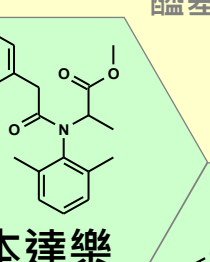
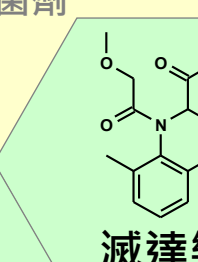


A1: RNA 聚合酶 I RNA 合成酶 I

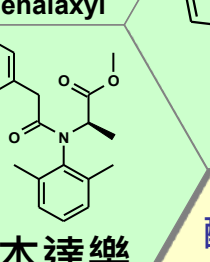
4 PA-fungicides (Phenyl(A)mides)
醌基苯胺類殺菌劑



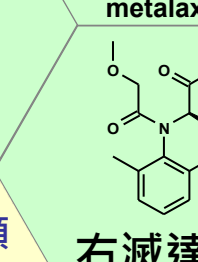
本達樂
benalaxyl



滅達樂
metalaxyl

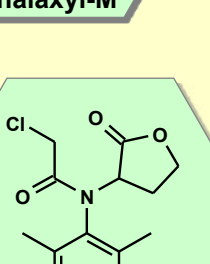


右本達樂
benalaxyl-M

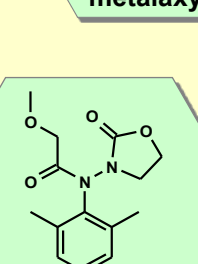


右滅達樂
metalaxyl-M

**醌基丙胺類
acylanilines**



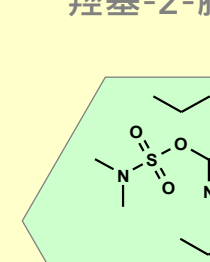
butyrolactones
丁內酯類



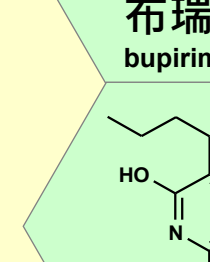
oxadiazolones
噁唑烷酮類

A2: adenosin-deaminase 腺苷脫氨酶

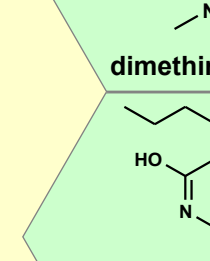
8 hydroxy(2-amino)-pyrimidines
羧基-2-胺基嘧啶類



布瑞莫
buprimide



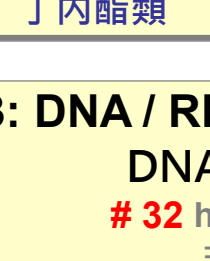
dimethirimol



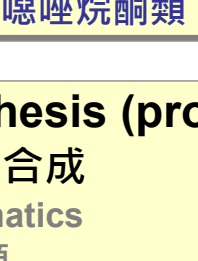
依瑞莫
ethirimol

A3: DNA / RNA 合成 (prop.) DNA/RNA 合成

32 heteroaromatics
芳香雜環類



殺紋寧
hymexazole



ocltionone

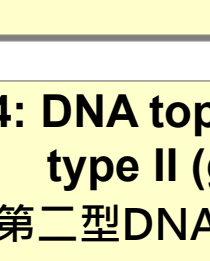
**isoxazoles
異噁唑類**

**isothiazolones
異噁唑啉酮類**

A4: RNA topoisomerase type II (gyrase)

第二型DNA拓撲異構酶

31 carboxylic acids 羧酸類



歐索林酸
oxolinic acid
(bactericide)

B1: > β-tubulin assembly in mitosis
有絲分裂過程微管蛋白組合
1 MBC fungicides
(=Methyl Benzimidazole Carbamates)

B2: β-tubulin assembly in mitosis
有絲分裂過程微管蛋白組合
10 N-phenyl carbamates
N-苯基胺基甲酸鹽類

B3: > β-tubulin assembly in mitosis
有絲分裂過程微管蛋白組合
22 benzamides and thiazole carboxamides

B4: cell division (unknown site)
細胞分裂
20 phenylureas
苯基脲類

B5: delocalisation of spectrin-like proteins
類血影蛋白之去定域化
43 benzamides 苯胺酸類

B6: actin/myosin/fimbrin function
肌動蛋白/肌球蛋白/絲束蛋白等功能
47 cyanoacrylates
50 aryl-phenyl-ketones

Chemical Structures and Drug Names:

