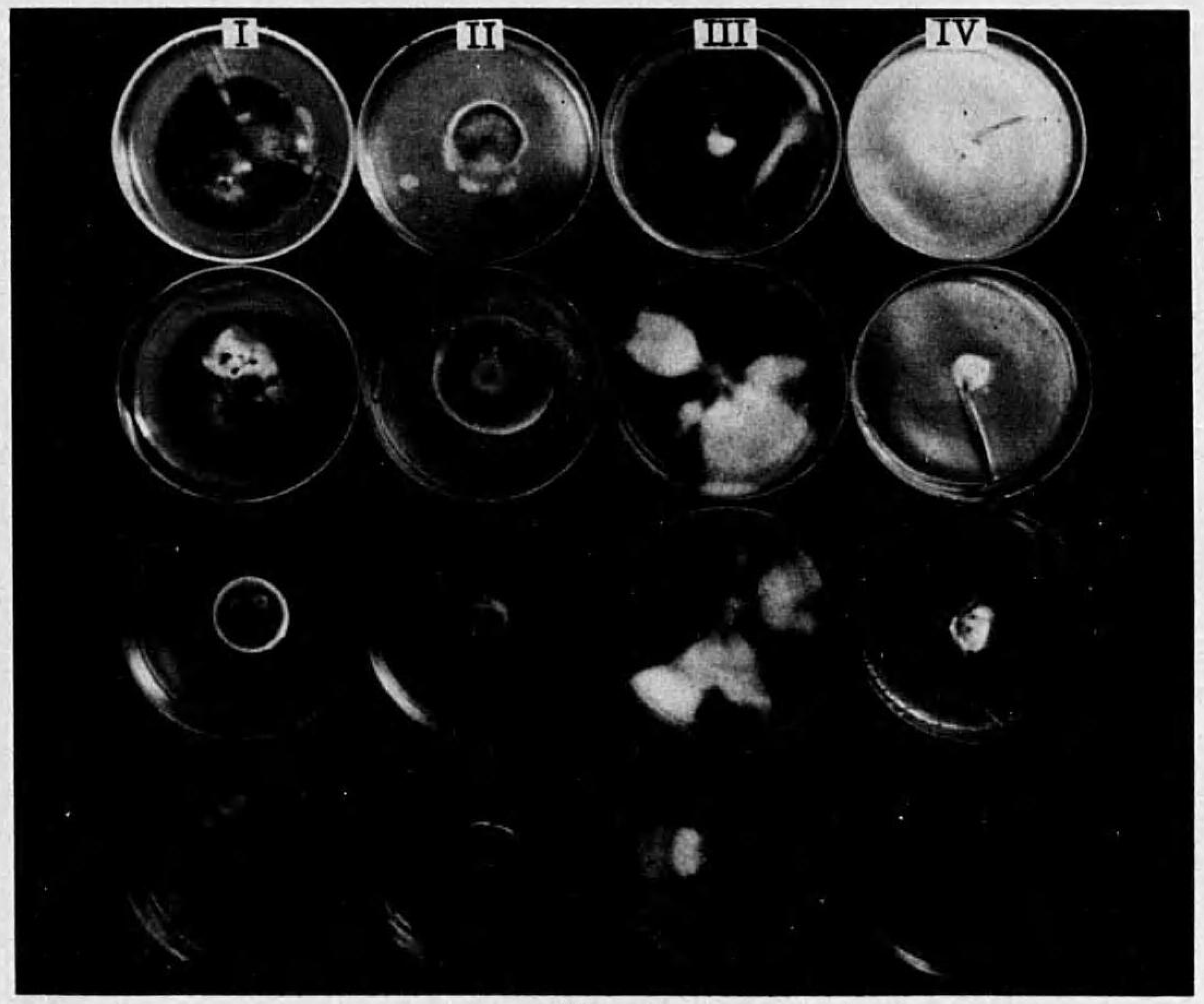



Fig. 2

第 13 圖 版
(Plate XIII)

## 第 13 圖 版 ノ 說 明

稻苗ニ病原性ヲ有スル4絲狀菌ニ於ケル突然變異的現象發現狀態（II）

アスパラギン加用合成寒天培養基上.

I. *Brachysporium Tomato.*

II. *Helminthosporium Oryzae-microsporum* n. sp.

III. *Brachysporium ovoideum.*

IV. *Brachysporium senegalense.*

第 1 圖 齋藤氏醤油寒天培養基上 (培養溫度 32°C)

第 2 圖 乾杏煎汁寒天培養基上 (培養溫度 36°C)

## Explanation of Plate XIII.

Saltations in the causal fungi of seedling blight of rice plant. (II) On synthetic agar with asparagine.

Fig. 1. At 32°C.

Fig. 2. At 36°C.

