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Biotechnology

GM-mustard

A group of scientist of delhi headed by Dr. Deepak patel develop transgenic mustard variety. The biggest problem in mustard cultivation is weed removal, for which commonly used herbicide, Glufosinate is used.
This herbicide has been developed by Bayer company, but when herbicide sprayed on not only weeds get damaged, but also mustard.
In addition, hybrid variety of mustard is not possible as mustard is a self pollinating crop.

for developing GM mustard, two variety of mustard were taken, first is varuna (Indian variety), and second is Heera (east Indian variety)

from the bacterium streptomyces, is introduced in a gene called "varuna" is used to make male sterlised. Another gene from same bacterium is used in "Heera" to make female sterlised.

Some additional genes, were transferred to "varuna" to make it herbicide tolerant, and Cross-pollination was conducted blw the two.

The resultant variety developed is called "DMH-11", which is herbicide tolerant and refer to as "GM mustard" This cultivated in the field and "herbicide Glufosinate" will be sprayed, the weeds would get damaged not the mustard.

GM crops → (debate)

(Against)

(1) GM varieties have antibiotic resistant genes, or antibiotic resistant markers which are health concern as they are responsible for reducing the impact of antibiotics on the body.

(2) Antibiotic Resistant markers can spill over to Conventional varieties

This process is called outcrossing and can have impact on diversity.

③ Empact Assesment norms, Pertaining GM crops are not very well developed

④ Technical committee of SC has stated "India is not (Presently) fit for GM crops cultivation.

⑤ They have been blamed for reducing the fertility of soil and also for farmer's distress.

⑥ They have been criticised for using "Terminator Gene technology"

Terminator Gene technology is developed by "Prof. Hope shrand", in this technology, seeds can be "one yield only" 2nd generation yield is not possible.

This technology consists of 2 gene system.

"Gene system I" consists of "Ribosome inactivating protein" which does not allow growth of embryo

Gene system II consists of "chemical Blockers which suppresses the growth of embryo

In favour of →

(1) It enhances productivitiy.

(2) Removes diseases associated with crops.

(3) It makes crops suitable to diff. Climatic condition.

(4) If terminator Gene technology is used it can be tested through Gene trial.

(5) If "Cry gene" used in BT varieties do not get activated in the acidic gut of human. It's wrong to assume that India is not accustomed to GM crops as no. of food in indian markets

have a transgenic bases.

"Gene therapy"

It is a technique to remove the inherited disorder from a person

This technique was developed by "W French Aderson". first of all the faulty gene responsible for the disorder is identified and normal version of that gene is developed in the lab. "Host cells" are selected from the body of the patient and the normal version gene are transffered into it. these cells are now reffered to as "Doctored cells", which is returned back to the body of patient through injections, when these cells replicate, the disorder is gradually removed, but the disorder reappears in the next generation and again

Gene therapy is conducted.

The reason for this is ~~somatic cells~~ Gene therapy is conducted only for somatic cells not for reproductive cells.

[Crispr-cas9 technology]

Crispr stands for clustered regularly interspaced palandromic Repeats with the help of this tools gene editing can be conducted in reproductive cells and gemline cells (embryos)

This tools was developed by "carpentier & doudna" both have been awarded nobel prize of 2020. Both tools have been consists of two parts →

(1) RNA sequence - which binds with DNA sequence that needs to be removed and C4s9 is a type of enzyme that acts as

molecular scissors and remove the DNA sequence, this tools can be used for removing diseases from the germline cells and also to fullfill the aspirations of parents, in context of features of their baby. If it is utilised for removing disease, it is justified, if it utilised for aspirations of parents it is uncalled for.

Any kind of genetic alterations will be pass through generations and the impact is unknown.

Gene editing through CRISPER-CAS9 technology is only possible if gate keeper to the cells P53 protein is inactive. If it is active, then crisper-cas9 technology is useless.

The chinese scientist Mr Jiankui developed twins "Lulu and nana" who have innate resistance to HIV. It was done by alteration in gene "CCR5", the alter version was called "CR5Δ32"

CCR5 → codifies protiens allows the invasion of HIV.

But this experiment of Jiankui raises many objection worldwide, the criticism include, these girls may become susceptible to "west Nile virus". the criticism is also on the fact that this has been done, before the disease comes into existence. scientists also o questions the effectiveness of these alteranations

on the other hand, crisper-cas9 technology is used to develop hybrid variety of crops.