- B1:**
 - 苯并咪唑類 benzimidazoles
 - fuuberidazole
 - 免賴得 benomyl
 - 腐絕 thiabendazole
 - 貝芬替 carbendazim
 - 多保淨 thiophanate
 - thiophanates 硫胺甲酸類
 - 甲基多保淨 thiophanate-methyl
- B2:**
 - diethofencarb
- B3:**
 - 苯胺酸類 tolumamide
 - 乙胺基噻唑羧酸類 ethylamino-thiazole carboxamide
 - 座囊胺 zoxamide
 - ethaboxam
- B4:**
 - 寬克隆 pencycuron
- B5:**
 - 吡啶甲基苯胺酸類 pyridinylmethyl-benzamide
 - 氟比來 fluopicolide
 - fluopimimide
- B6:**
 - aminocynoacrylates
 - phenamacril
 - 二苯甲酮類 benzophenone
 - 滅芬農 metfenalene
 - 甲苯酰吡啶 benzoylpyridine
 - pyriofenone

* negative cross-resistance to B1 與B1無交叉抗性

[illegible]

C1: complex I NADH Oxidoreductase

電子傳遞過程複合物I-NADH氧化還原酶
39 pyrimidinamines, pyrazole-MET1, quinazoline

pyrimidineamine 二氟林 diflufenorin	pyrazole-5-carboxamide 脫芬瑞 tolfenpyrad	quinazoline 芬殺蟻 fenazaquin
--	--	--------------------------------------

C4: complex III cytochrome bc₁(ubiquinone reductase) at Qo site
粒線體電子傳遞複合劑III 細胞色素bc₁ Q1位置
21 Qi fungicides (Qunone inside inhibitors)

ciano-imidazole 賽座滅 cyazofamid	sulfamoyl-triazole 安美速 amisultronic acid	picolinamide fenpicoxamid
--	--	----------------------------------

C6: inhibition of complex III cytochrome bc₁(ubiquinolone reductase) at Qo site stigmatellin binding sub site
粒線體電子傳遞複合劑III 細胞色素bc₁ Qo位置
45 QoSt-fungicide (stigmatellin binding) triazole-pyrimidinylamine 三唑嘧啶胺類

滅諾定
ametoctadlin

C3: complex III cytochrome bc₁ (ubiquinol oxidase) at Qo site (*cyt b gene*)
粒線體電子傳遞複合劑III 細胞色素bc₁ Qo位置
11 Qoi fungicides (Qunone outside inhibitors)

甲氧基丙烯酸酯類 methoxy-acrylates fluindapyr	oximino-acetamides oryasstrobin	噁嗪烷二酮類 oxazolinedione-diones 凡殺同 farnodanone
xane impyflusum	甲氧基乙酰胺類 methoxy-acetamides mandestrobin	胍乙酸脂類 oximino-acetates 百克敏 pyraclostrobin
ucypyrn picoxystrobin	phenyl benzimidazole flufenoxystrobin	kresoxin-methyl 克收欣 kresoxin-methyl
propoxy-N-pyrazole-amides benodanil	enoxastrobin coumoxystrobin	pyrametostrobin 三氟敏 trifloxystrobin
滅普寧 meprotin 本基苯醌胺類 pyraoxystrobin	fenaminobin benzylic carbamates 苯甲基碳酸鹽類	dihydrodioxazines fluxastrobin

C7: ATP transport (proposed) ATP運輸
38 thiophene-carboxamides 噻吩酰胺類

siltthiofam

C5: uncouplers of oxidative phosphorylation 氧化磷酸化作用解偶聯劑
29

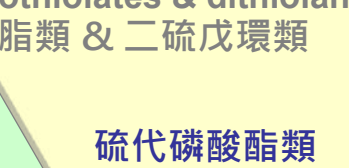
 扶吉胺 fluzianon	 白粉克 mepit dinacop
 百嬌克 binazacyl	 di-hydroxy crotonates 二氫羧丁二烯醇類