I. *Brachysporium Tomato* (ELL. et BARTH.) HIROE et WATANABE.

II. *Helminthosporium Oryzae-microsporum* HIROE n. sp.

III. *Brachysporium ovoideum* HIROE et WATANABE.

IV. *Brachysporium senegalense* SPEGAZZINI.



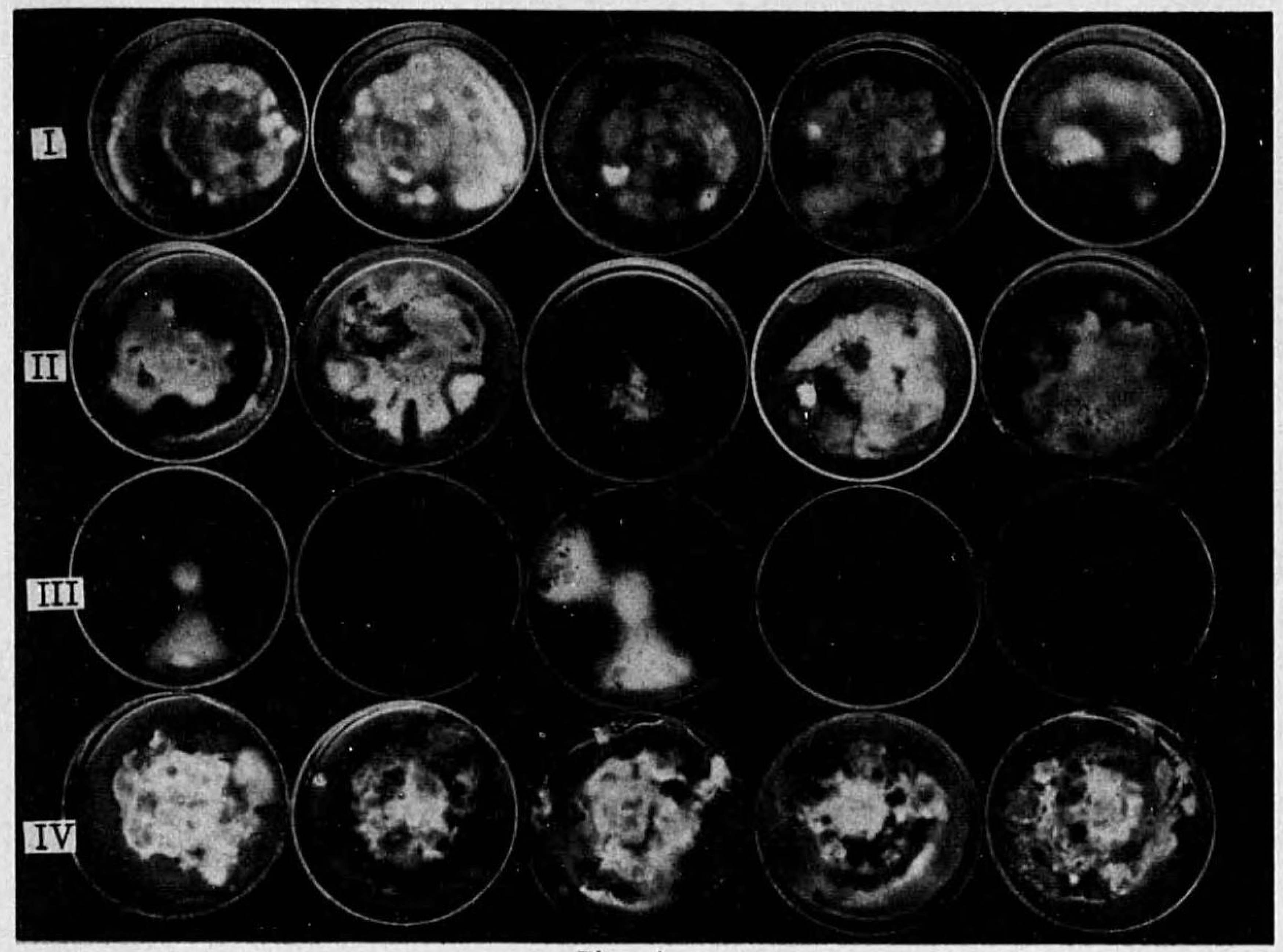



Fig. 1

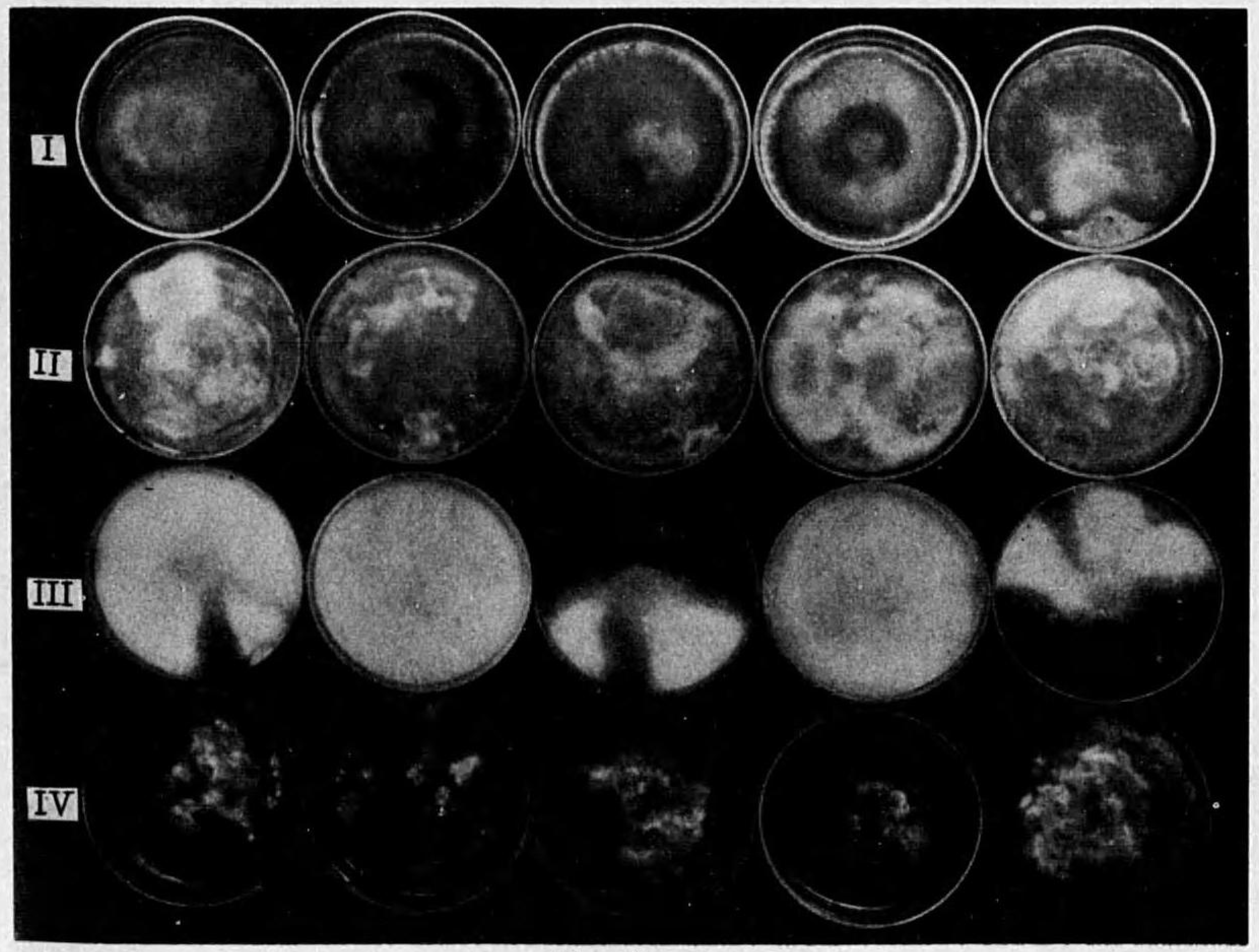



Fig. 2

第 14 圖 版
(Plate XIV)

# 第 14 圖 版 ノ 說 明

第1圖乃至第3圖蕃椒擬黑黴病原菌（*Brachysporium Capsici*）＝於ケル突然變異的現象.

第 1 圖　島狀準突然變異型發現ノ起源，ペプトン加用合成寒天培養基上.

第 2 圖　齋藤氏醬油寒天培養基上＝於ケル母菌　× 540.

第 3 圖　齋藤氏醬油寒天培養基上＝於ケル白色變異菌叢ヨリ現レタル長徑分生胞子.　× 540.

第 4 圖　稻 ブラキスポリウム 病原菌＝於ケル彷徨變異.

I.　*Brachysporium ovoideum* ＝於ケル扇狀彷徨變異型ノ發現.

II.　*Brachysporium senegalense* ＝於ケル扇狀彷徨變異型.

III.　*Brachysporium senegalense* ＝於ケル恒彷徨變異型.

第 5 圖　稻胡麻葉枯病原菌＝於ケル扇狀彷徨變異型ノ2例.（ペプトン加用合成寒天培養基上）

## Explanation of Plate XIV.

Fig. 1 to 3. Saltation in *Brachysporium Capsici* HIROE et WATANABE.

Fig. 1. Pure Cultures on synthetic agar with peptone giving rise to different saltants.

Fig. 2. Photomicrograph of conidia of the fungus on SAITO'S onion soy agar (× 540)

Fig. 3. Photomicrograph of long conidia derived from white patch on the dark mycelial colony, which gradually reverts to the original form. This is the so-called semi-permanent variation.

Fig. 4. Modification in causal fungi of seedling blight of rice plant.

I. *Brachysporium ovoideum* (Sector type of modification)

II. *Brachysporium senegalense* (do.)

III. do. (Ever modificating type)

Fig. 5. Pure cultures of *Ophiobolus Miyabeanus* on synthetic agar media with peptone, showing dark sector (upper one) and grey sector (lower one) which apparently revert to the original form.



