

RILS: WHAT ARE THEY, WHAT ARE THEY GOOD FOR, AND DO WE HAVE ANY?

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RILs, or recombinant inbred lines, are a set of genetically related individuals that can simplify the gene discovery process. They are constructed using regular breeding processes rather than using tissue culture or other advanced biotechnology. Operationally, a hybrid is made, and this hybrid is self-fertilized to produce a population that is segregating in a Mendelian fashion for whatever differences were present in the original parent's gametes. Each of these differences is then fixed in individual lines through continued inbreeding in successive generations, resulting in a population of plants that captures the genetic variability of the initial hybrid distributed among a relatively large number of genetically-fixed, true breeding, inbred lines, also known as RILs. Genetic analyses of these stable populations can be accomplished across years and locations, thus facilitating analyses of major and subtle effects of genes and environments on the expression of heritable characters. These are precisely the characters for which the traditional breeding process is effective at concentrating into varieties, and knowledge of the inheritance of these characters (such as sugar yield) will allow more effective breeding strategies to be developed. Additionally, RIL populations can be marked with molecular markers. Because RILs are genetically stable, a stable genetic map can be created such that any new variation discovered can be partitioned against the map and thus discover genes at any time in the future with no additional investment in mapping, at least to a first approximation. Currently there are four RIL populations created at East Lansing being evaluated for agronomic and disease resistance traits, and molecular mapping is in progress.