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“Bridging the gap between increasing knowledge and decreasing resources”

Determining Tolerance of non-GM Cotton Cultivars Towards Cotton Bollworm in Central India

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Abstract

The cotton bollworm is one of the major pests in cotton causing dramatic yield losses worldwide. In recent years, this led to the widespread adoption of genetically modified (GM) cotton, expressing *Bacillus thuringiensis* toxin, which is less susceptible to the bollworm, and to a neglect of breeding in non-GM cultivars especially towards bollworm resistance. Cultivation of “organic cotton” depends on effective bollworm control based on inherent tolerance and treatments with botanical pesticides. Even though India is the world’s largest producer of organic cotton, stakeholders from this sector face serious problems because they do not find suitable non-GM cultivars in the Indian market. Therefore a GM-free seed supply chain has to be re-established. For the support of organic cotton farmers participatory programs for cotton breeding and cultivar evaluation have been initiated in Madhya Pradesh in Central India to increase the genetic diversity of cultivated *Gossypium* species.

This study focuses on pest resistance and especially on the bollworm incidence in different non-GM cotton cultivars. More than 100 cotton cultivars representing different species and plant types (hybrids and varietal lines) of *Gossypium hirsutum* and *Gossypium arboreum* were screened for bollworm damage under irrigated heavy soil and rain fed light soil conditions. It was found that at harvest time, on average 70 % of the assessed capsules were damaged by the cotton bollworm. Significant differences in the susceptibility of the different cotton cultivars were observed ranging from 39 to 91 %. Therefore breeding for improved bollworm resistance together with improved management systems (“push-pull method”, bio-pesticides) has a big potential for organic cotton production. Breeding for pest resistance may also be important for GM cotton, as sucking pests, which are not controlled by the Bt toxin, still have to be encountered by pesticides in conventional farming. Since cotton is an essential cash crop in India enormous economic benefits for local farmers could be achieved by providing them with seeds of resistant cultivars and in addition by strengthening their awareness of sustainable crop production.

Keywords: Cotton, Bt toxin, *Gossypium* spp., organic farming, smallholder farmer

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