



# TOBACCO TECH

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## Blue Mold Research Shows Promise

In the past five years alone, yield reductions due to blue mold have cost Kentucky tobacco farmers an estimated \$300,000,000. Given the variable weather in Kentucky and the ability of blue mold to spread quickly, tobacco producers must always be prepared for the next blue mold outbreak. Many infections are the result of setting infected plants from the greenhouse. The greenhouse environment is ideal for blue mold development, creating the opportunity for infection very early in the production season. Even with the limited rainfall during the early part of the current burley tobacco growing season, several blue mold outbreaks have occurred around the state. Given the change to wetter, over-cast weather, the stage could be set for a serious epidemic.

To combat the persistent blue mold problem, the Tobacco and Health Research Institute (THRI) and the Plant Pathology Department at the University of Kentucky have teamed up in an aggressive new research endeavour. This research includes a grants program designed to learn more about the tobacco/blue mold interaction at the genetic level, and an applied effort to develop and implement genetic engineering strategies for blue mold resistance in tobacco. Despite this being a new initiative, several of the projects are already producing encouraging results.

One of the projects involves examining the various blue mold isolates (possibly hundreds) to determine how much

diversity actually exists. We have all heard about metalaxyl-sensitive blue mold isolates compared to metalaxyl-resistant isolates, but little is known about their difference on a genetic level. A strategy that is effective at limiting one blue mold isolate may not be as effective against another. Learning about the disease and determining how quickly it can adapt to farmers' efforts to fight it yields information that will be useful for finding new methods to engineer resistance.

A more applied, nearer-term project involves obtaining and testing tobacco plants from academic and industrial sources that have already been engineered for disease resistance. Over 50 different types of genetically engineered tobacco have been obtained and are in the process of being tested for

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## New Technology Patented at THRI

THRI stresses interaction with industry as part of the program to create new agricultural crops based on genetic engineering of tobacco. In the expanding world of plant biotechnology, intellectual property development is a key to attracting commercial collaborations. One such effort is already paying dividends. A large company has obtained a commercial license for the use of a recently patented

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## Blue Mold



*By injecting blue mold spores into tobacco leaves (top) and measuring the resulting lesions (bottom), it is possible to determine how resistant a tobacco variety is to blue mold. Along with measuring the size of the lesion, the number of spores produced by each infected area can be determined. Several THRI projects that involve engineering tobacco to express compounds which may be deadly to blue mold are already showing encouraging results.*

resistance to blue mold. Even though these tobacco plants may have been used to develop engineering strategies for resistance to other tobacco diseases, it is very possible that they may also show increased resistance to blue mold.

To help in the testing of these genetically engineered tobacco plants, a large environmentally controlled room designed for the inoculation of a large number of plants was added to the THRI facilities. Because the organism that causes blue mold is difficult to work with (it spreads easily

through the air and can only grow on living tissue), it is necessary to evaluate infected tobacco plants in strict quarantine conditions. The addition of this new equipment will greatly enhance the effort to test for blue mold resistance.

Numerous other strategies are being explored as part of this comprehensive program to defeat blue mold. Some tobacco varieties are already resistant to blue mold but have low yields or poor agronomic characteristics. Using the tools of biotechnology, it should be possible to find the genes that control blue mold resistance in tobacco and to engineer those genes to be more effective in a commercial variety. Other projects involve putting totally new types of genes into tobacco to convey blue mold resistance. Several of these projects are already showing promise in the effort to develop a burley tobacco variety that is resistant to blue mold. Blue mold is a continuing serious problem to

both existing and totally new uses for tobacco. Through the efforts of THRI and the Plant Pathology Department, there is new hope for more effective control of the disease in the future.

Additional blue mold information can be found on the Kentucky Blue Mold Warning System Web site at [www.uky.edu/Agriculture/kpn/kyblue.htm](http://www.uky.edu/Agriculture/kpn/kyblue.htm) or by contacting Dr. William Nesmith in the Plant Pathology Department at the University of Kentucky.

## New Technology

technology which was developed at THRI. This genetic 'promoter' technology is used to express new genes in genetically engineered plants. As a basic engineering tool, this technology is valuable to THRI in its efforts to establish the production of valuable materials such as pharmaceuticals and industrial chemicals in genetically engineered tobacco and in its efforts to develop new tobacco varieties with altered characteristics such as blue mold resistance.



**Control**

**Transgenic**

*The blue stain in the transgenic tobacco seedling on the right shows the action of a genetic 'promoter' which enables the tobacco plant to express new genes. In a practical application of this THRI technology, new products such as pharmaceuticals, enzymes or anti-blue mold agents would be made wherever the blue color is apparent.*

**TOBACCO TECH** is an occasional series published by THRI to inform growers and others about the exciting new possibilities for genetic engineering in tobacco. Topics will provide information on our cutting-edge biotechnology research program and our efforts to create a new crop opportunity for Kentucky tobacco farmers.