IPM: Breeding for Pest Management

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Genetic resistance of a pepper plant to a specific biotic or abiotic disease is usually the simplest, most cost-effective method of pest management in an IPM system. Breeding for pest resistance, however, is generally not simple and can be very costly.

A wealth of germplasm is available within the Capsicum germplasm pool, which includes many very different and distinct types of peppers, both cultivated and wild. Breeders have lots of genetic diversity to use in breeding and selection programs. However, the target of the selection program must be clearly defined, and an appropriate timeframe, with the necessary financial resources, must be provided. Generally 5 to 8 years are required to develop a new variety, with wide scale testing required before variety release.

Generally, past breeding efforts have involved relatively simple traits from a genetic point of view. Most of them have involved traits governed by single genes or a few genes. We have many improved varieties which have been bred for resistances to:

VIRUSES - TMV, PVY, TEV, PMMV, PeMV, TSWV, CMV

BACTERIA - Xcv Races 1 to 10

FUNGI - Phytophthora root rot, Verticillium wilt, Anthracnose, Powdery Mildew

ABIOTIC - STIP

Many challenging opportunities remain for breeders in the future. In general these traits involve complex inheritance, or new and more difficult screening techniques.

Future target traits for breeders of peppers in CA include:

INSECTS - thrips, aphids, whiteflies, psyllids, leafhoppers. European pepper breeders are apparently working with resistance to whiteflies and thrips which they identified in a wild relative species of pepper.

VIRUSES - BCTV, new strains of TSWV, new strains of all viruses

ABIOTIC - nitrogen efficiency, drought tolerance, closer spacing

HARVEST EFFICIENCY - firmness, shape, size, and ease of fruit detachment for mechanical

harvest.

FLAVOR - “fruity”, “floral” flavors from *C. baccatum, C.chinense*

COLOR

Screening techniques for determining useful genetic variation are often complicated and expensive when used in breeding for complex traits or traits with complicated inheritance or low heritability.

Another useful source of genetic variability might be the small differences we see in tolerances of one variety versus another, although these differences will be difficult to isolate and move between populations. Use of molecular markers to may make it easier to pyramid these genes into improved varieties

Genomics might be useful, however phenotyping will continue to be the bottleneck to genetic improvement through the use of genomics. And taken as a group, the various peppers we grow do not comprise a large enough market value to allow for large investments in genomics and phenotyping of peppers.