**NICOTIANA TABACUM BREEDING LINES RESISTANT TO VARIOUS ROOT-KNOT NEMATODES (MELOIDOGYNE SPP)**

*BY*

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The smallest differences in susceptibility to *Meloidogyne javanica* of the *Nicotiana tabacum* breeding stock R83 and N.C.95 resistant to *Meloidogyne incognita* races 1 and 3 were used to establish a family of breeding lines with resistance to *M. incognita* races 2 and 4 and moderate resistance to *M. javanica*. By single plant selection in every stock through seven generations and finally combining morphologically similar responding plasms, two lines resistant to either race 2 or race 4 and 14 lines resistant to races 2 and 4 were produced. To improve the quality of these breeding lines, crosses were made with accepted cultivars, Delcrest 202, Hicks, Hicks 76 and TL 33. The root-knot resistance was selected in the glasshouse and tested under field conditions by planting at four locations with naturally occurring nematode populations. The quality of these breeding lines approximates that of Hicks and they can be further utilized in breeding programs as sources of resistance.

*Keywords:* tobacco, resistance, *Meloidogyne incognita*, double-row spacing.

Tobacco (*Nicotiana tabacum*) losses due to root-knot nematode (RKN) infestation caused by *Meloidogyne* spp. is a world-wide problem. Milne (1961) reported that *M. javanica* was the major RKN species attacking cultivated tobacco in South Africa, so Calitz & Milne (1962) sought resistance to this species. When the resistant variety NC95 was released it was tested by Nuss (1966) but found not to be of great use in combating this problem. The possibility of allelic expression was envisaged. Nuss & Honey (1968) completed a diallel study utilizing Hicks, R83 and NC95 in all possible combinations and reciprocals. Hicks is a good quality tobacco, susceptible to all root-knot nematode species. R83, a Zimbabwean breeding-line, is slightly resistant to *M. javanica* (Schweppenhauser, 1968) and NC95, an American variety, was released with resistance to *M. incognita* (Moore, 1960), subsequently shown to be resistant only to Races 1 and 3 of *M. incognita* (Eisenback, 1981). However, Van Wyk (1985) found that *M. incognita* in South Africa firstly comprised of races 2 and 4 and secondly was as prevalent as *M. javanica* in the tobacco-growing areas.

The preliminary results of Nuss (1966) led to the objective of the senior author to utilize the small differences in reaction to *Meloidogyne* and pursuing the search for better recombinations. The available "resistance" was thus to be recombined with good quality.
MATERIALS AND METHODS

The hybrid, R83 x NC95, and its reciprocal from the diallel by Nuss (1966) was used in the 1970’s as a starting point to combine the available resistance to *M. javanica* and *M. incognita* in a good quality tobacco.

Bulked seed from the Nuss R83 x NC95 hybrid was sown and plants were grown in *M. javanica* infested sandbins under glasshouse conditions and a temperature of approximately 25°C for 12 weeks. From this planting single plants were selected for lowest infection-rating, selfed and sibbed. The selection was done with the rating-indices mentioned in the subscript to Table II.

Intercrossing with Hicks, Hicks 76, Delcrest 202, TL33 and TL38 was performed at various stages to enhance the flue-cured characteristics of the hybrids as is evident from the pedigrees in Table I. These were the accepted flue-cured varieties that were commercially grown at that time. In tests they all were found to be highly susceptible to nematodes. The progeny of every generation of selfing and/or crossing was re-evaluated for *M. javanica* resistance in sandbins (*M. javanica*) and under field conditions with a natural population of *Meloidogyne* spp. when infected sites were available. Plants with low infection indices were screened in this way for up to thirteen generations.

This recurrent-type selection was done using a double-row plot technique. One row was the segregating breeding-line population and the other, 30 cm abreast, was susceptible “Hicks” which was used as an indicator for the status of the nematode population at that specific test-station (Cornelissen, 1987).

After the findings of Van Wyk (1985), it was necessary to reassess the breeding lines for their reaction to *M. incognita* races 2 and 4. This was done under controlled temperature conditions of 28°C (day) and 20°C (night) during late 1985. Twenty-five plants per line were infected at a rate of one nematode per gram of soil with *M. incognita* race 2 or 4 or *M. javanica* (Van Wyk, 1985). The plants were planted in 20 cm plastic pots. Retesting of the parental lines was done at the same inoculation density but in plastic seedling trays.

RESULTS AND DISCUSSION

A family of 16 breeding lines was produced (see Table I). A comparison of these lines with Hicks and TL33 was made in respect of certain chemical and morphological characteristics. The complete pedigrees are included.

In Table II, the reaction of the 16 KNST-breeding lines to *M. incognita* races 2 and 4 and *M. javanica* are given (KNST = Root-knot nematode senior breeding lines). All lines showed varying combinations of resistance to these species of nematodes. From these results it is evident that KNST 16 has the widest tolerance to *Meloidogyne* spp. Lines KNST 5, 11 and 16 have the best resistance to *M. incognita* races 2 and 4. Line KNST 5 is totally resistant to race 2 and KNST 16 to race 4 based on these findings.