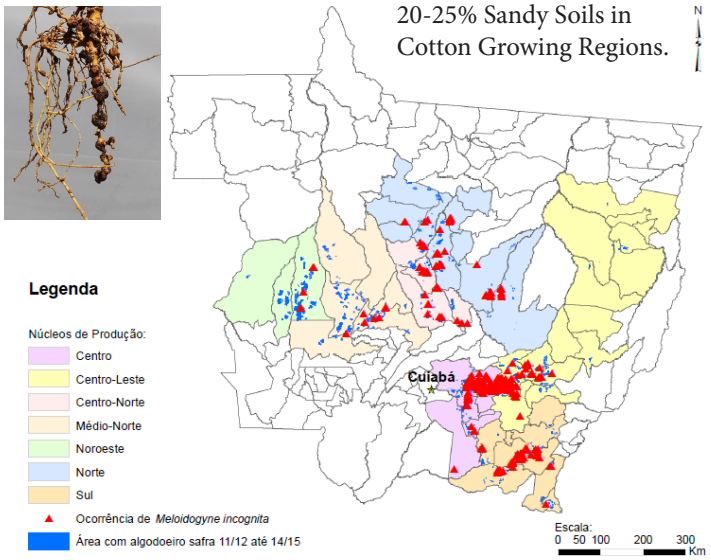
sistance, linked to a QTL on chromosome 14 near the SSR marker BNL 3661, is relatively easy to manage from a breeder's perspective.

NEMATODE RESISTANCE IN BRAZILIAN COTTON

Damage caused by root-knot nematodes (*Meloidogyne incognita* - Mi) in the cotton-growing areas of Mato Grosso and Bahia began to increase drastically in several monoculture areas with sandy soils. Prioritizing germplasm resistant to these nematodes emerged as a main goal in the early 2010s. It coincided with numerous publications, primarily by U.S. teams, on a resistant source identified in 1974, Auburn 623RNR. Molecular markers linked to the two genes involved in this resistance, located on chromosomes 11 and 14, were used to transfer them into elite IMAmt's germplasm, leading to the release of the first commercial Brazilian variety resistant to RKN in 2018, IMA 5801B2RF. This resistance, due to the combination of two genes with different modes of action, has not yet been overcome.

Figure-1 Breeding for Resistance to the Nematode *Meloidogyne incognita*



CHALLENGES WITH CONTINUOUS CULTIVATION AND EMERGING PESTS

Similar to past experiences in the states of Paraná and São Paulo, the monoculture in the best clay soils of Mato Grosso has led to the proliferation of another nematode, *Rotylenchulus reniformis* (Rr). The situation has become so severe that some fields are currently unviable for cotton production, even with the use of nematicides.

A source of resistance to Rr was identified in *G. barbadense*, accession GB-730 (Robinson et al. 2004), and between 2011 and 2017, research teams pinpointed the genes and molecular markers involved. Using this information and donors received from Drs. Jenkins and McCarthy, IMAmt introgressed this resistance into its germplasm and released in 2024 its first commercial varieties resistant to both nematodes (e.g., IMA 3010B2RF-RKN-RN).

IMPACTS OF GENETIC RESISTANCE ON CROP MANAGEMENT

Armed with information on molecular markers linked to genes of interest and germplasm donors, it took 5 to 6 years to develop competitive resistant varieties. However, paradoxically, after drastically reducing the populations of Mi and Rr, a new species of nematode, *Meloidogyne enterolobii*, quickly began to appear in cotton fields.

Similarly, reducing the incidence of ramularia leaf spot led to the emergence of another damaging fungus, *Corynespora cassiicola*—"target spot." Unfortunately, we have not yet identified any source of resistance to these two pathogens, which are highly detrimental to cotton production, and it will take several years for breeders to develop effective tools.

INFLUENCE OF FIBER YIELD ON SEED QUALITY

Simultaneously, seed companies have faced strong pressure to release varieties with higher fiber yield potential in the Brazilian market, aiming to increase gin turnout (GT%). This competition to enhance GT% has proceeded without due care to preserve the quality of the seed, seed size, and the fragility of the seed coat. As a result, Brazilian fiber may sometimes be contaminated by seed coat fragments (SCF) and exhibit sticky characteristics due to almond residue in the fiber. These issues are being addressed by breeders, but it may take a significant amount of time before some affected germplasm pools are adequately modified.

THE ROLE OF IMAMT IN THE COMPETITIVE MARKET

Another critical aspect is the importance of factors other than genetics, such as crop management, ginning, and their interactions, which can be as influential as the genetic factors themselves. Finally, the IMAmt breeding program, owned by the Mato Grosso cotton growers, aims to act as a "regulatory player" in this market, offering competitive varieties for those associated with AMPA. Our competitiveness and a minimum market share of 10% are crucial for the self-sufficiency of our institution. Moreover, many investments are being made at IMAmt in research for biological control based on microorganisms (bacteria, fungi, and viruses), aiming to reduce chemical control and help preserve the efficiency of the genetic resistance incorporated into new cultivars, whether of natural or biotechnological origin. The preservation of these genetic resistances, introgressed into commercial varieties through extensive time and investment, should be reinforced not only with biological control but also with all other management tools available, whether chemical or agronomic.