

# 水稻稻曲病菌药剂室内生物测定和筛选

林琳, 叶正和, 高同春 (1. 安徽省农业科学院植保所, 安徽合肥230031; 2. 安徽省农业科学院植保所科苑公司, 安徽合肥230031)

**摘要** [目的] 筛选出有效控制水稻稻曲病菌(*Ustilaginoidea virens*)的杀菌剂。[方法] 采用菌丝生长速率测定法, 分别测定烯唑醇、丙环唑、咪鲜胺杀菌剂对稻曲病菌的毒力, 并采用最小二乘法求得其毒力回归方程。[结果] 烯唑醇对稻曲病菌的毒力方程为:  $Y = 0.3314X + 5.9465$  ( $R^2 = 0.9418$ ), 计算得烯唑醇对稻曲病菌的  $EC_{50} = 0.06 \mu\text{g/ml}$ ; 丙环唑对稻曲病菌的毒力方程为:  $Y = 0.489X + 6.1751$  ( $R^2 = 0.9824$ ), 计算的得丙环唑对稻曲病菌  $EC_{50} = 0.09 \mu\text{g/ml}$ 。咪鲜胺对稻曲病菌的毒力方程为:  $Y = 0.1163X + 5.0321$  ( $R^2 = 0.99$ ), 计算得咪鲜胺对稻曲病菌的  $EC_{50} = 0.76 \mu\text{g/ml}$ 。[结论] 烯唑醇对稻曲病菌毒力最高, 丙环唑次之, 咪鲜胺最小。

**关键词** 稻曲病菌; 杀菌剂; 毒力测定

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## Indoor Bioassay and Screening of Medicaments against *Ustilaginoidea virens* in Rice

LIN Lin et al (Institute of Plant Protection, Anhui Academy of Agricultural Sciences, Hefei, Anhui 230031)

**Abstract** [Objective] The research aimed to screen out the bactericides that could control *Ustilaginoidea virens* in rice effectively. [Method] The toxicities of bactericides including diniconazole, propiconazole and prochloraz to *U. virens* were determined respectively by the determination method of mycelium growth rate. And the regression equations of their toxicities were calculated by using least square method. [Result] The toxicity equation of diniconazole to *U. virens* was  $Y = 0.3314X + 5.9465$  ( $R^2 = 0.9418$ ) and the  $EC_{50}$  value of diniconazole to *U. virens* was calculated as  $0.06 \mu\text{g/ml}$ . The toxicity equation of propiconazole to *U. virens* was  $Y = 0.489X + 6.1751$  ( $R^2 = 0.9824$ ) and the  $EC_{50}$  value of propiconazole to *U. virens* was calculated as  $0.09 \mu\text{g/ml}$ . The toxicity equation of prochloraz to *U. virens* was  $Y = 0.1163X + 5.0321$  ( $R^2 = 0.99$ ) and the  $EC_{50}$  value of prochloraz to *U. virens* was calculated as  $0.76 \mu\text{g/ml}$ . [Conclusion] The toxicity of diniconazole to *U. virens* was highest, followed by propiconazole and that of prochloraz was lowest.

**Key words** *Ustilaginoidea virens*; Bactericide; Toxicity determination

水稻稻曲病(*Ustilaginoidea virens*)是危害水稻穗粒的病害之一<sup>[1-2]</sup>。近年来,随着耕作制度变化、杂交稻推广、生产条件改善和生产水平提高,稻曲病的发生越来越严重,在一些地区已经跃升为主要病害<sup>[3]</sup>。笔者采用菌丝生长速率法,对水稻稻曲病进行药剂生物测定和筛选,以期选出防效较高的杀菌剂。

### 1 材料与方

**1.1 试验材料** 供试药剂:12.5%烯唑醇药剂、25%丙环唑乳油、50%咪鲜胺药剂。供试菌株:水稻稻曲病菌 *Ustilago virens* (Cooke)。培养基:肋本哲氏培养基(马铃薯200g,硝酸钙0.5g,磷酸二氢钠1.0g,蔗糖20g,蛋白胨0.5g,琼脂20g)<sup>[4]</sup>。

### 1.2 试验方法

**1.2.1 试验设计。**采用菌丝生长速率法<sup>[5]</sup>,为摸索各药剂对供试菌株的作用浓度,先进行预备试验,测定药剂的完全抑制浓度(MC),并设置空白对照,各浓度设置3次重复。再根据各药剂的MC分别设置5个处理浓度,每个处理3次重复,设空白对照。

**1.2.2 接种方法。**将病菌在肋本哲氏培养基上活化后,从菌落边缘用打孔器(直径5mm)打菌碟,并将菌碟接入预先设置好的含药培养基上,28℃黑暗培养。于接种后的7、14、21、28、35d分别检查菌丝生长情况并用十字交叉法测量菌落直径,根据每个处理14d平均菌落净增长值分别计算出其抑制率,查表获得机率值。建立机率值和浓度自然对数回归方程(即毒力回归方程),分别计算各药剂对病菌的  $EC_{50}$  值。

