2. Viral Resistant Squash

Four mosaic viruses are of particular concern to U.S. summer squash production: cucumber mosaic virus, watermelon mosaic virus, zucchini yellow mosaic virus and papaya ringspot virus type W.

Cucumber mosaic virus (CMV) is one of the most devastating viruses affecting summer squash. Fruits are discolored with mosaic patterns, reduced in size and misshapen with a warty texture. Watermelon mosaic virus 2 (WMV) symptoms show up in leaves as yellowing between the veins and reduced leaf area around the veins. Fruit can be bumpy and distorted in shape and color. Zucchini yellow mosaic virus (ZYMV) makes leaves yellow and distorted, either with a blistered surface or tendril-like appearance. Plant growth is stunted and fruit is bumpy and deformed. Generally growers can expect to lose about 20% of their summer squash crop to viruses.

The four mosaic viruses are transmitted from infected plants to healthy plants primarily by aphids. Because there is no pesticide that can kill the individual virus particles themselves, the only way to manage viruses in crops is to manage their transmission. Foliar applications of stylet oil (highly refined petroleum oil) provide a barrier between the aphid and the plant, interfering with virus transmission. Frequent applications must be made in order to ensure that new foliage, which is attractive to aphids, is constantly coated.

Recently, pathogen derived resistance has been developed in summer squash. By inserting certain nonvirulent genes from a virus into a squash plant, scientists are able to endow the plant with resistance to that virus. Any virus particles that invade the plant are prevented from causing an infection.

The first line of summer squash with transgenic resistance to viruses was deregulated by EPA in 1994 and made available commercially in 1995. It carried coat protein mediated resistance to two viruses, ZYMV and WMV2. In 1996, EPA deregulated another line that carried resistance to these two viruses as well as to CMV.

Transgenic summer squash plants produce as many or more marketable fruit than nontransgenic squash. A Cornell University study found that transgenic squash with resistance to three viruses produced a 50-fold increase in marketable yield over nontransgenic varieties.

There are a great variety of summer squash cultivars grown in order to appeal to the variety of consumer preferences. To date, the background varieties that have been transformed for virus protection are varieties grown in southeastern states, while most of the varieties used in other regions have yet to be given transgenic virus protection.

It is estimated that transgenic squash with virus protection has been planted on 5,000 acres – mostly in Georgia and Florida. Planting transgenic squash increases the length of the marketing season and increases the number of harvests per acre.

Potential Impacts of Viral Resistant Transgenic Squash
Change in production: increase production by 6 million lbs.
Change in net income: increase of $1.6 million/yr.

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