

## Commercially available GMO crops

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**Genetically modified crops** are the transgenic plants whose DNA has been manipulated using genetic engineering tools. These plants carry novel genes that were not present before and show some more desirable characteristics such as resistance to pathogens, insect pest as well as tolerance to abiotic stresses. Around the world, farmers have accepted this genetically engineered crop as it increases their income and in addition lower the cost of cultivation by reducing the use of pesticides on plants. USA acquired the top most position in the for producing the GM crop and has 75 million hectares of land under its cultivation, on the other hand India is on the 5<sup>th</sup> position in terms of production and has 11.6 million hectares of land under GM crop cultivation (ISAAA, 2018). In past 20 years, farmers have witnessed the some positive impact of using GM crops such as increment in productivity that adds to worldwide food, feed, and fiber safety, autonomy with respect to a country's farming land, conservation of biodiversity by preventing deforestation and protecting biodiversity sanctuaries, overcoming tasks that are related to overall climate change and improvement in health and economic status. The coin has two faces i.e. head and tail, in the same way GMO crops have some negative effects such as these crop may trigger allergic reaction in once body, some researchers believed that eating GMO Crops may cause cancer, they also leads to the antibacterial resistance, out crossing between conventional crops and GMO crops deteriorate the germplasm and they also leads to the genetic erosion.

### Genetically modified crops available in market

Bt crops	
Bt	Bt gene extracted from <i>Bacillus thuringiensis</i> , a soil bacterium.

<b>cotton</b>	<p>Effectively control American, spotted and pink boll worm</p> <p>Kill the insect larvae by forming pores in their mid gut</p> <p>Contain Cry toxin (<i>Cry 1Ac</i>, <i>Cry 2 Ab</i>, <i>Cry 1F</i>)</p> <p>It has maximum area in world among all the GM crops</p> <p>In India this is the only GM crop which is allowed for commercial cultivation.</p> <p>Varieties : Bikaneri Narma, NHH-44, Bollgard I, Bollgard II and Bollgard III, wide strike 3, Co17 (TNAU), BT-1, BT-2 and F1861 (PAU),</p>
<b>Bt corn</b>	<p>Have insecticidal properties against European corn borer (<i>Ostrinia nubilis</i>) and Corn root worm (<i>Diabrotica vigifera</i>)</p> <p>Contain Cry toxin <i>Cry1Ab</i>, <i>Cry1F</i>, <i>Cry1A,105</i> and <i>CryAb2</i> (European corn borer) and <i>Cry3Bb</i>, <i>Cry 34Ab1/Cry 35Ab1</i> or <i>mCry3A</i> protein (Corn rootworm)</p> <p>Maximum area under cultivation in North America</p> <p>Reduces the need of spraying insecticides, it does not harm beneficial insects such as Lady bug</p>
<b>Bt Brinjal</b>	<p>It is developed against pest fruit and shoot borer, <i>Leucinodes orbonali</i></p> <p>It contains <i>cry1Ac</i> gene with CaMV 35S promoter and selectable marker genes <i>nptII</i> and <i>add</i></p> <p>In 2017, China became the largest producer of Bt brinjal with 32.8 million tonne of production.</p> <p>India allowed field trials of Bt brinjal in 2020 with variety ‘Janak’ and ‘BSS-793’</p>

<b>Roundup Ready Crops</b>	
<b>Soyabean (GTS-40-30-2)</b>	<p>It shows resistance against broad spectrum herbicide called as Glyphosate</p> <p>It expresses a version of Enzyme 5-enolpyruylshikimate-3-phosphate synthase (EPSPS) extracted from CP4 strain of bacterium <i>A.tumifaciens</i> and continue to synthesis essential amino acid, whose synthesis will otherwise blocked by glyphosate herbicide</p>
<b>Canola</b>	<p>It also offers tolerance to the glyphosate herbicide</p> <p>2 noval gene were inserted in the natural genome of canola, one is taken from</p>

	<p><i>Agrobacterium</i> strain CP4 (encodes EPSPS) and other gene came from <i>Ochrobactrum anthropi</i> stain LBAA (encodes <i>glyphosate oxidase</i>)</p> <p>Glyphosate oxidase break down glyphosate within the plant</p>
<b>GM Potato (Protato)</b>	<p>It contains higher protein content (60 per cent higher) than wild type</p> <p>Its genotype contain a foreign gene <i>AmA 1</i> taken from <i>Grain Amaranthus</i></p> <p>It also has higher amount of leucine, isoleucine, arginine, glutamic acid and aspartic acid (Chakraborty, 2010)</p>
<b>Golden Rice</b>	<p>It is a genetically modified <i>japonica</i> rice developed for biosynthesizing <i>beta-carotene</i> in edible part of rice</p> <p>GR 1 (Golden rice version 1) contain one gene from daffodil i.e., Phytoene synthase (<i>Psy</i>) gene and one gene from bacterium <i>Pantoea ananastis</i> and produce upto 6µg/g of beta carotene which was four times of prototype</p> <p>GR 2 (Golden rice version 2) contains gene <i>Psy</i> from <i>Zea maize</i> and rest other genes were kept same, produces 37 µg/g of beta carotenoids of which 31 µg/g was beta carotene (Babili and Beyer, 2005).</p>

### Reference

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