

REACTION OF DIVERSE NICOTIANA TABACUM GERMPLASM TO BLUE MOLD

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The 1018 Tobacco Introductions were screened for resistance to blue mold caused by *Peronospora tabacina* Adam. The disease affected the plants with varying severity. The TI's were grouped in ten classes according to severity of infection based on ratings from 0-100. Only 12 TI's or 1.18% of the total number were in the 0-10 class. They are of potential value as new sources of resistant germ plasm.

INTRODUCTION

Blue mold caused by (*Peronospora tabacina* Adam) is a destructive and costly disease that affects the leaves of tobacco (*Nicotiana tabacum* L.) In the United States it primarily affects tobacco in plant beds, however, it can seriously affect field-grown plants in Florida and to some extent in Connecticut in areas where cigar wrapper tobacco is shade-grown.

Nicotiana debneyi Domin. has served as the source of resistance in breeding lines developed to date. High resistance has been associated with certain growth and quality defects. Clayton (2) reported evidence that the resistance transferred to tobacco from *N. debneyi* was controlled by three gene pairs. Since the resistance is interspecific, it is possible that the undesirable defects were caused by alien genetic material linked to the genes for resistance. The polygenic nature of inheritance complicated separation of desirable and undesirable factors and retention of disease resistance.

Despite Clayton's (3) findings that resistance transferred to the tobacco genome from the *Nicotiana* species could be used faster and with fewer complications involving type, yield, and quality, than resistance found in the genome from the cultivated species, it was decided to screen the Tobacco Introductions (TI's) again because many had been added to the collection since Clayton tested them (3). Also, the appearance of another race of blue mold in Europe and 2 races in Australia (4), made it possible that a TI could be found that would be resistant to these additional races.

MATERIALS AND METHODS

Over a 3 year period all accessions in the TI collection (1018) were screened in the greenhouse for resistance to blue mold, including those tested for reaction to tobacco mosaic virus (TMV) by Chaplin and Gooding (1) and those tested for resistance to *Cercospora nicotianae* Ell. and Ev. by Stavely (6).

Each TI was seeded in a 7.6 cm clay pot and when the seedlings were the proper size, they were individually

transplanted to 5 cm pots. Seedlings at the four-to-five leaf stage were indexed for blue mold resistance during the fall and winter months. Environmental conditions during the tests included reduced light intensity, high humidity, and temperature ranges of 19°-22° C during the day and 14°-16° C at night. Ten plants of each TI were screened for resistance. The seedlings were artificially inoculated using an atomizer containing a water suspension of conidia of the blue mold fungus, and were maintained under conditions favorable for the development of the pathogen.

When all the plants of the susceptible check (cv. 402) were dead, approximately 3 weeks after inoculation, the seedlings were classified by the percentage of diseased leaf area on each plant. Ten classes encompassed the scale from 0 to 100, and a disease index (DI) was computed which utilized the number of plants in each class as well as the percentage of diseased leaf area.

RESULTS AND DISCUSSION

Blue mold varied in severity on the infected TI's. The plants were grouped in 10 classes with DI ratings which ranged from 0-100. The number of spores which contacted a given plant in the seedling test was greater than would be encountered under field conditions in all but extreme instances (5). Thus, the extent of blue mold infection was greater than normal on all TI's.

Therefore any of the TI's with moderate resistance in this test actually could have sufficient resistance to adequately protect them from average blue mold epidemics in the field and Table 1 lists only those TI's with moderate resistance (DI ratings of 0-30), since all others are assumed to lack adequate resistance.

Florida 513 (7) was used as the resistant check and (cv.)402 as the susceptible check in all the tests. The average disease index was 0.58 for Florida 513 and 99.60 for (cv.)402. Of the 1018 accessions screened for resistance, only 12 or 1.18% were in the 0-10 class. In fact, only a total of 42 or 4% of the TI's screened for blue mold resistance scored from 0-30. The number of TI's and percentage of the total number for the other classes are as follows: Class 31-40, 21 or 2.06%; Class 41-50, 14 or 1.38%; Class 51-60, 29 or 2.85%; Class 61-70, 39 or 3.84%; Class 71-80, 67 or 6.58%; Class 81-90, 104 or 10.21%; and Class 91-100, 702 or 68.86%.

Two of the TI's were immune to blue mold, TI 657 and 1506. There were approximately 1,000 TI's in the collection when Clayton (3) tested them and found none with a high enough level of resistance to be useful in a breeding program. Since the earlier testing, several of the TI's have been lost and there was much duplication in the collection. According to the original information we have on TI 657, it was collected as a mixture of varieties. Over the last 30 years seed increase for TI

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Table 1. Tobacco Introductions with Disease Indices of 0-30

Class 0-10		Class 11-20		Class 21-30	
TI No.	D.I.*	TI No.	D.I.	TI No.	D.I.
575	4.80	545	14.80	349	27.20
657	0.00	581	20.00	350	26.80
722W	8.80	583	17.20	365	23.60
748	4.80	605	14.80	405	23.20
808	10.00	698	15.20	454	28.50
845	6.40	731	16.00	578	26.00
1461	9.60	745	16.40	589	30.00
1462	8.00	746	19.60	645	23.60
1463	8.00	745	12.40	722R	21.60
1464	2.40	1237	20.40	747	25.20
1506	0.00	1274	14.00	786	28.00
1550	9.60	1460	11.20	806	22.40
		1501	14.40	1326	30.00
		1561	12.40	1475	29.60
		1562	13.60	1528	28.40

* Each disease index figure is the total injury for 10 plants 0 = immune; 100 = all plants dead.

657 has been done in the absence of blue mold testing. Seed has apparently been harvested from the more resistant plants in a heterogenous population. TI 1506 has been added to the collection in the last 5 years. It was received from Dr. R. Corbaz, State Experiment Station, Switzerland, and according to him is a chemical mutant with good field resistance to blue mold.

SUMMARY

The TI collection maintained by the Tobacco Laboratory, Beltsville Agricultural Research Center, U. S. Department of Agriculture, is a collection of diverse *Nicotiana tabacum* germplasm. The plants from the collection were tested for their reaction to blue mold in the greenhouse during the fall and winter months over a 3 year period. The TI's were grouped in 10 classes, ac-

ording to their resistance, and given scores that ranged from 0 to 100. Twelve TI's were in the 0-10 class and a total of 42 in the range of 0-30.

Since the *N. debneyi* type of resistance has not resulted in a commercial blue mold resistant cultivar with desirable quality characteristics, the TI's with the highest resistance should be studied to determine their effectiveness as sources of improved blue mold resistance. According to Chaplin and Gooding (1), TI's 1461 and 1462 carry the local lesion reaction to TMV. Therefore, it might be possible to incorporate blue mold and mosaic resistance, at the same time, in a breeding program utilizing these two TI's. It is also possible that the TI's with a DI of 0 to 30 could prove to be a source of resistance to the races of blue mold in Europe and Australia.

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