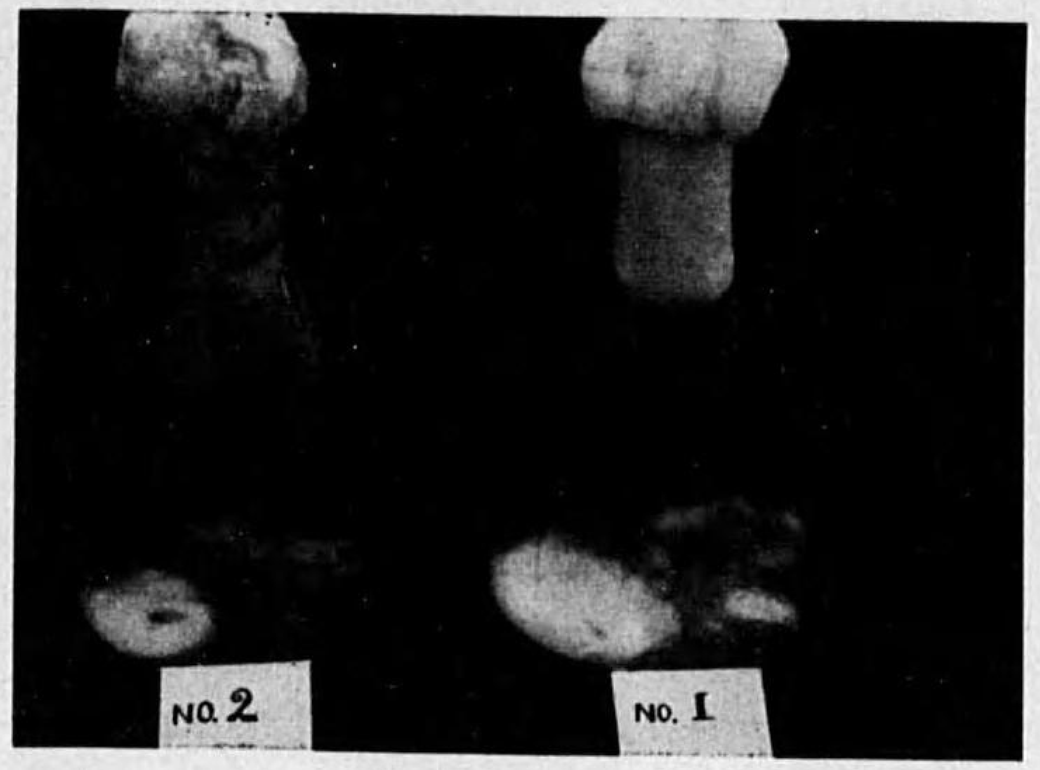


Fig. 1

Fig. 4

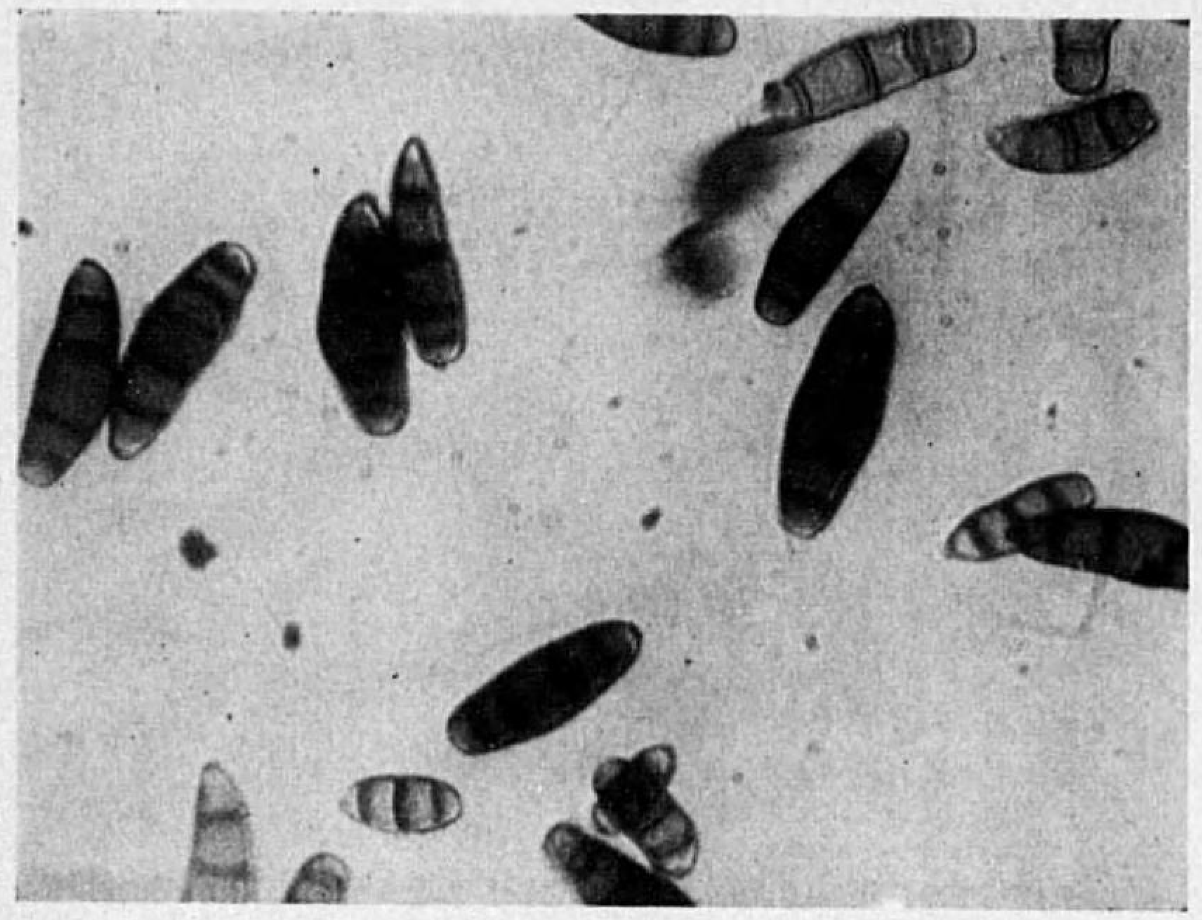


Fig. 2

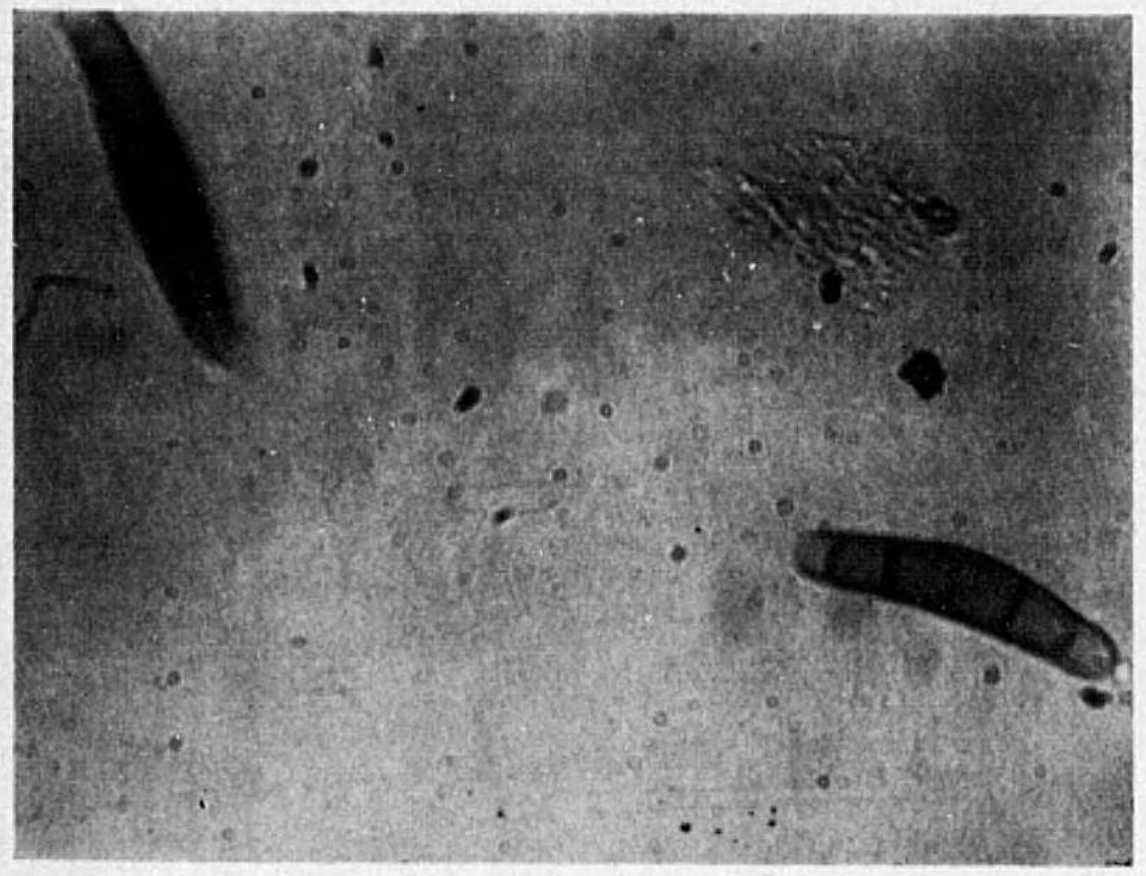


Fig. 3

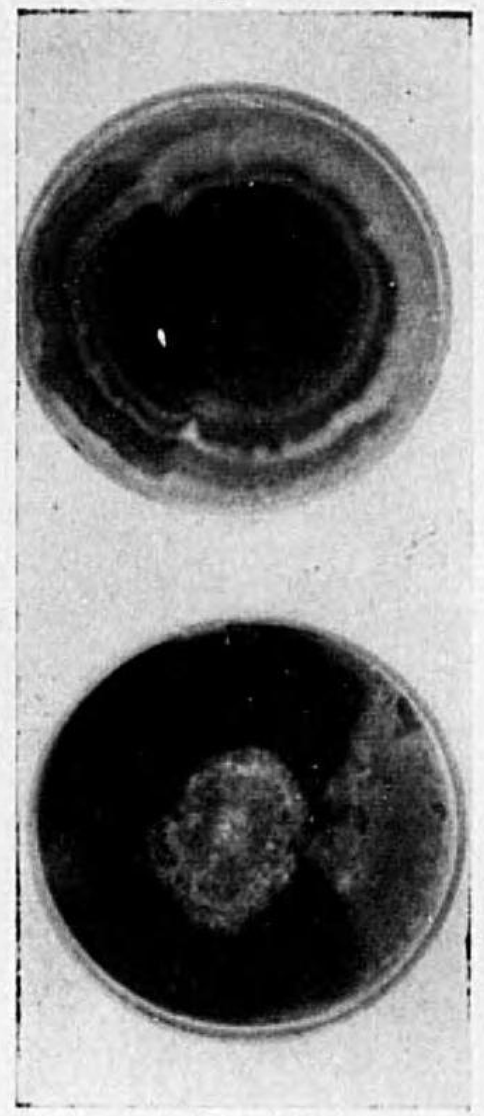


Fig. 5

第　15　圖　版

(Plate XV)

## 第 15 圖 版 ノ 説 明

稻胡麻葉枯病原菌＝於ケル全準突然變異型ノ發現.

第 1 圖　全準突然變異型ノ證明. (第 1 例)
平面培養，馬鈴薯煎汁寒天培養基上＝於ケル全準突然變異型. (28°C)
試驗管培養，菌叢各部ノ次代＝於ケル發育狀態ヲ示ス.
上段　左ヨリ 5 本迄ハ母菌ノ發育狀態ヲ示ス.

第 2 圖　全準突然變異型ノ證明. (第 2 例)
平面培養，馬鈴薯煎汁寒天培養基上＝於ケル全準突然變異型. (28°C)
試驗管培養，菌叢各部ノ次代＝於ケル發育狀態ヲ示ス.
下段　3 本迄ハ母菌ノ發育狀態ヲ示ス.

第 3 圖　全準突然變異型ノ證明. (第 3 例)
平面培養，馬鈴薯煎汁寒天培養基上＝於ケル全準突然變異型. (28°C)
試驗管培養，菌叢各部ノ次代＝於ケル發育狀態ヲ示ス.
上段　右ヨリ 3 本迄ハ母菌ノ發育狀態ヲ示ス.

第 4 圖　全準突然變異型ノ證明. (第 4 例)
平面培養，馬鈴薯煎汁寒天培養基上＝於ケル全準突然變異型. (28°C)
試驗管培養，菌叢各部ノ次代＝於ケル發育狀態ヲ示ス.
上段　左ヨリ 2 本迄ハ母菌ノ發育狀態ヲ示ス.

第 5 圖　莞草葉枯病原菌＝於ケル島狀彷徨變異型. (乾杏煎汁寒天培養基上)

## Explanation of Plate XV.

All saltating type in *Ophiobolus Miyabeanus* ITO et KURIBAYASHI.

Fig. 1. Demonstration of saltation. (1)
Plate culture, All saltating type on potato juice agar at 28°C.
Slant cultures, albino mycelial characters of subsequent stage on SAITO's onion soy agar, but the first five of the top row are parent.

Fig. 2. Demonstration of saltation. (2)
Plate culture, All saltating type on potato juice agar at 28°C.
Slant cultures, albino mycelial characters of subsequent stage on SAITO's onion soy agar, but the first three of the top row are parent.

Fig. 3. Demonstration of saltation. (3)
Plate culture, All saltating type on potato juice agar at 23°C.
Slant cultures, albino mycelial characters of subsequent stage on SAITO's onion soy agar, but the first two of the top row are parent.

Fig. 4. Demonstration of saltation. (4)
Plate culture, All saltating type on potato juice agar at 28°C.
Slant cultures, albino mycelial characters of subsequent stage on SAITO's onion soy agar, but the first two of the top row are parent.

Fig. 5. Pure cultures of *Brachysporium Yamadaeanum* MATSUURA, on apricot decoction agar showing "Island type of modification."



