

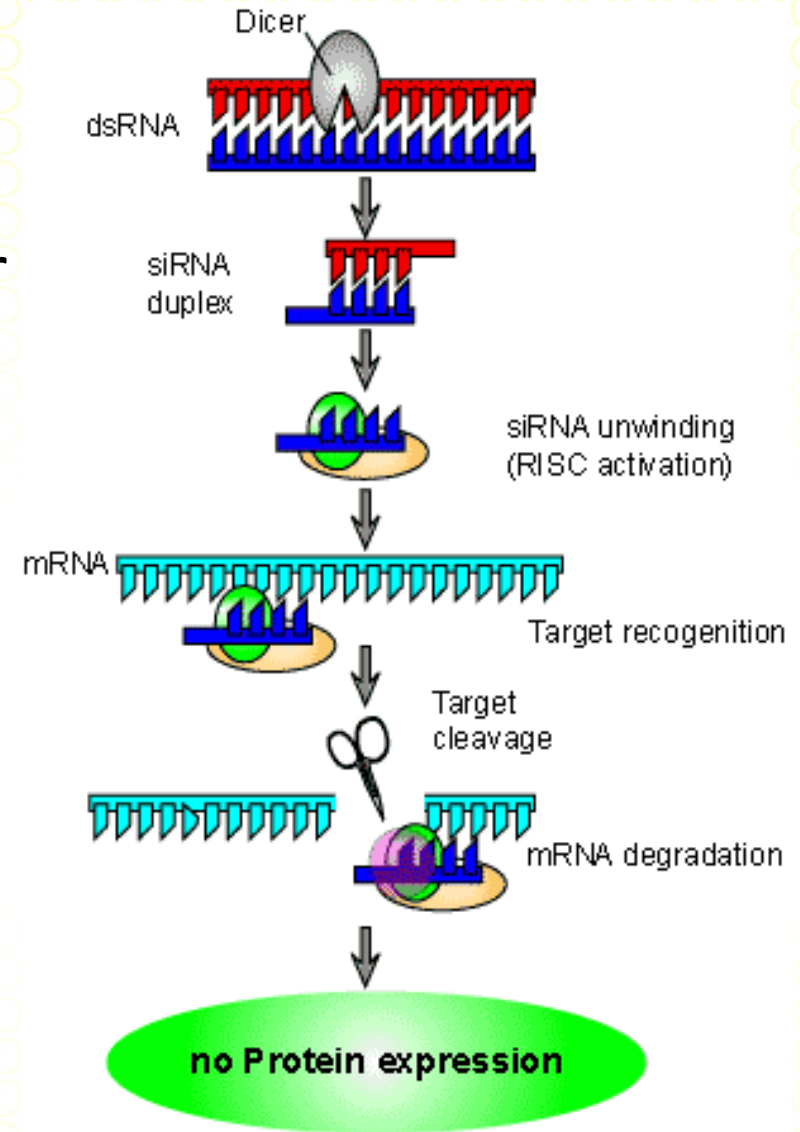
# Chapter 12

## GM Crop: Benefit and Issues

# Antisense Technology

- Inactivation the gene activity or suppressed it
- Antisense is orientation of RNA transcript were reverse
- RNA strand which has a mirror image of nucleotide bases of a mRNA strand
- The formation of double stranded RNA inhibits gen expression because protein synthesis requires single stranded mRNA molecule

- Thus mRNA unavailable for translation and dsRNA molecule is degraded by specific Ribonucleases



# Application of Antisense Technology

- 1) Product of genetic modify, Flavr Savr tomato contained antisense PG resulting in slow ripening and fruit softening therefore shelf life improved
- 2) Synthesis of ethylene inactivated
- 3) Decoration of flower color modify

# Genetic modified plant

- Develop by Calgene, USA which known as Flavr Savr in 1992
- Granted a license for human consumption
- Prevent of softening by addition of antisense PG thus more resistant to rotting
- The lower expression of PG enzyme made the slow process of pectin degradation and slower the ripening