D1: methionine biosynthesis (cgs gene) (proposed) 甲硫胺酸合成 #9 Anilino-Pyrimidines (AP fungicides) 苯胺嘧啶類 賽普洛 cyprodinol	D2: protein synthesis (ribosome, termination step) 蛋白質合成(終止步驟) #23 enopyranuronic acid 吡喃糖酸類 保米黴素 blastidinone-S	D3: protein synthesis (ribosome, initiation step) 蛋白質合成(轉譯起始) #24 hexopyranosyl antibiotics 吡喃六碳糖類抗生素 嘉賜黴素 kasugamycin
D4: protein synthesis (ribosome, elongation step) 蛋白質合成(轉譯起始) #25 glycyrrhazyl antibiotics 吡喃糖甙類抗生素 滅派林 pyrimethrin	D4: protein synthesis (ribosome, elongation step) 蛋白質合成(延長步驟) #41 tetracycline antibiotics 四環素類抗生素 鏈黴素 streptomycin (bactericide)	D5: protein synthesis (ribosome, elongation step) 蛋白質合成(延長步驟) #41 tetracycline antibiotics 四環素類抗生素 土黴素 oxytetracycline (bactericide)

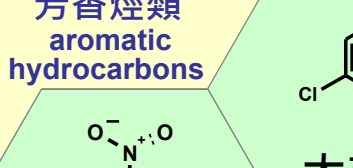
E1: signal transduction (mechanism unknown) 訊息傳遞 (機制未知) #13 azanaphthalenes 酞氧基喹啉類 aryoxyquinoline 快諾芬 quinoyfen 普快淨 quinazolid	E2: osmotic signal transduction ▷ MAP / histidine-kinase (os-1, Daf1) os-1, Daf1 滲調作用有關MAP/histidine-kinase 所啟動之訊息傳遞過程 #2 dicarboximides 二甲酯亞胺類 依普同 iprodinoo 克氣得 chlozolate 免克寧 vinclozolin 撲滅寧 procymidone dimethachlone
E2: osmotic signal transduction ▷ MAP / histidine-kinase (os-2, HOG1) os-2, HOG1 滲調作用有關MAP/histidine-kinase 所啟動之訊息傳遞過程 #12 phenylpyrroles (PP-Fungicides) 苯吡咯類 fenpiclonil 護汰寧 rudioxonil	

F2: phospholipid biosynthesis

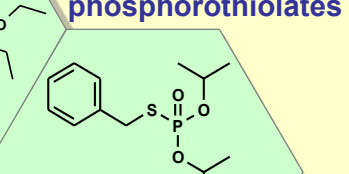
➤ **methyltransferase**
磷脂質合成作用-甲基轉移酶
6 phospholipid relatives
 硫代磷酸脂類 & 二硫代環類



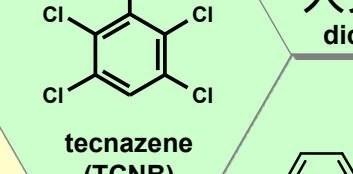
白粉松
pyrazophos



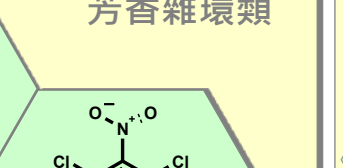
丙基喜樂松
iprobentol



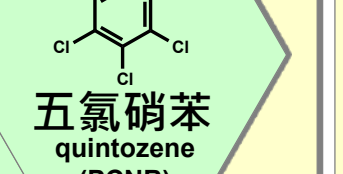
護敵松
edifenphos



二硫代環類
dithiolanes



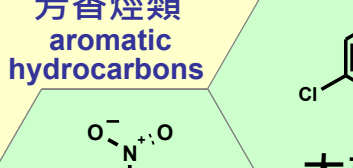
硫代磷酸脂類
phosphorothiolates



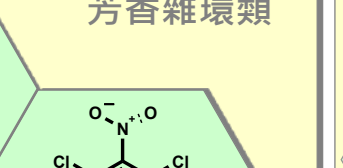
亞錫丹
isopropthiathione

F3: cell peroxidation (prop.)

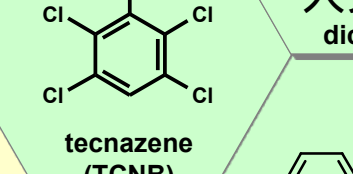
脂質過氧化作用
14 aromatic hydrocarbons & heteroaromatics
 芳香烴類 & 芳香雜環類



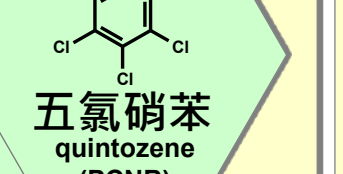
大克燭
dicloran



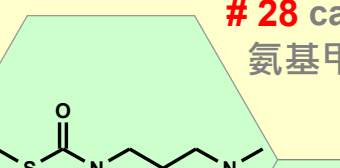
五氯硝苯
quintozene (PCNB)