**1.2.3 含药培养基的制备。**将药剂配制成一定的浓度备用。把制好的培养基分别量取25ml装入大试管中,封口,高压湿热灭菌40min。在无菌接种室内用一定量的枪吸取稀释后的药液加入灭过菌的定量培养基中配成所需浓度的含

药培养基<sup>[6]</sup>,该过程严格按照无菌操作。

**1.2.4 数据处理与统计方法<sup>[7]</sup>。**根据处理14d的平均菌落直径,分别建立以浓度的自然对数值为自变量X,抑菌率的机率值为变量Y的回归方程(毒力回归方程),计算各配比对稻曲病菌的  $EC_{50}$ 。实际抑制率(%) = (对照菌落直径 - 处理菌落直径) / (对照菌落直径 - 菌碟直径) × 100%;将抑制率换算成机率值(纵坐标)将浓度换成自然对数(横坐标),根据最小二乘法求取  $EC_{50}$ 。

### 2 结果与分析

**2.1 烯唑醇对稻曲病的毒力测定** 根据预备试验的结果,将烯唑醇原药浓度分别设为5.00000、1.25000、0.31250、0.07812、0.01953  $\mu\text{g/ml}$  5个处理,加上空白对照,共6个处理,在接种后14d的平均抑菌率分别94.4%、82.2%、73.3%、57.8%、28.4%,结果如表1。根据表1的结果,按最小二乘法计算烯唑醇对稻曲病菌的毒力方程,得其毒力方程为:  $Y = 0.3314X + 5.9465$ , ( $R^2 = 0.9418$ ),  $EC_{50} = 0.06 \mu\text{g/ml}$ 。

表1 烯唑醇对稻曲病菌的毒力测定结果

Table 1 Toxicity determination results of diniconazole to *Ustilaginoidea virens*

处理浓度	平均值	抑菌率
Treatment concentration $\mu\text{g/ml}$	Mean cm	Inhibition rate %
CK	3.60	
5.00000	0.77	94.4
1.25000	1.13	82.2
0.31250	1.40	73.3
0.07812	1.61	57.8
0.01953	2.72	28.4

**2.2 丙环唑对稻曲病的毒力测定** 将丙环唑原药的浓度分别设为1.00000、0.25000、0.12500、0.06250、0.01562  $\mu\text{g/ml}$  5个处理,并设置1个空白对照,在接种后14d的平均抑菌率分别为88.8%、72.5%、54.5%、45.5%、19.7%结果见表2。根据表2的结果,得到毒力回归方程  $Y = 0.489X + 6.1751$ ,

( $R^2 = 0.9824$ ),  $EC_{50} = 0.09 \mu\text{g/ml}$ 。

表2 丙环唑对稻曲病的毒力测定结果

Table 2 Toxicity determination results of propiconazole to *Ustilaginoida virens*

处理浓度 Treatment concentration $\mu\text{g/ml}$	平均值 Mean cm	抑菌率 Inhibition rate %
CK	2.28	
1.000 00	0.70	88.8
0.250 00	0.99	72.5
0.125 00	1.31	54.5
0.062 50	1.47	45.5
0.015 62	1.93	19.7

2.3 咪鲜胺对稻曲病菌毒力测定 将咪鲜胺药液浓度分别为45.000 00、20.000 00、2.500 00、0.312 50、0.078 11  $\mu\text{g/ml}$  5 个处理,加上1 个空白对照,共6 个处理,在接种后14 d 的平均抑菌率分别为79.8%、63.5%、52.7%、44.2%、26.6%(表3)。根据表3 的结果,按最小二乘法计算咪鲜胺对稻曲病菌的毒力方程,得其毒力方程为  $Y = 0.1163X + 5.0321$ , ( $R^2 = 0.9900$ ),  $EC_{50} = 0.76 \mu\text{g/ml}$ 。

### 3 讨论

在实验室条件下,烯唑醇等几种杀菌剂对稻曲病菌都有较好的抑菌效果,其中以烯唑醇的抑菌效果最好。实验室测试几种常用杀菌剂对稻曲病菌毒力的结果很理想,但田间效

果还需要进一步验证<sup>[8]</sup>。

表3 咪鲜胺对稻曲病菌毒力测定结果

Table 3 Toxicity determination results of prochloraz to *Ustilaginoida virens*

处理浓度 Treatment concentration $\mu\text{g/ml}$	平均值 Mean cm	抑菌率 Inhibition rate %
CK	2.83	
45.000 00	0.97	79.8
20.000 00	1.35	63.5
2.500 00	1.60	52.7
0.312 50	1.80	44.2
0.078 11	2.21	26.6

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