For Immediate Release
November 25, 2018

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New peer-reviewed study confirms Bt brinjal can reduce pesticides and benefit farmers in Bangladesh

The first replicated field trials comparing genetically modified eggplant varieties with their non-GM counterparts in Bangladesh have confirmed that the Bt gene confers almost total protection against this vital crop's most damaging pest.

The field trials were carried out in the Bogra district of Bangladesh by a joint Bangladeshi-US team of researchers. The results are published in the Nov. 21 issue of the open-source peer-reviewed scientific journal *PLoS One.*

Eggplant, known as brinjal in South Asia, is an economically and culturally important crop in the region. Its most severe insect pest is the eggplant fruit and shoot borer (EFSB), which can cause up to 80 percent yield loss in Bangladesh.

"This study confirms with good statistical evidence that Bt brinjal can indeed help reduce the dependence of Bangladeshi farmers on insecticides to protect their brinjal crop," said Anthony Shelton, entomologist at Cornell University, corresponding author of the *PLoS One* paper, and principal investigator for the $4.8 million, three-year U.S. Agency for International Development (USAID) grant that supports the Feed the Future South Asia Eggplant Improvement Partnership.

Feed the Future is a partnership of Cornell University, the Bangladesh Agricultural Research Institute (BARI), the University of the Philippines at Los Banos, the Cornell Alliance for Science and USAID. It is working to advance agricultural productivity and sustainability among smallholder farmers.

The latest results, conducted in 2016-17 by the On-Farm Research Division (OFRD) of BARI, confirm that all four Bt brinjal varieties grown currently in Bangladesh are effective in protecting against EFSB. Researchers reported 0-2 percent infestation in Bt brinjal varieties, as compared to 36-45 percent infestation in non-Bt isolines (the same varieties but without the Bt gene).

"EFSB is the major pest of brinjal throughout Bangladesh and cannot be controlled well even with weekly spraying," said the study's senior author, Dr. M.Z.H. Prodhan of BARI. "This study clearly demonstrates the excellent control of EFSB these four lines of Bt brinjal provide, even

when no sprays are applied. We now have studies underway that will help provide us with information on how to control secondary pests, such as mites and whiteflies, so farmers can maximize their gross returns and minimize their use of insecticides."

Historically, virtually all brinjal farmers in Bangladesh have relied solely on insecticide sprays to control BFSB, with farmers applying as many as 84 insecticide sprays during the growing season. As an alternative to insecticides, four brinjal varieties carrying the Bt gene were released to farmers in Bangladesh in 2013.

The field trials also confirm that reduced insecticide sprays and increased yields should allow Bangladeshi farmers to earn higher economic margins on the genetically modified Bt brinjal than on conventional varieties, even where sprays are used to control BSFB and other insect pests.

For example, in one of the two annual field trials, all four Bt brinjal varieties showed a positive gross margin, even when no insecticide sprays were applied. In contrast, only two of the non-Bt isolines that were sprayed showed a positive gross margin when sprayed and only one of the unsprayed non-Bt isolines showed a positive gross margin.

"This shows that Bt brinjal can achieve its main aim, which is to improve the livelihoods of smallholder farmers in a developing country while also protecting the environment by reducing insecticide sprays," Shelton noted.

In agreement with numerous other studies of the ecological impact of the Bt gene in different crops, the tests also indicated that Bt brinjal had no impact on non-target beneficial arthropods, such as lady beetles and spiders.

Four Bt brinjal varieties were approved for release by the Bangladeshi government in October 2013, and first distributed to 20 farmers in 4 districts in January 2014, making Bangladesh a pioneer in the world in allowing the commercial cultivation of a genetically engineered vegetable crop. Adoption has increased dramatically since then with Bt brinjal now grown by more than 27,000 farmers across all districts of Bangladesh.

Photo caption: Abdus Salam harvests genetically modified Bt brinjal from his field in Bangladesh. The pest-resistant crop has dramatically reduced the use of insecticides.

Photo credit: Alliance for Science