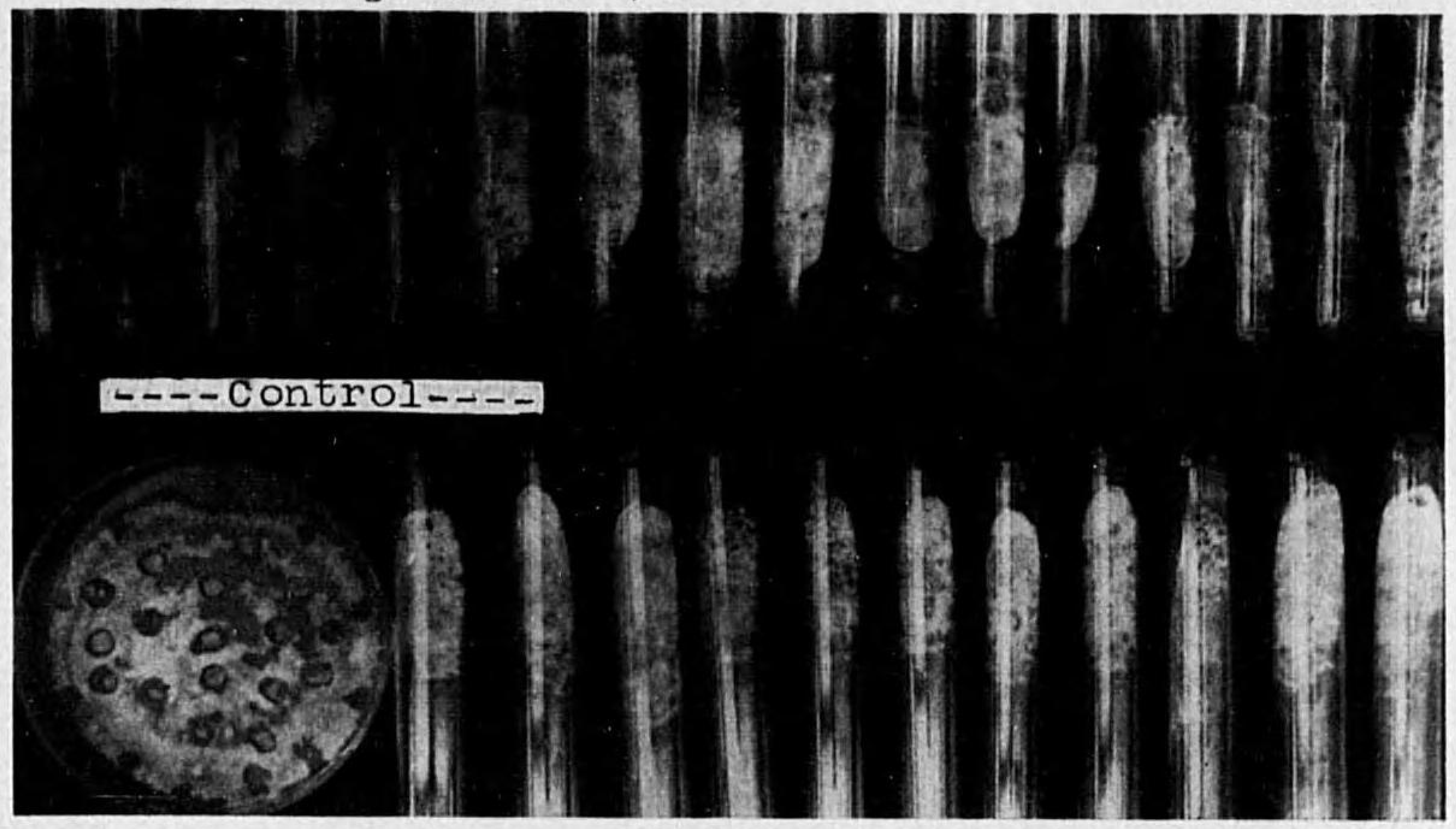


Fig. 1

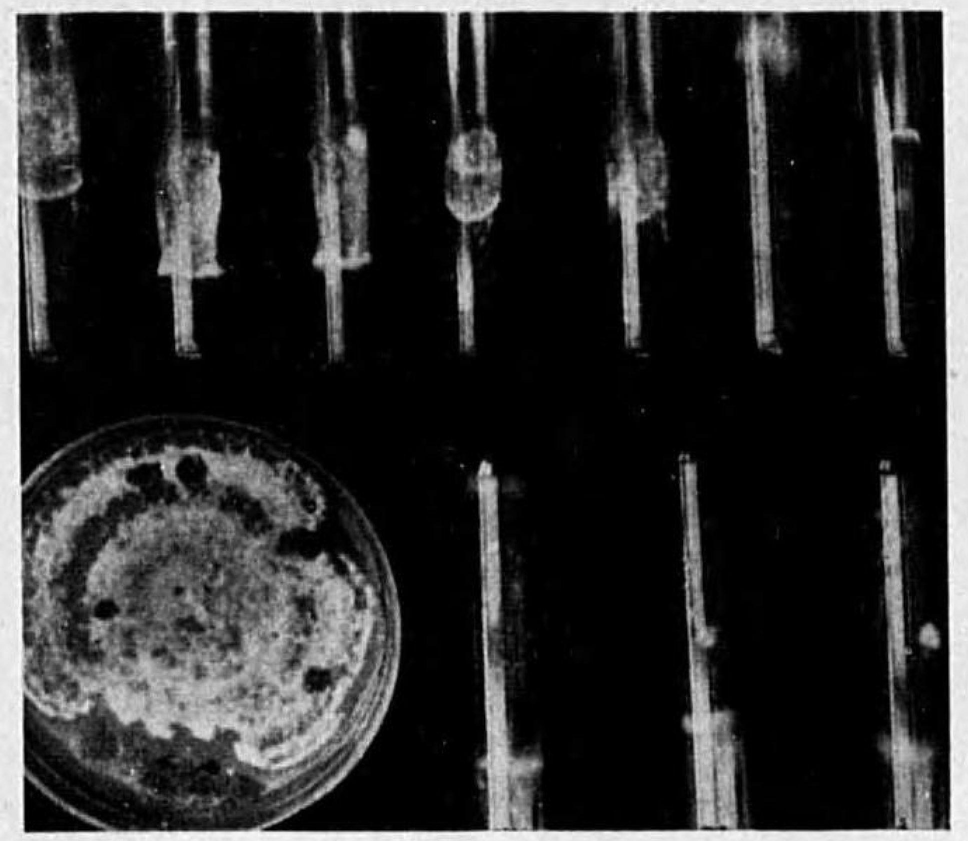


Fig. 2

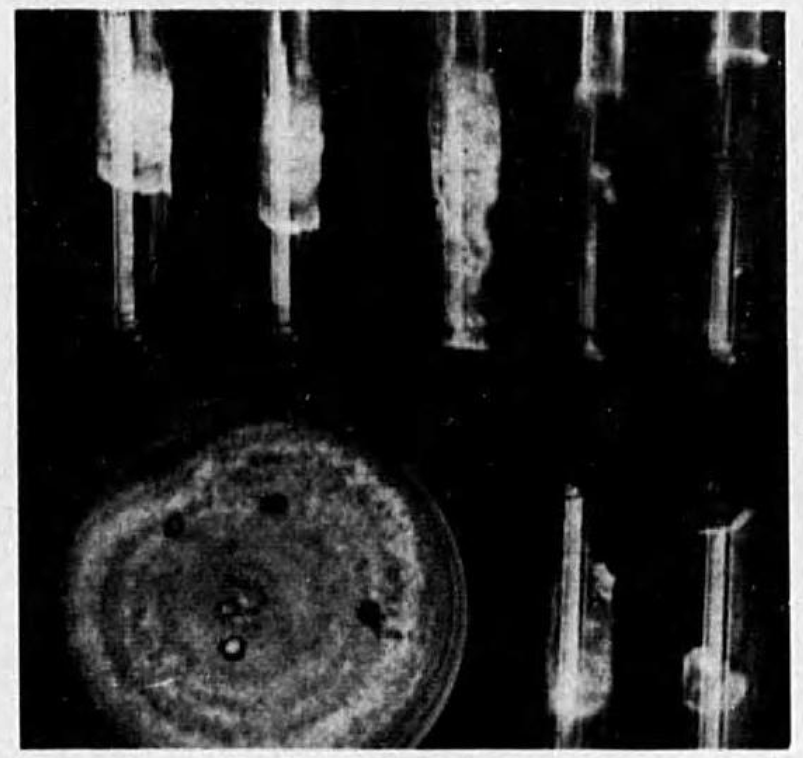


Fig. 4

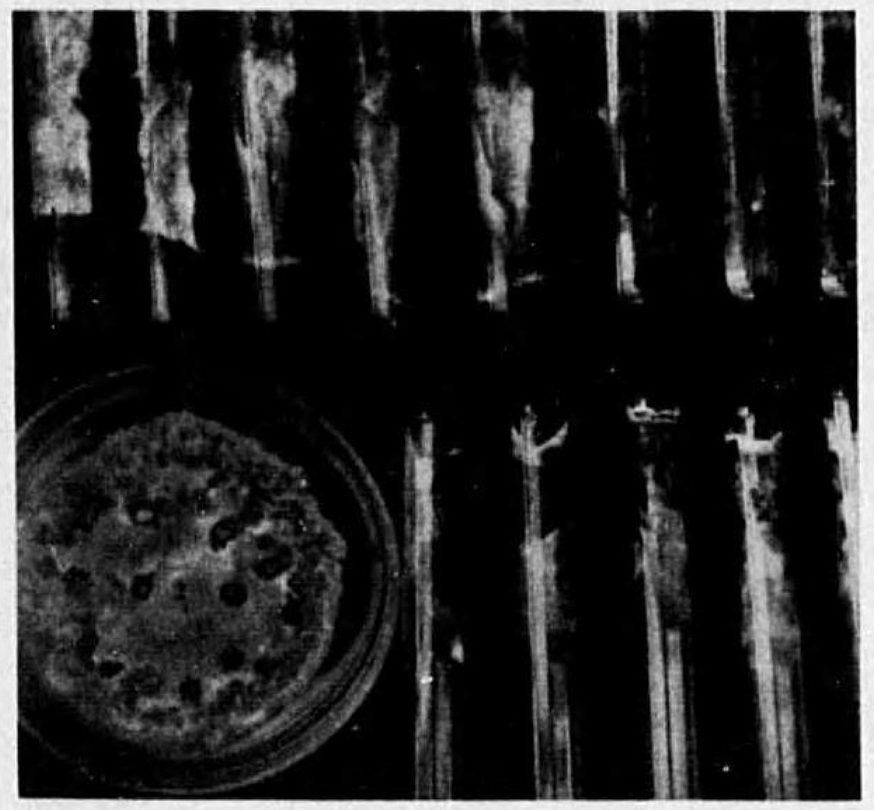


Fig. 3

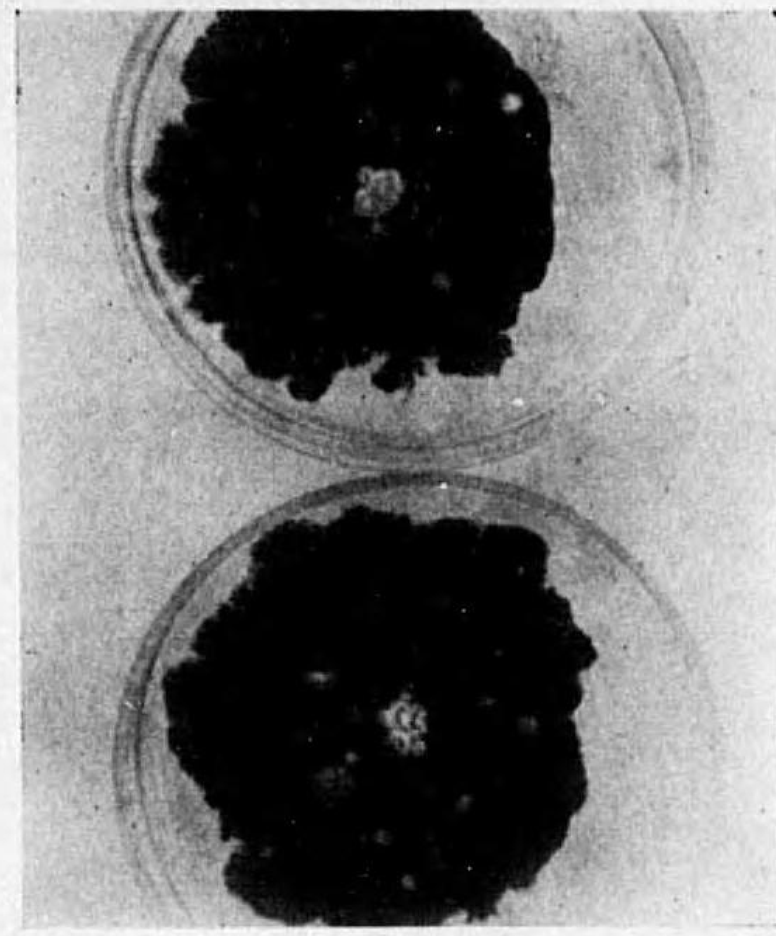


Fig. 5

第　16　圖　版
(Plate　XVI)

## 第 16 圖 版 ノ 說 明

第 1 圖 稻胡麻葉枯病原菌ノ島狀準突然變異型ノ發現ニ及ボス レントゲン線，紫外線並ニ兩者ノ混合放射ノ影響．（齋藤氏醬油寒天培養基上）
- a. レントゲン線放射．
- b. 標　　準．
- c. レントゲン線並ニ紫外線混合放射．
- d. 紫外線放射．

第 2 圖 第 1 例　左列，標準．右列，紫外線放射區．島狀準突然變異型發現セズ灰色氣中菌絲ヲ叢生ス．

第 3 圖 第 2 例　同　上．

第 4 圖 第 3 例　標準（左）放射區（右）間ニ差異ヲ認メズ．

第 5 圖 供試紫外線濾光板ノ Spectrum.
- I. Violet Ultra.
- II. Heat Resisting Clear Chemical Glass.
- III. Signal Blue.
- IV. Violet No. 511.
- V. Red Purple Ultra.
- VI. Blue Purple Ultra No. 585.
- VII. 普通硝子．
- VIII. 鐵弧燈．

## Explanation of Plate XVI.

Fig. 1. Effect of ultra-violet ray and RÖNTGEN'S ray radiations, and their mixed radiations on the rate of occurrence of island type of saltation in *Ophiobolus Miyabeanus* ITO et KURIBAYASHI.
- a. RÖNTGEN'S ray (no effect)
- b. Control.
- c. Röntgen's and ultra-violet rays (decided effect)
- d. Ultra-violet.

Fig. 2. Left row, Control.
Right row, Ultra-violet ray.
(Giving rise to grey aerial mycelium but no island type of saltation.)

Fig. 3. do.

Fig. 4. Left, Control.
Right, Ultra-violet ray. (No difference observed)

Fig. 5. Spectrum of filters of ultra-violet ray used.
- I. Violet Ultra.
- II. Heat Resisting Clear Chemical Glass.
- III. Signal Blue.
- IV. Violet No. 511.
- V. Red Purple Ultra.
- VI. Blue Purple Ultra No. 585.
- VII. Window Glass.
- VIII. Iron Arc.



