A **transgenic plant** has modified genes. People insert a gene from another organism into its genome. The gene could be from a different plant, a bacterium, a virus, or an animal. The inserted gene codes for new traits in the plant.

There are many uses for transgenic plants. One use is to make pharmaceutical proteins, which are used as medicines and vaccines. Another name for this process is molecular farming.

**Pharmaceutical Products**

Tobacco has been engineered to produce pharmaceutical proteins. One protein is the result of an inserted viral gene. The transgenic tobacco plant produces a protein that might help treat diabetes. Transgenic tobacco plants can also produce proteins that keep blood from thickening and help...
wounds heal. These proteins are used to make blood substitutes and collagen. Collagen is the most abundant protein in the human body.

Transgenic tobacco can also make proteins to treat liver disease, asthma, hay fever, and high blood pressure. It is a source of vaccines, too. Vaccines help us develop immunity against certain diseases. All this from a plant that we normally think of as harmful!

Other plants such as corn, mustard, potato, rice, tomato, and lettuce are also being modified to produce medicines. Transgenic lettuce has a gene that allows the plant to produce insulin. It may help treat diabetes. Duckweed and cress, plants that are not grown for food, are other possibilities for producing medicines.

**Advantages**

There are advantages to using transgenic plants to produce pharmaceutical proteins. One advantage is that scientists may be able to skip the extraction process that you see in the diagram. A patient could just eat a salad to get the necessary proteins!

Another advantage to using plants is that it costs less than using animals. That can help lower the price of the medicine. Cost is especially important for people in developing countries. Affordable vaccines could reach many more people around the world. Transgenic plants can also help produce vaccines or medicines for uncommon diseases. Many drug companies do not produce vaccines for rare diseases. Lower costs might change that.

**Concerns**

It is important to make sure that genetic material from transgenic plants does not get into our food supply. Eating transgenic lettuce that makes insulin is not a good idea if you are not diabetic. Edible transgenic plants might affect food plants that are not grown for that purpose. One solution is to use only nonfood plants such as tobacco and duckweed for transgenic purposes. Another is growing them in secure greenhouses.

Ensuring that transgenic plants are not confused with food crops is also an important concern. One solution is to alter transgenic plants so that they are obvious. A green or purple tomato is an example.

Transgenic plants have great potential to produce medicines needed to save lives. But we should have safety rules for growing them. New technology often requires new regulations and supervision.