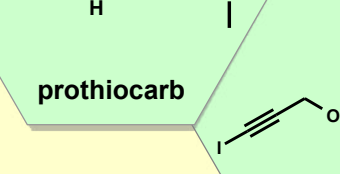
tecnazen (TCNB)



二氯甲氧苯
chloroneb



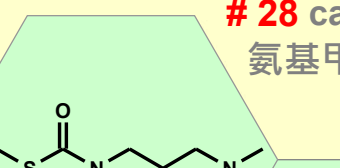
脫克松
tolixolone-methyl



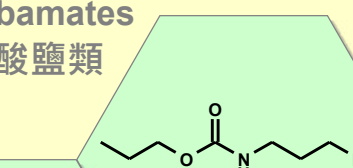
依得利
etridiazole

F4: cell membrane permeability, fatty acids (prop.)

影響細胞膜通透性、脂肪酸
28 carbamates
 氨基甲酸酯類



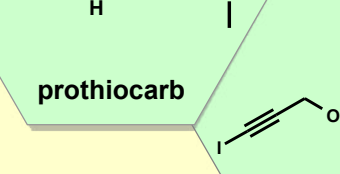
普拔克
propanomcarb



lodocarb

F7: cell membrane disruption

細胞膜破壞
46 plant extract
 植物萃取物



茶樹精油
Melaleuca alternifolia (Tea Tree Extract)



香茅油
eugenol, geraniol, thymol

F8: ergosterol binding

結合麥角固醇
48 polyene 多烯類



納他黴素
natamycin (pimaricin)

F9: cell membrane disruption

細胞膜破壞
47 plant extract
 植物萃取物



亞錫丹
pimaricin

F6: microbial disruptors of pathogen cell membranes 微生物對病原菌細胞膜的破壞 #44 Microbial (<i>Bacillus</i> sp.) 微生物 (桿菌屬) <i>Bacillus</i> sp. and the fungicidal lipopeptides produced <i>Bacillus amyloliquefaciens</i> (synonym <i>B. subtilis</i>) strain QST713 FZB24 MB600 0747 稻草桿菌 液化澱粉牙擦桿菌	I1: dehydratase in melanin biosynthesis 黑色素合成過程脫水酶 #16.1 Dihydroxybenzoylserine synthetase Inhibitors: Reductase (MBI-R) 黑色素合成過程還原酶抑制劑 isobenzofuranone 熱必斯 thidide	I2: dehydratase in melanin biosynthesis 黑色素合成過程脫水酶 #16.2 Dihydroxybenzoylserine synthetase Inhibitors: Dehydratase (MBI-D) 黑色素合成過程脫水酶抑制劑 cyclopropane carboxamide dicyclopent	I3: polyketide synthase in melanin biosynthesis 黑色素合成過程聚酮合成酶抑制劑 #16.3 Polyketide synthase (MBI-P) Inhibitors: Polyketide synthase (MBI-P) 黑色素合成過程聚酮合成酶抑制劑 tolprocarb trifluoroethyl-carbamate 三氣乙基胺基甲酯鹽類
F9: lipid homeostasis and transfer/storage #49 OSBP1 Oxysterol binding protein homologe inhibition oxathiapropin piperidinyl- isoxazolin	百快隆 pyroquilon triazolobenzothiazole 三嗪唑 tricyclazole	加普酸 carpropamide propionamide 芬諾尼 fenoxenil	

G1: C14-demethulase in sterol biosynthesis (*erg11/cyp51*)

固醇類合成作用過程C14-去甲基化作用

3 DMI-fungicides (DMI-methylase inhibitors)
(SBI : Class I)

三唑類
triazoles

吡啶類
pyridines

嘧啶類
pyrimidines

咪唑類
imidazoles

三唑啉酮
triazolinone

etaconazole

吡咯嗪
piperazines

賽福寧
triforin

azaconazole

吡咯嗪
pyridines

賽福寧
triforin

芬克座
fenbuconazole

得克利
tebuconazole

比多農
bifentanol

滅特座
metconazole

四克利
tetraconazole

fluquinconazole

溴甲克座
bromuconazole

澳克座
oxiconazole

諾砂得
flusilazole

通克尼
myclobutanil

三奈芬
triadimenol

尼瑞莫
nuarimol

環克座
cyproconazole

諾汰芬
flutriafol

三奈隆
triadimenol

芬瑞莫
fenarimol

待克利
difenoconazole

普克利
propiconazole

依滅列
imazali

賽福座
triflumazole

達扶克
diniconazole

菲克利
hexaconazole

披扶座
pefurazoate

依普座
epoxiconazole

易胺座
imibenconazole

oxpoconazole

撲克拉
prochloraz

prothioconazole

G2: Δ¹⁴-reductase and Δ⁸→Δ⁷-isomerase in sterol biosynthesis (*erg2*, *erg24*)