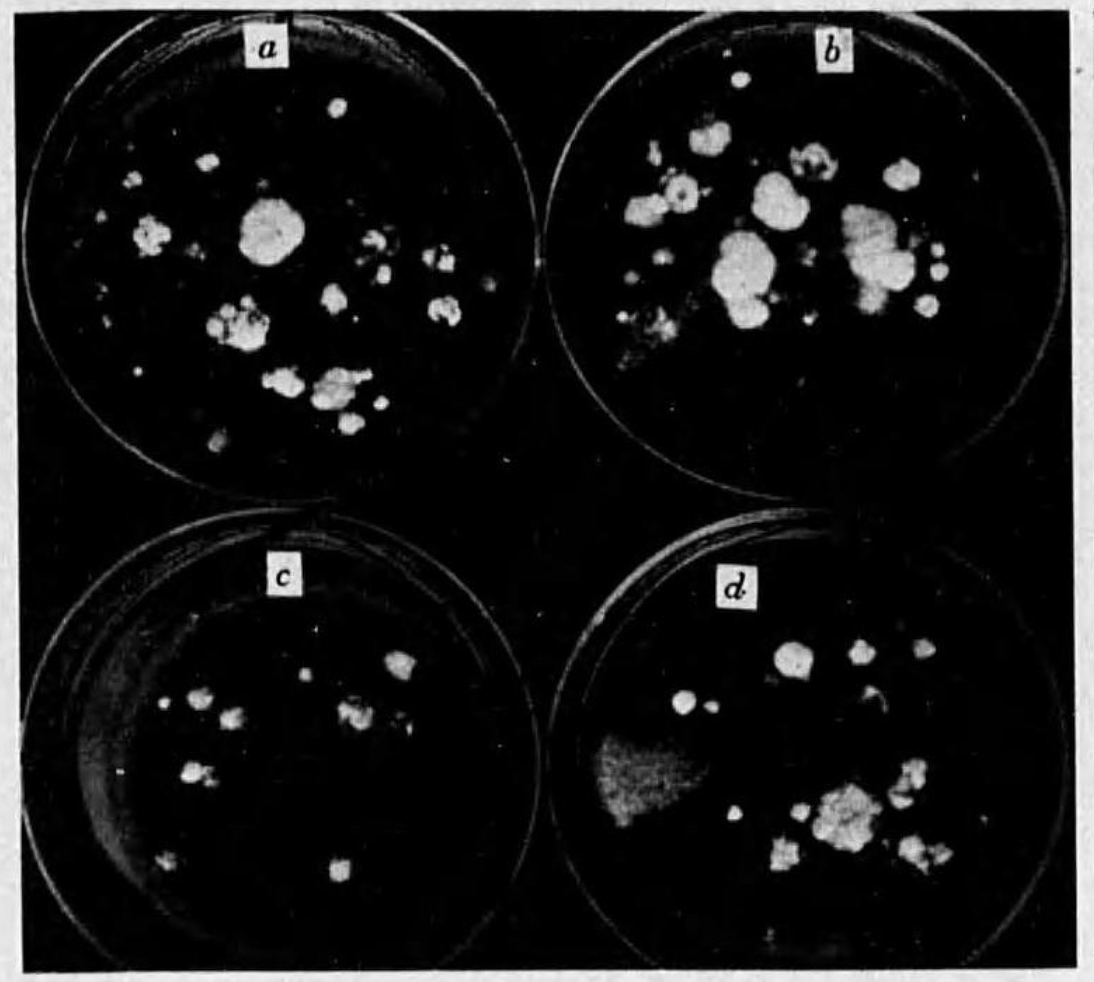



Fig. 1

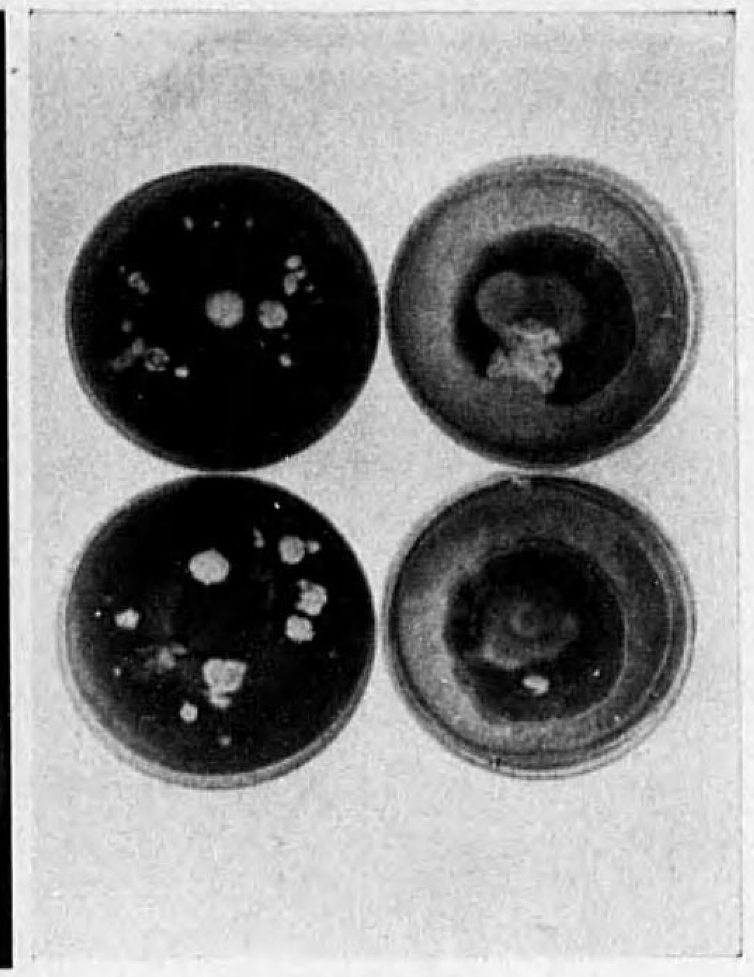


Fig. 2

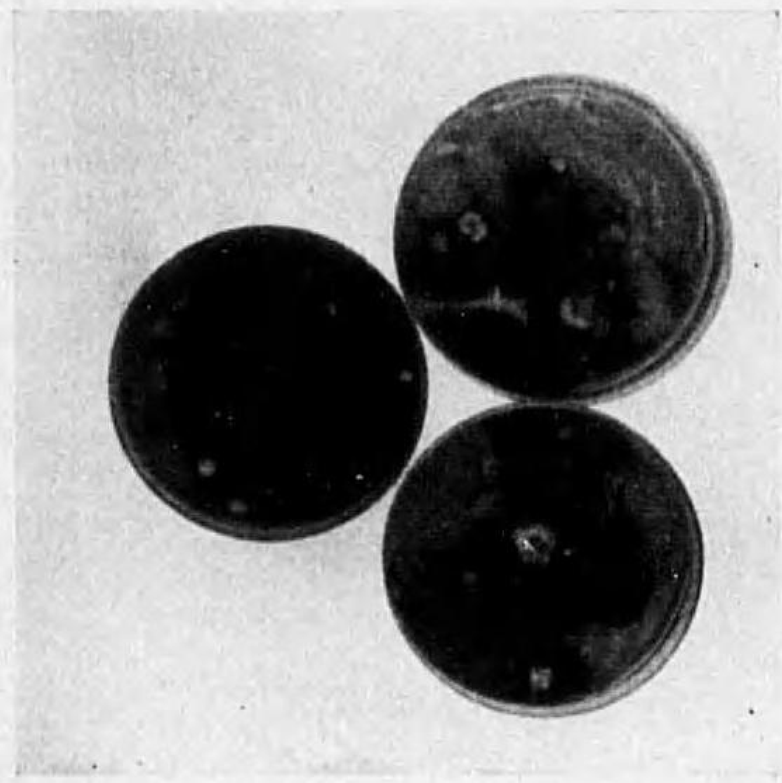


Fig. 3

Fig. 4


Fig. 5

第　17　圖　版

(Plate XVII)

## 第17圖版ノ説明

稻胡麻葉枯病原菌ノ突然變異的現象ノ發現ニ及ボス各種化學物質ノ影響.

（齋藤氏醤油寒天培養基）

第1圖　I.　標　　準.

II.　重クローム酸加里添加.

III.　硫酸亞鉛添加.

IV.　昇汞添加.

V.　石炭酸添加.

第2圖　I.　弗化水素酸添加.

II.　硫酸銅添加.

III.　過マンガン酸加里添加.

IV.　硼酸添加.

## Explanation of Plate XVII.