# Green Revolution

- A planning of research and development as well as technology transfer from 1940s-1970s that will increased agriculture production around the world
- Developed by Norman Borlaug
- Develop cereal plant with high yield, expansion of irrigation infrastructure, modernization of management techniques, distribution of hybridized seeds, synthetic fertilizer and pesticides to farmers

# Green Technology Product

- Novel wheat cultivars
- Increase yield production in rice, maize and wheat
- Case study in India : high yield seed
- Vaccine encoded in a plant DNA by insertion of TMV in tobacco and increase the defense system in papaya and potato

## 2. Plant Pesticide

- *Bacillus thuriangiensies* registered as plant pesticide
- Clone Bt gene into plant, thus resistant to insect
- 1961: Commercialization of Bt as pesticide with trade name of Dipel and Thuricide
- Produce GM maize and cotton plant that have Bt gene



# 3. Herbicide Resistant

- Production of Glyphosate herbicide resistant plant by Monsanto
- Has been used widely in agriculture, forestry, aquaculture, alongside roads and highways, and in home gardening
- Glyphosate is a broad-spectrum herbicide that poisons many plant species so it is frequently used to ‘burn down’ weeds on a field prior to the planting or emergence of crops

# Drawback of resistant crop

- However, this made glyphosate-resistant populations of the economically damaging weed *Ambrosia artemissifolia*, *Ambrosia trifida*, *Amaranthus palmeri*, *Amaranthus rudis* and *Amaranthus tuberculatus* while *Sorghum halepense* appeared in Argentina
- This new weed resistant call transgenic treadmill
- To shift comprehensively to organic agriculture

# Enhance nutrition

- GM Rice called Golden rice (B) with production of high beta-carotene in grain
- This will solve problem deficiency of vitamin A in children
- Provitamin in golden rice must be dissolve in fat before can be used in human body
- Their diets may not be able to reap the full benefits of enriched golden rice

# Stronger fiber and safe storage

- Produce GM cotton with stronger fibre
- Transgenic corn expressing avidin. Thus made the seed were resistant to pest during storage
- Avidin blocks the availability of biotin, a vitamin that insect require to grow

# GM Crop: Benefit and Risk

- GM foods can fight world hunger. The world population has reached an all-time high of over 6 and a half billion.
- Over 20% of these are suffering from poverty and hunger
- GM foods supposedly are easier to grow and bring higher yields product

- GM crops are better where more sturdier and robust
- They are meant to be resistant to drought, diseases, and pests.
- The Hawaiian papaya industry, for example, only managed to survive a virus epidemic after the introduction of more resistant transgenic varieties

- Fight malnutrition with more nutritious food such as Golden rice
- Enhanced content of antioxidants such as FLORA oranges have higher than normal flavonoids and phenolics.
- The FLORA purple tomatoes have three times the amount of the antioxidant anthocyanins compared to normal tomatoes.

- GM foods are good for the environment.
- GM foods translate into less use of pesticides, herbicides and fertilizers, and therefore less pollution
- GM foods can be used in antibodies, biopharmaceuticals and edible vaccines in plants such as bananas (vaccine to hepatitis B) or genetically modified goats that produce milk which contains a human anticoagulant called anti-thrombin



- GM foods are safe. The creators of GM crops are quick to assure that GM foods are safe and pose no threat to human health
- Regulated by 3 agencies: USDA, EPA, and US FDA

# Issues against GM

- GM foods are for profit
- GM foods can harm the environment and affect their environment that might actually be harmful
- The effects are especially evident in other living organisms within the vicinity.
- How cross-pollination with pollens from GM plants can affect non-GM plants?

- GM foods can be detrimental to human health like antibiotic resistance, toxicity and allergenicity.
- Difficult to predict. In the food chain, this can even affect animals fed by GM crops and slaughtered for human use.

# Starlink

- Not approved Bt corn for human consumption because of risk as an allergen in contaminated tacos at taco Bell
- Compensation to millions to consumers to settle class action lawsuits for alleged health problems.

- The antibiotic marker may leak out from GM plants, and are absorbed by bacteria, they could ensure the survival of the very bacteria the drugs were created to kill
- There are concerns that the marker genes will be taken up by naturally occurring gut bacteria and lead to resistant, more pathogenic strains
- The effect of GMP to ecosystem