固醇類合成作用過程Δ¹⁴-還原酶與Δ⁸→Δ⁷異構酶
5 Amines ("Morpholines") (SBI : Class II)

- aldiformorph
- fenpropimorph
- fenprolalin
- trifdemorph
- dodemorph
- pipridine
- spiroketal-amines
- spirosamine

G3: C-3-keto reductase in C₄-demethylation (*erg27*)

固醇類合成C₄-去甲基化作用之3-酮還原酶
KetoReductase Inhibitors (SBI : Class III)
C₄-去甲基化作用之3-酮還原酶抑制劑

- fenthaxamid
- aminopyrazolinones
- fenpyrazamine

G4: squalene epoxidase in sterol biosynthesis (*erg7*)

固醇類合成角鯊烯環氧化酶
18 (SBI : Class IV)

- allylamines
- terbinafin
- naphitfine
- thiocarbamates
- pyributazole

H4: chitin synthase

幾丁質合成酶

19 Polyoxins

保拉霉素甲
Polyoxin B

pepyridyl pyrimidine nucleoside
肽嘧啶嘧核苷

H5: cellulose synthase

纖維素合成酶

40 Carboxylic Acid Amides
(CAA fungicides)

dimethomorph
達滅芬

flumorph
cinnamic acid amides
丙性膦胺類

mandipropamid
mandelic acid amides
苦杏膦胺類

iprovalicarb

vainfenalate
vinamidic carbamates
錫胺酸胺基甲酯類

benthiavalicarb

* Temporary status; information no mode of action and/or resistance risk is still uncertain 暫時之作用機制或抗性風險與尚未確認

#27 克絕 cymoxanil 氰酐乙醯胺類	#34 克枯爛 teciothalham 鄰苯甲醯苯甲酸類	#35 bentazotriazines 苯併三嗪類	#36 flusulfamide 苯磺醯胺類	#37 pyridazinones 嘧啶酮類	#U06 phenyl acetamides 苯乙醯胺類
#U13 cyano methylene thiazolidine 氰基亞甲基噻嗪類	#U14 嘧啶酮類 ferimzone 噁基噻基嘧啶類	#U16 4-quinoly acylate 喹啉基羧酸鹽類	#U17 tetrazoloxime 四氮唑類	#U18 glucosyrinyl antibiotic 吡喃糖胺類	#U12 guanidines 多寧

P1: salicylate related 水楊酸途徑 #P01 benzothiadiazole BTH 苯并噻二唑類 acibenzothiazol-S-methyl	P3: salicylate related 水楊酸途徑 #P03 thiadiazole carboxamide 噻唑羧酸類 亞汰尼 isotianil	P4: polysaccharide elicitors 多糖 #P04 polysaccharide 多種 海帶多糖 laminarin	P5: anthraquinone elicitors 蒽醌 #P05 plant extract 多種 萃取 Reynoutria sachalinensis (Giant Knotweed Extract) 虎杖萃取
P2: salicylate related 水楊酸途徑 #P02 benzothiazole 苯并噻二唑類 撲殺酚 probenazole	P3: salicylate related 水楊酸途徑 #P03 thiazole 噻唑類 tiadinil	P6: microbial elicitors #P06 Bacillus mycoides 蕈狀芽孢桿菌 (Isolate J) Bacterial Bacillus spp.	P7: phosphonates #P07 phosphonates 磷鎧脂 福賽得 fosetyl-al ethyl-phosphonates
NC : Not Classified 未分類			
 礦油、有機油 生物性來源 無機鹽類	 Cell walls of <i>Saccharomyces cerevisiae</i> Strain LAS117 Fungal <i>Saccharomyces</i> spp.	 H_3PO_3 亞磷酸 phosphorous acid Phosphorous acid	

[illegible]

C2: inhibition of complex II: ← 次分群
 ➢ **succinate dehydrogenase** ← 作用標靶(已知
 或可能作用標
 SDHI (Succinate dehydrogenase
 inhibitors) ← FRAC 編碼 (非
 作用機制
 次分群名稱)
 ➢ **thiazole carboxamides** ← 化學結構分類