Effect of chemicals on rate of occurrence of saltation in *Ophiobolus Miyabeanus* Ito et Kuribayashi. (on Saito's onion soy agar)

Fig. 1. I. Control.

II. Kalium bi-Chromate.

III. Zinc Sulphate.

IV. Merchulic Chloride.

V. Carbolic Acid.

Fig. 2. I. Hydrofluoric Acid.

II. Cupper Sulphate.

III. Kalium Permanganate.

IV. Boric Acid.



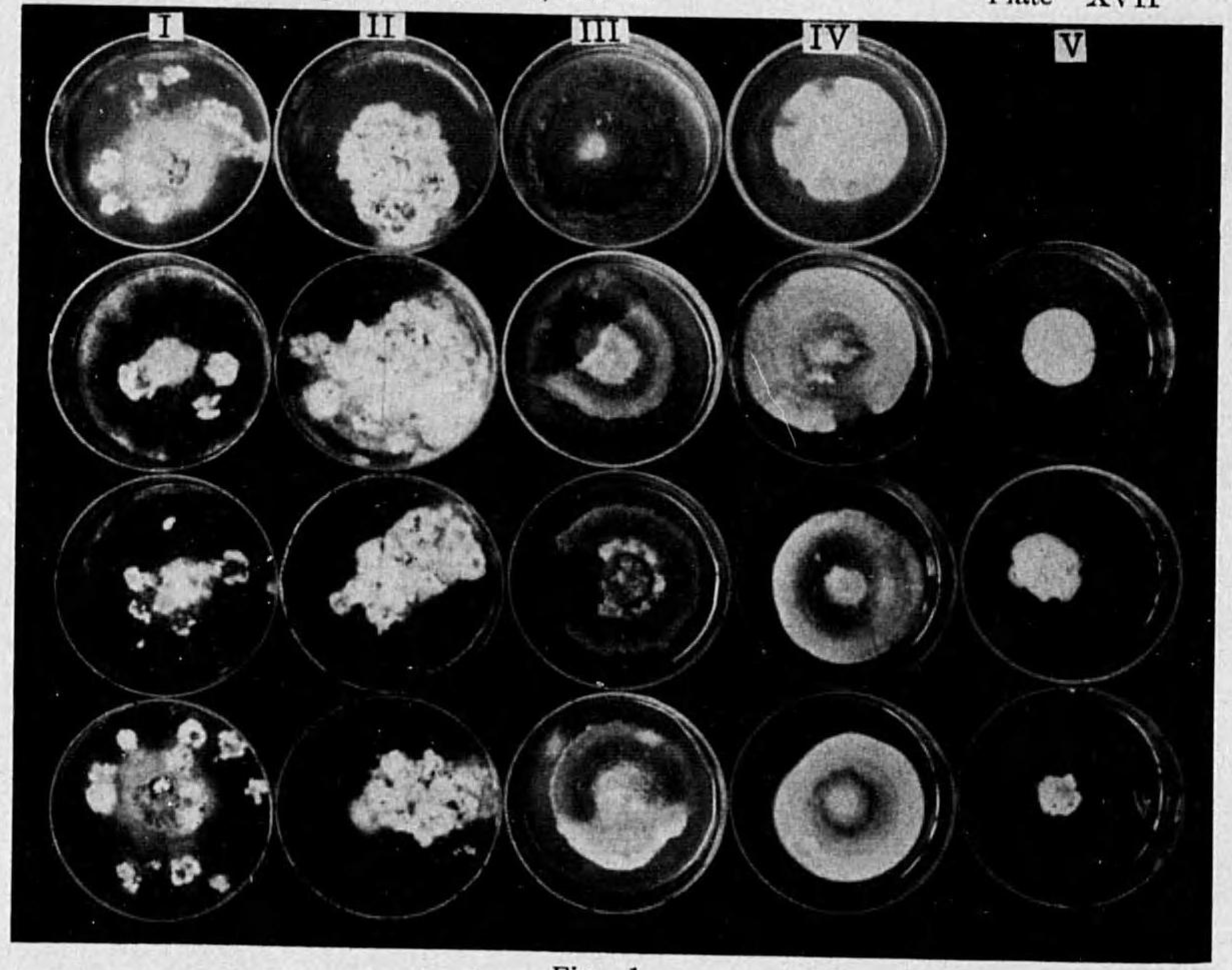



Fig. 1

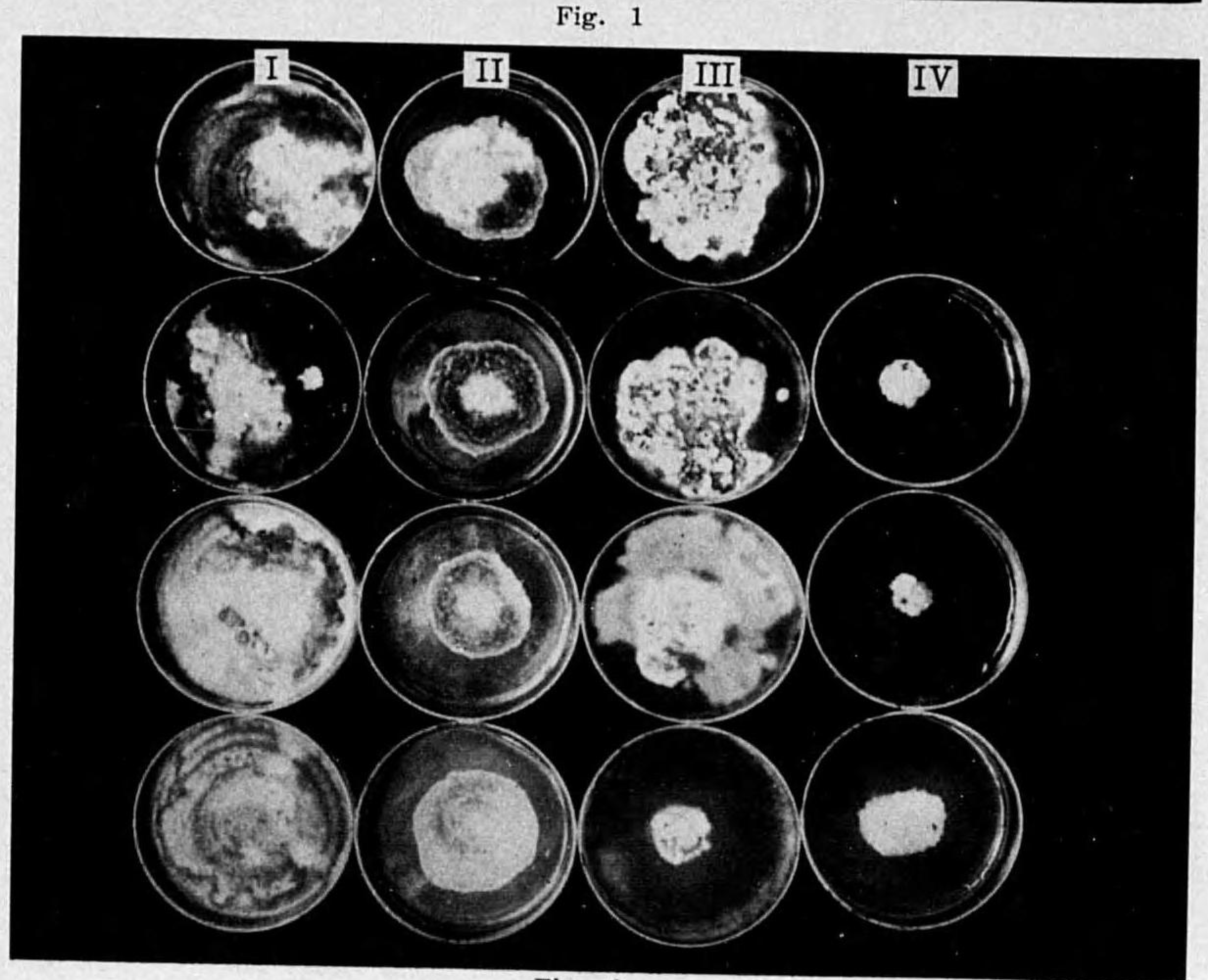



Fig. 2

第　18　圖　版
(Plate　XVIII)

## 第 18 圖版ノ說明

第 1 圖　梨黑班病原菌ノ突然變異的現象ノ發現ニ及ボス各種化學物質ノ影響.

