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A Review on Plant Genetics, Gene Transformation and Role of Plant Active Compounds

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Abstract

Plant genetic engineering raises exaggerated expectations and induces fear in parts of the population. Plants, like all other known living organisms, pass on their traits using DNA. Plants however are unique from other living organisms in the fact that they have chloroplasts. Genetic modification has been the cause for much research into modern plant genetics, and has also lead to the sequencing of many plant genomes. The gene gun method is also referred to as "biolistics" (ballistics using biological components). This technique is used for in vivo (within a living organism) transformation and has been especially useful in monocot species like corn and rice. Transformation via Agrobacterium has been successfully practiced in dicots, i.e. broadleaf plants, such as soybeans and tomatoes, for many years. Extract of the plants has ability to protect the cells of the DNA from the attack of the chemicals, xenobiotics and other compounds that damages the cells. Free radicals when in the excess concentration, cause severe damage to nitrogen bases of the specific region of the DNA which ultimately damaged due to large chain of the free radicals.

Keywords: Plants genetics, genetic engineering, DNA, Plant genomes, plant genetic diversity.

INTRODUCTION

Plant genetic engineering raises exaggerated expectations and induces fear in parts of the population. Responsible application of plant genetic engineering requires that for each plant licensed for cultivation, a risk analysis be made according to strict scientific criteria as to whether the corresponding plant represents a hazard to the environment. Among other criteria, it has to be examined whether crossing between the released transgenic and wild plants is possible, and what are the potential consequences for the environment [1].

Plants, like all other known living organisms, pass on their traits using DNA. Plants however are unique from other living organisms in the fact that they have Chloroplasts. Like mitochondria, chloroplasts have their own DNA. Like animals, plants experience somatic mutations regularly, but these mutations can contribute to the germ line with ease, since flowers develop at the ends of branches composed of somatic cells. People have known of this for centuries, and mutant branches are called "sports". If the fruit on the sport is economically desirable, a new cultivar may be obtained [2-4].

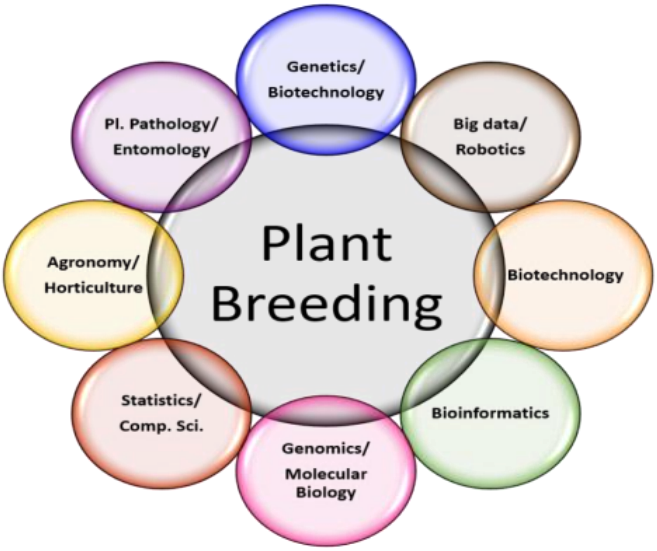

Fig-1: Shows the relationship of plant breeding to other branches of sciences

Plant genetic diversity is gradually diminishing because of human alteration or destruction of the natural habitats to which wild species are adapted, and races are being replaced by improved cultivars; the cowpea is no exception [5].

Genetic modification has been the cause for much research into modern plant genetics, and has also lead to the sequencing of many plant genomes. Today there are two predominant procedures of transforming genes in organisms: the "Gene gun" method and the Agrobacterium method. Extract of the plants has ability to protect the cells of the DNA from the attack of the chemicals, xenobiotics and other compounds that damages the cells. Extracts of the plants given to the dogs to assess the activity of the active compounds in onions for the protection of the DNA. Less data in previous studies available for taken the meal of onion in the excess amount that ultimately leads to toxicity and finally damages to DNA. Excess quantity of the onions in the diet alters the position bases of the DNA. It resulted to the severe mutations that might be detrimental. High concentration of the extracts also applied to cells of the rats that significantly reduced the damage caused to the DNA. The active compounds in the onions mainly flavonoids that contributed to maintenance of the function of the DNA when they applied in the optimum amount. When their amount reached the normal limit, then severe damage to DNA leads the occurrence of the diseases associated with nucleus [6-10].

Gene gun" method

The gene gun method is also referred to as "biolistics" (ballistics using biological components). This technique is used for in vivo (within a living organism) transformation and has been especially useful in monocot species like corn and rice. This approach literally shoots genes into plant cells and plant cell chloroplasts. DNA is coated onto small particles of gold or tungsten approximately two micrometres in diameter. The particles are placed in a vacuum chamber and the plant tissue to be engineered is placed below the chamber. The particles are propelled at high velocity using a short pulse of high pressure helium gas, and hit a fine mesh baffle placed above the tissue while the DNA coating continues into any target cell or tissue [11, 12].

Gene transformation Method

Transformation via Agrobacterium has been successfully practiced in dicots, i.e. broadleaf plants, such as soybeans and tomatoes, for many years. Recently it has been adapted and is now effective in monocots like grasses, including corn and rice. In general, the Agrobacterium method is considered preferable to the gene gun, because of a greater frequency of single-site insertions of the foreign DNA, which allows for easier monitoring. In this method, the tumor inducing (Ti) region is removed from the T-DNA (transfer DNA) and replaced with the desired gene and a marker, which is then inserted into the organism [13, 14].

