

Virus-resistant Bean Developed and Approved in Brazil,

Using biolistic technology with several anti-viral constructs originally developed by the Bean/Cowpea CRSP program, a team of Brazilian researchers has successfully cultivated a GMO transgenic bean with excellent virus resistance to the Bean Golden Mosaic virus (BGMV) transmitted by the whitefly *Bemisia tabaci*. The work represents a successful public-sector effort to develop useful crop traits for a product grown by poor farmers and consumed by millions of people in Brazil.

The Brazilian National Technical Commission on biosafety announced the bean's approval for commercialization on September 16, 2011. This event represented the culmination of a research project sponsored by CRSP in 1987 that involved work at the University of Wisconsin, Madison, and the University of Puerto Rico along with collaboration with scientists at Agracetus, Inc., CIAT (International Center for Tropical Agriculture), and EMBRAPA (Brazilian Enterprise for Agricultural Research).

Beans are an important food in the developing world, both as a commercial product and as a source of protein-rich food for local consumption. Unfortunately, the golden mosaic virus has been a serious problem in Brazil and South America, resulting in annual losses of up to 200,000 tons of beans, with some farmers losing 100 percent of their plants. Both smallholder farmers and millions of Brazilian consumers will benefit from this transgenically developed bean.

This project had its origins in the 1970s, when the search for beans resistant to BGMV began. Despite the evaluation of thousands of bean lines for natural immunity to BGMV, no genotypes with sufficient resistance levels were found. By the 1980s, failures to breed beans for resistance to BGMV led the Bean/Cowpea CRSP (the forerunner to the Dry Grain Pulses CRSP) to initiate a research program with CIAT at the University of Wisconsin. Scientists there sequenced the BGMV from Brazil and similar viruses from the Caribbean and Central America. Studies of viral genome function and the development of anti-viral strategies followed. Brazilian scientists with EMBRAPA then combined biolistic technology with the anti-viral constructs developed by Bean/Cowpea CRSP and cultivated beans resistant to BGMV.

More than 20 years of research initiated by Bean/Cowpea CRSP has come to fruition. Two thousand kg of seed has been purchased by Brazil's Social Welfare Department to distribute to smallholder farmers for the next planting cycle.

The Pulse CRSP (formerly the Bean/Cowpea CRSP) contributes to economic growth and food and nutrition security through knowledge and technology generation that strengthens pulse (e.g., bean, cowpea, pigeon pea, etc.) value chains and enhances the capacity and sustainability of agriculture research institutions which serve pulse sectors in developing countries of Africa and Latin America. Pulse CRSP is supported by the United States Agency for International Development and the generous support of the American people through Cooperative Agreement No. EDH-A-00-07-00005-00.