（齋藤氏醬油寒天培養基上）

I.　標　　準.

II.　重クローム酸加里添加.

III.　硫酸亞鉛添加.

IV.　昇汞添加.

V.　石炭酸添加.

第 2 圖　稻胡麻葉枯病原菌ノ準突然變異菌ニ於ケル歸先遺傳ニヨリ發現シタル 2 菌系ノ發育ニ及ボス溫度ノ影響.

I.　第 7 號準突然變異菌ヨリ復歸セシ菌系.

II.　第 14 號準突然變異菌ヨリ復歸セシ菌系.

上段左ヨリ　12°C　15°C　20°C　24°C.

下段左ヨリ　28°C　32°C　36°C　40°C.

（乾杏煎汁寒天培養基上）

## Explanation of Plate XVIII.

Fig. 1. Effect of chemicals on rate of occurrence of saltation in *Alternaria Kiku-chiana* TANAKA, causal fungus of black spot disease of Japanese pear, on SAITO's onion soy agar.

I. Control.

II. Kalium bi-Chromate.

III. Zinc Sulphate.

IV. Merchulic Chloride.

V. Carbolic Acid.

Fig. 2. Effect of temperature on mycelial growth of two new strains, derived from reversion in saltants of *Ophiobolus Miyabeanus*, on apricot decoction agar.

I. Strain derived from saltant No. 7.

II. Strain derived from saltant No. 14.

Top row, left to right, 12°C, 15°C, 20°C, 24°C.

Bottom row, left to right, 28°C, 32°C, 36°C, 40°C.



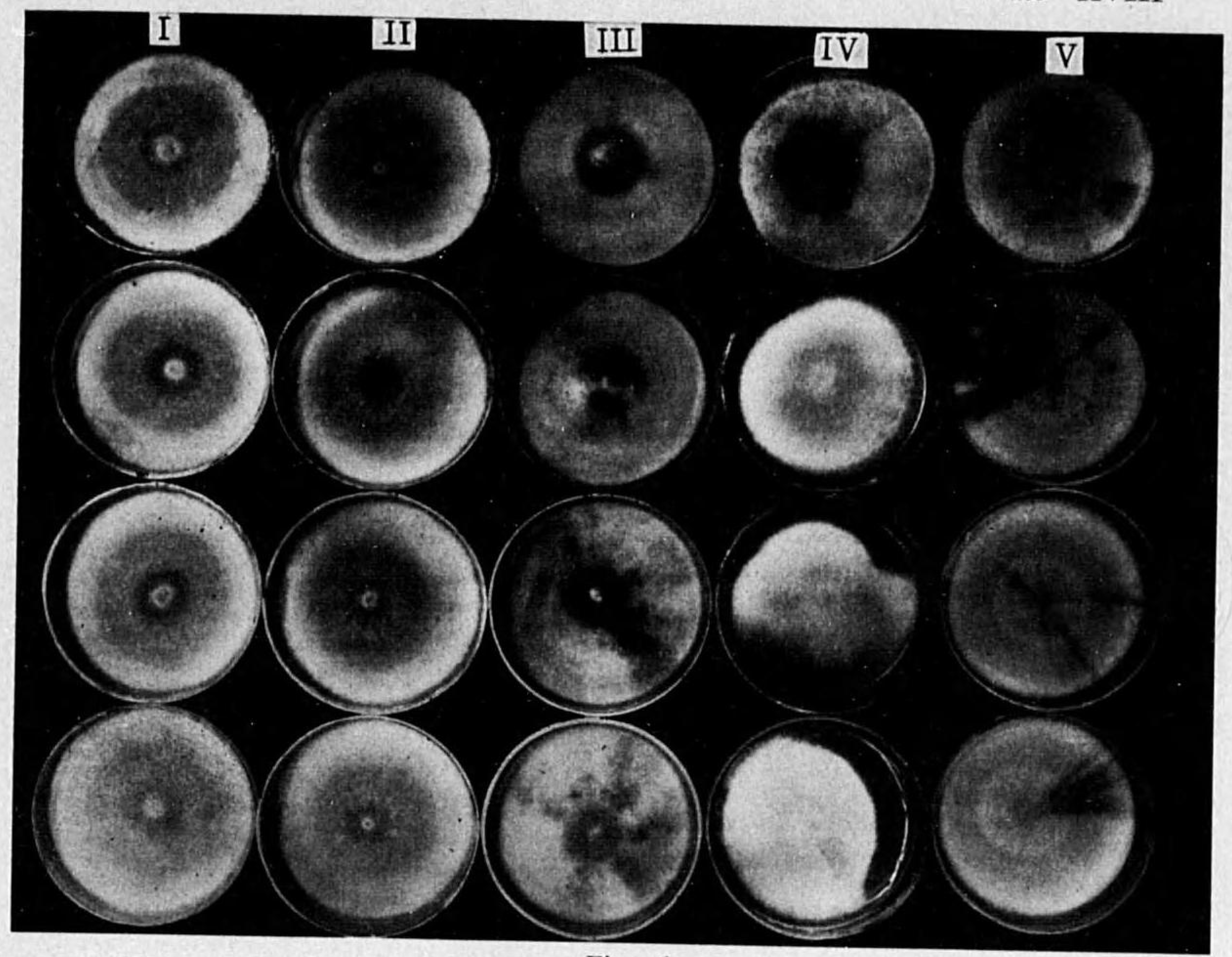



Fig. 1

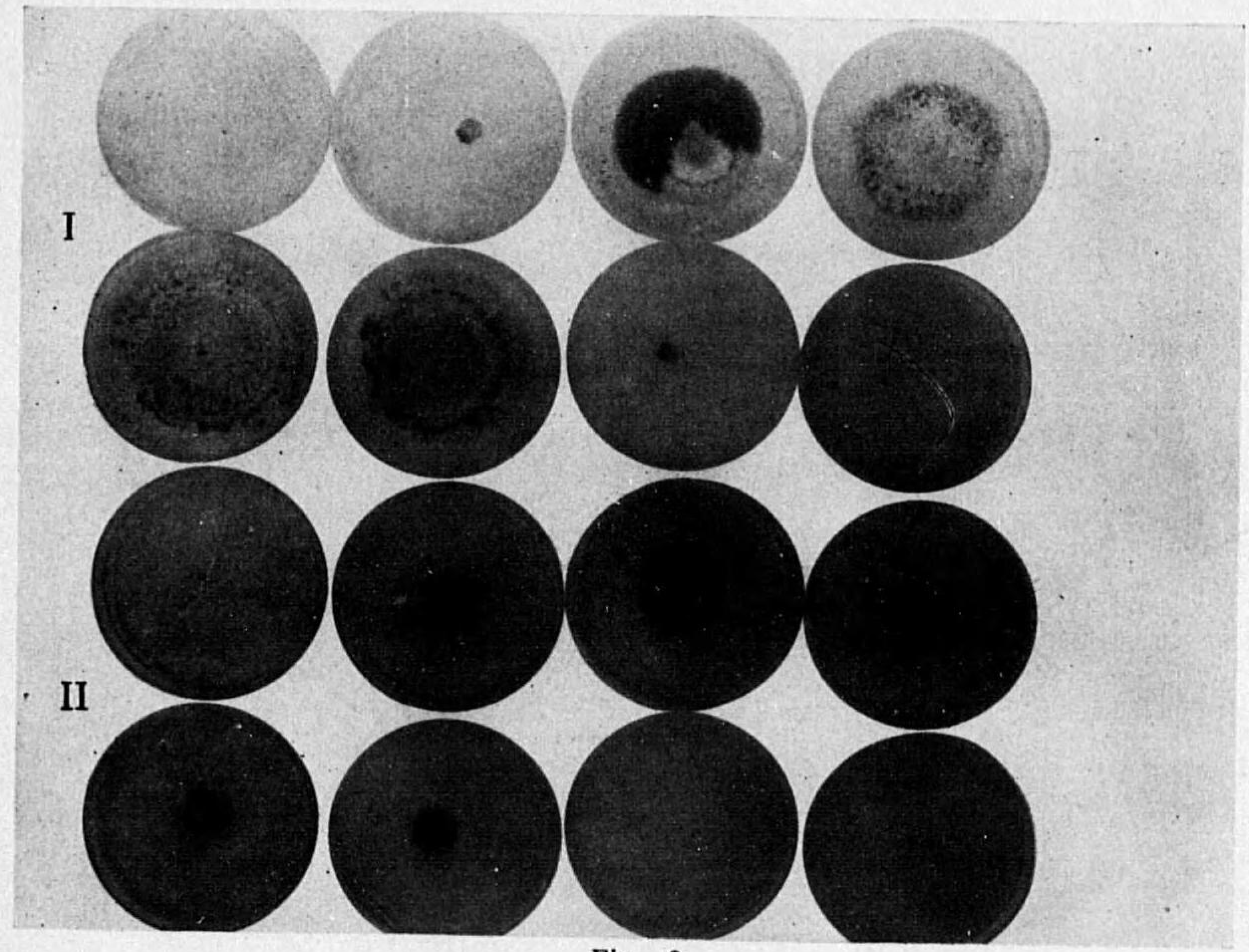



Fig. 2

第　19　圖　版
(Plate XIX)

## 第19圖版ノ説明

各種培養基上ニ形成セラレタル稻胡麻葉枯病原菌分生胞子ノ形態. × 540

培養温度 28°C.

