

We almost lost our farm when ringspot virus infected our papaya trees. The use of genetically engineered papaya has allowed us to grow both the GE and conventional varieties.



My customers expect my organic foods to be GE-free. Is it possible to keep crops separated?



I am concerned that the scientists may not understand or respect our culture. What is the risk that the genes being used will spread into culturally important plants?



Seed crops are Hawaii's most valuable agricultural product. Some of the seeds are genetically engineered and there have not been safety or environmental problems. I am glad to have an agricultural job that pays well.



**For more information,
please contact:**

Biotechnology Outreach Program

Dr. Ania Wieczorek
College of Tropical Agriculture
and Human Resources
University of Hawai'i at Mānoa
3190 Maile Way, St John 102
Honolulu, HI 96822
Phone: (808) 956-7058
Fax: (808) 956-3894
E-mail: ania@hawaii.edu
Website: www.ctahr.hawaii.edu/biotech



**College of Tropical Agriculture
and Human Resources**

University of Hawai'i at Mānoa

**College of Tropical Agriculture
and Human Resources**



Biotechnology: Can It Be a Good Neighbor?

The College of Tropical Agriculture and Human Resources, University of Hawai'i, is committed to protecting and improving agriculture in Hawai'i and the Pacific Region. Genetic engineering (GE), along with conventional and organic practices, provides tools to meet the challenges brought on by pests, diseases and climate change. While GE shows tremendous potential to address problems that cannot be solved using other practices, it also raises concerns about how it will affect other forms of agriculture.

Coexistence

Coexistence occurs when conventional, organic and genetically engineered agricultural methods exist in the same geographic area. For coexistence to be successful, each type of agriculture must be able to keep their operations separate. Accidental mixing of crops can take place at several stages during production and processing. One of the biggest concerns of non-GE farmers is that the wind or insects will carry GE pollen to their fields. To determine if this is a concern for Hawai'i we must look at the characteristics of the crops that are grown here. At this time, Hawai'i farmers and gardeners may be growing genetically engineered papaya, squash and corn. Seed companies that operate in Hawai'i grow additional GE crops for research and production purposes. GE crops that are being evaluated for safety are monitored by the United States Department of Agriculture (USDA), which has strict containment rules.

Organic Concerns

Organic certification is based on the process used to grow the crop instead of the product produced. Organic farmers are not allowed to use genetically engineered seeds or inputs. In addition, the farmers must create and follow plans to avoid mixing with non-organic crops. The accidental presence of GE products does not result in loss of organic certification as long as the correct procedures are followed and all GE plants are removed.



Cultural Considerations

It is important to respect and acknowledge the cultural beliefs that sustained and developed traditional crops such as kalo (taro). Due to the concerns of the Hawaiian community, the College of Tropical Agriculture and Human Resources has suspended genetic engineering research on Hawaiian kalo.

Tolerance Thresholds

The same methods that allow seed growers to separate seed varieties can be applied to the separation of GE and non-GE varieties. These include separation of fields, planting crops so they are not fertile during the same time period and the use of separate storage containers.

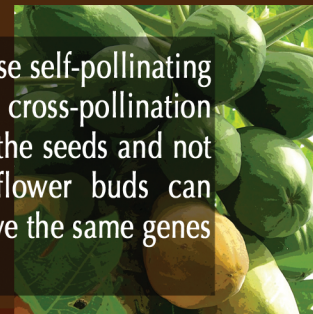
Recognizing that complete separation is not possible in open farming environments, many governments have established thresholds for identifying the presence of GE products. For instance, the European Union requires labeling if a food ingredient is 0.9% genetically engineered, and Japan uses a 5% threshold. The issue of thresholds is controversial in the United States, so none have been established.

The reproductive characteristics of individual crops determine the likelihood that they can coexist without impacting neighboring fields. Let's look at the characteristics of plants that may be grown by individual farmers or gardeners in Hawai'i.

It is unlikely that GE zucchini and yellow crookneck squash are being grown in Hawai'i. However, zucchini flowers are attractive to bees, which can carry the pollen for long distances, so plants need to have a two-mile separation.



Papaya growers normally use self-pollinating hermaphrodite plants. If cross-pollination does occur, it affects only the seeds and not the fruit flesh. Bagging flower buds can ensure that saved seeds have the same genes as the parent plant.



No GE coffee is currently approved for commercial use. While there has been little research on the characteristics of coffee pollen, coffee seed growers have found that planting different varieties 200 feet apart maintains seed purity.



Pollination of corn has been studied extensively and can be controlled through timing and spacing of the crops. If corn is planted 4 weeks apart, the pollen from one crop will not be present during the fertile period of the next crop. The use of border rows and spacing can reduce the amount of cross-pollination to less than 1% at 100 feet.