Designer baby

The first such baby was developed in los Angles in 2012. first of all harmoral injections given to female so that it releases more than "one ovum" at a time.

This ovum is fertilised at a lab either by sperm of father or a selected donor, a no. of embryos will be formed, which will be scanned for desired trait, after which one will be selected and other will discard.

Now, crisper-cas9 will be used to enhance the desired trait. Now the embryo will be put in womb of

Surrogate mother in which baby would be developed, there is positive and negative aspects to it.

The Positive aspects is embryo is scanned constantly, if there is any kind of genetic disorder it will be easily known.

The negative aspect is no. of embryos have been discarded which is life forms.

Pandemic and Epidemic

if no. of reported disease should have higher than that time of year, the disease is called as epidemic.

But if the disease engulfs large geographical area and if trans national in nature called pandemic.

Pandemic disease are those, for which the world does not have known response
Alg to WHO, Pandemic have repruccisions on human health and economy

viruses

→ are infected agent, do not replicate on their own, replicate inside the host.

There are two phases in virus →

(1) Lytic phase →
the virus replicate in very high speed.

(2) Lysogenic phase –
the virus combines its genetic materials with host so that it can remain for longer period of time.

The genetic materials of virus include either DNA/RNA and protein coat over it and lipid coat over it.

if virus have RNA as genetic material, these virus replicate with help of enzyme called Reverse transcriptase.

Pandemic can be in form of [zoonotic disease], which spread from vertebrates to humans

The main reasons for transmissions of disease include [triple recombination of Gene.] [SWINE flu]

The virus responsible for spread of swine flu is "H_1N_1A" which is influenza A virus having two types of protein (H- HAEMAGLUTININ and N- Neuraminidase). The influenza A infect no. of organisms, birds, human, Swines, whales etc.

But the Influenza A affecting swine won't naturally affect humans and vice versa

But in this case influenza A impacting swine is spilling over to intermediating medium which is bird in this case and humans also come in contact with birds

As a result, human virus also reaches intermedium, where alterations of Gene takes place and the swine virus get a virus from swine and humans and resultant is H1N1 A, which is hybrid of swine, bird and humans virus.

But predominantly it is swine virus and have the ability to impact humans.

swine flu

When ^virus enters the human body, it changes the genetic material, ~~Swine confer the exchange the~~

It invade the human body and the antibody produce and in order to escape the antibody it changes it's surface of protein and cause the tissue damage by reaching the respiratory tract. It is called cytokine storm. from respiratory tract it moves to lungs and from lungs it mones to blood stream. As person suffering from swine flu, die from multi-organ failure.

Two drugs are used for this purpose Tami flu and relenza

vaccine developed is called "vaxi-flu-s"

Bird flu

It is also known as Avian influenza and most common varient of Bird flu is H5N1A.

Triple Recombination takes place in this case also and the intermediate (medium) is Swine.

This Bird flue virus originated from wild ducks but are never responsible for affecting birds in the wild but the affect domestic birds particularly the polluting farms.

More of transmission includes Bird, Bird product, Bird meat and eggs if they are uncooked and semi-cooked if can also be transmitted through nasal secretion of Birds,

Birds pooping and eg WHO, even the dead birds is responsible for transmitting it.

The variant H5N8A is responsible for affecting migrated Birds also.

Swine flu infect swine to human and also from humans to humans

But Bird flu infect Bird product to human, not in human to human

No vaccine is developed, the vaccine used for swine flu (Tami flu Relenza) is used.

Ebola virus

More than 10,000 people died due to this in county like sierra leone, Nigeria and Liberia.

This disease first occurance come in year 1976 in congo and name after "river ebola"

The virus responsible for this is "Retro virus"

There ares varient of this —

1. zaire virus
2. sudan virus
3. Reston virus
4. Bundi bugyo virus
5. Tai forest virus

And death rate due to their is very high (70 to 90%)

The main symptom is internal bleeding. The virus get transmitted through blood and bodyfluid.

The virus originated ~~from~~ in "fruit Bats" but the intermediate medium is not known. The virus is destroyed if it is kept at tempature of 60°c and above over 90 minutes, but it is hard to isolate the virus. The WHO has recomended two drugs for this purpose -

1. TKM EBOLA
2. ZMAPP