第1圖 齋藤氏醬油寒天培養基上.

第2圖 アスパラギン加用合成寒天培養基上.

第3圖 乾杏煎汁寒天培養基上.

第4圖 第7號準突然變異菌ヨリ歸先遺傳ニヨリ形成セラレタル分生胞子. (齋藤氏醬油寒天培養基上)

## Explanation of Plate XIX.

Photomicrographs of conidia of *Ophiobolus Miyabeanus* on various media at 28°C. (× 540)

Fig. 1. On SAITO's onion soy agar.

Fig. 2. On synthetic media with asparagine.

Fig. 3. On apricot decoction agar.

Fig. 4. Conidia of reverted strain derived from albino saltant No. 7, on SAITO's onion soy agar.



Fig. 1

Fig. 2

Fig. 3

Fig. 4

第　20　圖　版
(Plate　XX)

## 第 20 圖版ノ說明

稻胡麻葉枯病原菌ニ於ケル第 14 號準突然變異菌ヨリ歸先遺傳ニヨリ形成セラレタル分生胞子.

第 1 圖　齋藤氏醬油寒天培養基上ニ形成セラレタル分生胞子. （第 1 世代）

第 2 圖　アスパラギン加用合成寒天培養基上ニ形成セラレタル分生胞子. （第 2 世代）

第 3 圖　乾杏煎汁寒天培養基上ニ形成セラレタル分生胞子. （第 2 世代）

第 4 圖　齋藤氏醬油寒天培養基上ニ形成セラレタル分生胞子. （第 6 世代）

漸次母菌ノ分生胞子ニ近キ形態ヲ示セリ.

## Explanation of Plate XX.

Photomicrographs of conidia of reverted strain derived from albino saltant No. 14 of *Ophiobolus Miyabeanus* Ito et Kuribayashi.

Fig. 1. Conidia on Saito's onion soy agar. (1st generation)

Fig. 2. Conidia on synthetic media with asparagin. (2nd generation)

Fig. 3. Conidia on apricot decoction agar. (2nd generation)

Fig. 4. Conidia on Saito's onion soy agar. (6th generation)

Note the gradual change of conidial form to form of parent.



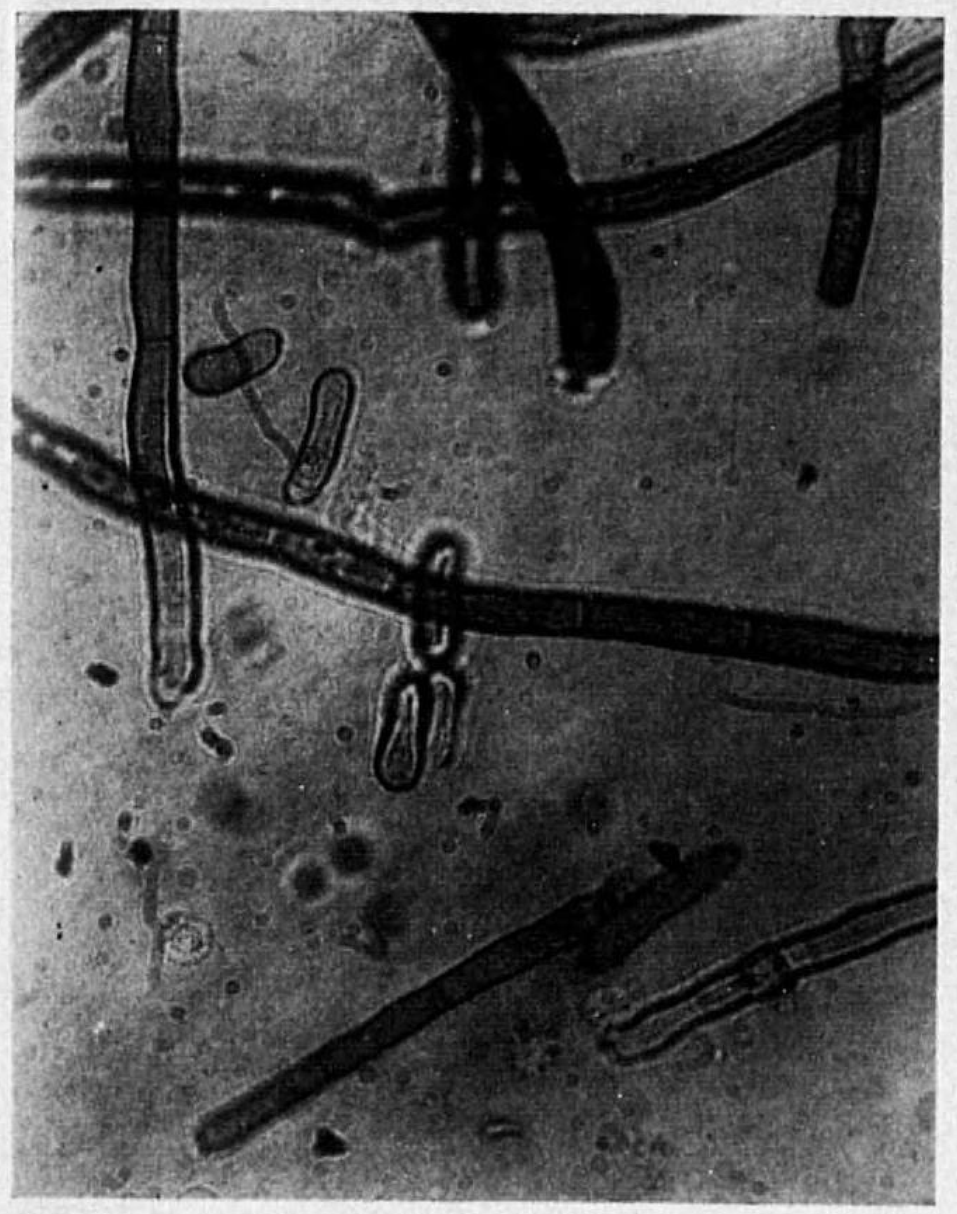


Fig. 1

Fig. 2

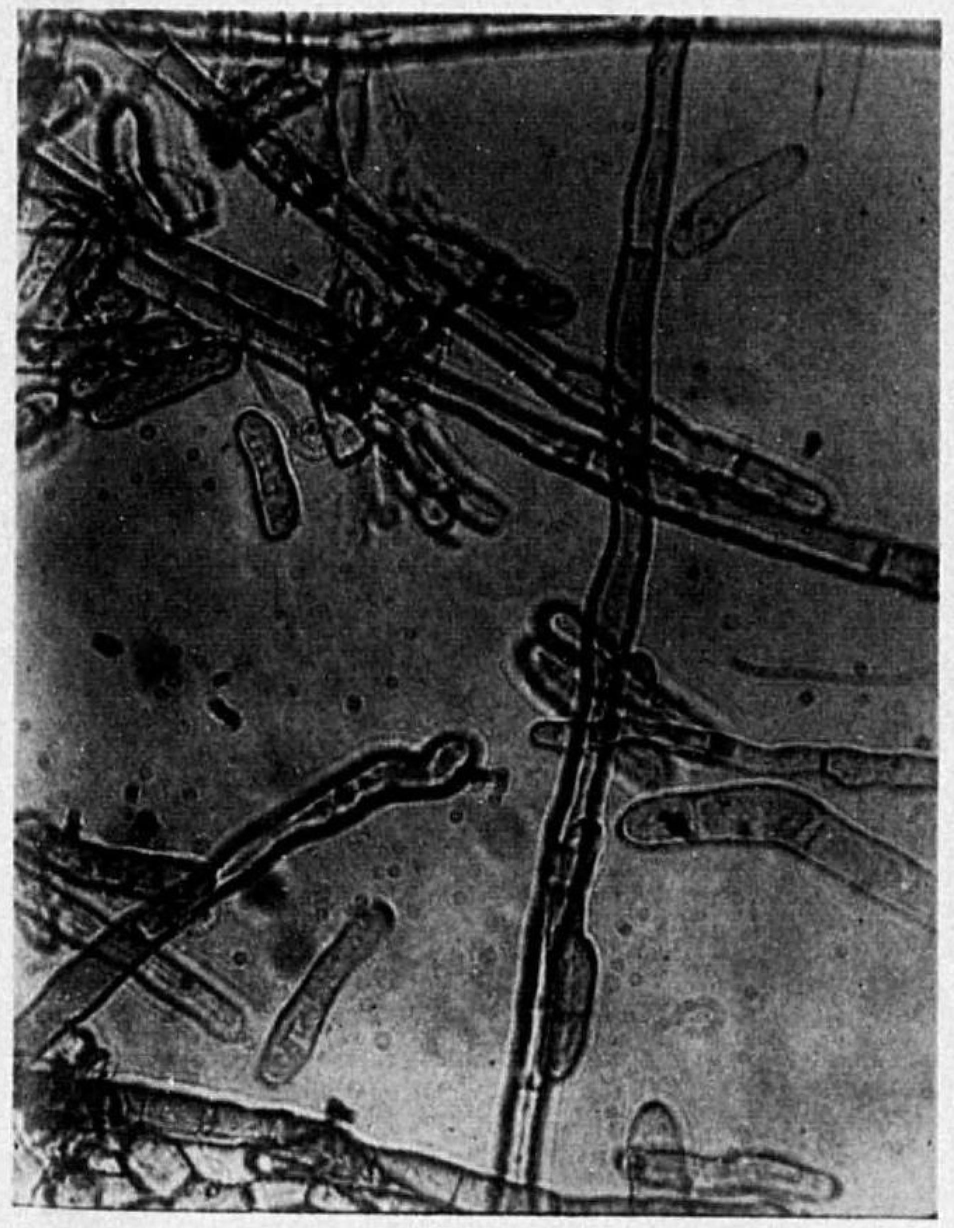


Fig. 3

Fig. 4

第　21　圖　版
(Plate XXI)