

## 论文

### 禾谷镰刀菌产毒影响因子预测微生物学筛选

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#### 摘要:

目的 对可能影响禾谷镰刀菌产毒的关键因子进行筛选,为不同自然条件下预测禾谷镰刀菌的产毒情况和粮食防霉提供实验手段。方法 以禾谷镰刀菌为材料,以玉米、小麦和大米为基质,对影响禾谷镰刀菌产毒的重要因素变量(温度、通气量、水分含量、pH值、光照、培养基量、基质成分、培养时间等)进行筛选,构建L18-Hunter和Plackett-Burman模型(PB模型)。结果 L18-Hunter模型的实验结果表明,3株禾谷镰刀菌受试菌株中仅菌株3.4522产3-A-DON、15-A-DON以及毒素总量的模型拟合结果有统计学意义,回归方程系数效应检验结果显示,水分含量和培养时间是影响禾谷镰刀菌3.4522产3-A-DON、15-A-DON及毒素总量的关键因子;PB模型实验结果表明,就脱氧雪腐镰刀菌烯醇(DON)及毒素总量的绝对值以及DON、玉米赤霉烯酮(ZEN)、DON及其衍生物、B类单端孢霉烯族化合物及毒素总量浓度的对数值而言,该模型显著( $P$ 值分别为0.034 5、0.014 8、0.002 2、0.002 9、0.006 8、0.006 7和0.000 6),模型 $R^2$ 分别为0.812 4、0.861 6、0.928 7、0.921 6、0.894 5、0.895 1和0.954 3,回归方程系数显著性检验结果显示,培养时间、温度和培养基初始pH值是影响禾谷镰刀菌3.452 2产毒的关键因子。结论 培养时间、一定范围内(20%~50%)的水分含量、温度和培养基初始pH值是影响禾谷镰刀菌产毒的关键因子。

关键词: 预测微生物学 禾谷镰刀菌 产毒

### Screening of toxin production influence factors of *Fusarium graminearum* with predictive microbiology method

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#### Abstract:

Objective To screen key factors affecting toxin production of *Fusarium graminearum*(*F. graminearum*) with predictive microbiology for prediction of toxin production under different natural conditions.Methods The L18-Hunter and Plackett-Burman(PB) models were developed based on wheat kernels,corn flakes,and rice inoculated with *F.graminearum* to screen the important factors (temperature,ventilatory capacity,water content,pH value,illumination,the amount and ingredients of the medium,and incubation time) which may affect the toxin production of *F.graminearum*.Results The results of L18-Hunter model showed that only 3-acetyl-deoxynivalenol(3-A-DON),15-aetyl-deoxynivalenol(15-A-DON) and total toxins produced by strain 3.4522 were statistically significant.The coefficients of the regression equations indicated that water content and incubation time were the key factors affecting the production of 3-A-DON,15-A-DON and total toxins by *F.graminearum* strain 3.4522.While the results of Plackett-Burman model designed on the basis of L18-Hunter results showed that the absolute concentration of doxynivalenol(DON) and the total toxins,logarithm concentration of DON,zearalenone(ZEN),DON and its derivatives,type B trichothecenes,and the total toxins were statistically significant( $P=0.0345,0.0148,0.0022,0.0029,0.0068,0.0067,$ and  $0.0006$ ),respectively.The  $R^2$  of the models were 0.8124,0.8616,0.9287,0.9216,0.8945,0.8951,and 0.9543,respectively.The coefficients of the regression equations showed that incubation time,temperature,and initial pH value of the matrix were the key factors for toxin production of *F.graminearum* strain 3.4522.Conclusion Incubation time,water content within a certain range(20-50%),temperature,and initial pH value of culture base are the key factors affecting toxins production of *F.graminearum*.

Keywords: predictive microbiology *Fusarium graminearum* toxin production

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