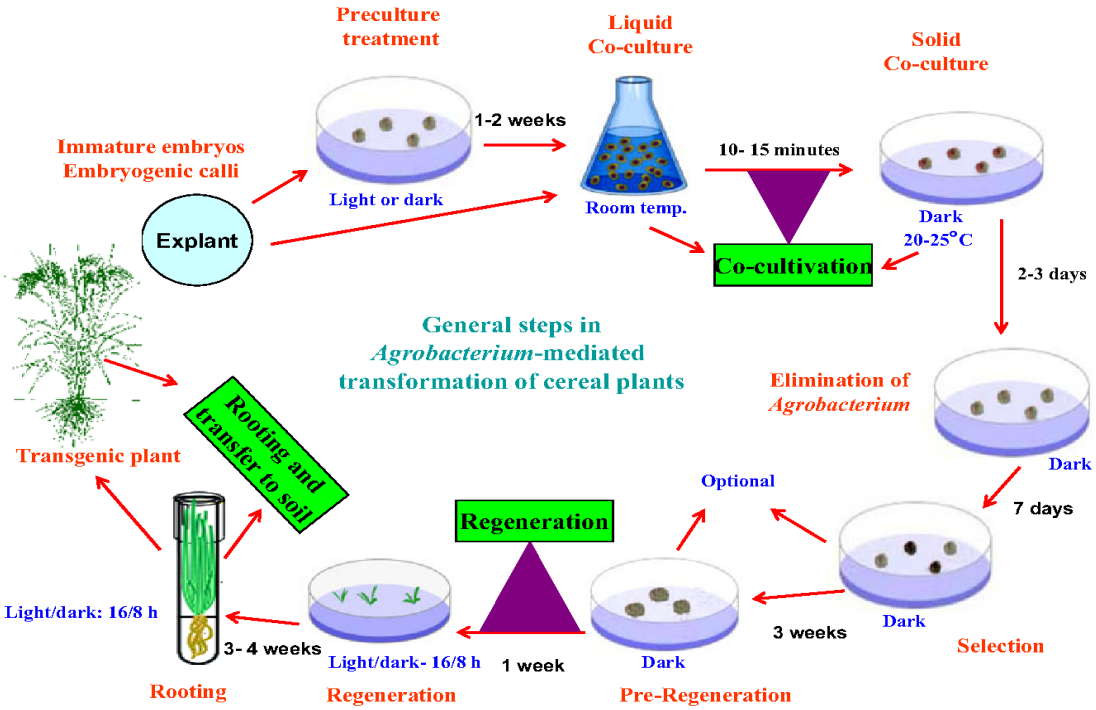

Fig-2: Shows the gene transformation via agrobacterium for prediction of transgenic plant

Protection of the strands of the DNA from the any damage or breakdown with the proper supplementation of the meals of the plants. The previous studies also investigated that the nitrogen bases of the strands of the DNA remain stable with biochemical application of the flavonoids present in foods. Increased of the concentration of the foods also help to maintain the structure of the DNA while low concentration also leads to the increased risk to the damage or breakdown any part of the DNA. As DNA actively involved in the replication. All other activities disturbed and that ultimately leads to death of the cell. Foods meals exhibit the dual character such as to protect the DNA and maintaining the functions of the DNA for the response needed to the cell. This response needed for the survival for the cell as well as the organ as these are the major parts [15-18].

Free radicals when in the excess concentration, cause severe damage to nitrogen bases of the specific region of the DNA which ultimately damaged due to large chain of the free radicals. The extracts of the foods also contains the antioxidants that are selectivity targeted to the free radicals by binding the to the initiating chain. When there are more antioxidants in the diet then there are fewer chances to the oxidative stress to the DNA. These antioxidants are the flavonoids that especially used in the industries as well the in the homes. The overall functions of the antioxidants are to maintain the functions of the DNA by protecting then as well as for their normal growth [19].

Combination of the extracts of the foods as well as the metal that has action on the DNA in the specific way with many benefits. The extracts of the foods as contains the numerous compounds such as the anthocyanin and other phenolic compounds. It also exhibits the metal that found in the limited amount. Some studies proves that using of the metal such as the zinc with extracts of the foods leads to the inhibition of the chemical agents that damage to the DNA. These extracts and metal such as zinc has positive effect to protect the DNA as well as in maintained the structure of the DNA [20].

Previous studies demonstrated that free radicals that responsible for damaging the specific part of the DNA inhibited by the applying of the extracts of the onions in the specific composition. The free radicals that once damaged the DNA and ultimately overall cell undergoes the stress and harmful condition. This condition also leads to death of the cell. It depends on the concentration of the extracts used in the specific experiment. The compounds in the extracts of the foods possess the characters like anticancer as well as tumors. The medical uses of the onions are extremely beneficial if they are used in the proper concentration. The higher concentration leads to the toxicity of the cells [21, 22].

Coagulation has a significant role in the blood in order to maintain the processes of the body such the homeostasis. Each of the clotting factor that is involved in the process of the coagulation has its own importance for the maintaining the fluid balance. Mutation in any factor leads to the certain disorder in blood. The actual process of the homeostasis maintained by the certain signals. It depends on the factors that are responsible for

the proper coagulation. The excess of the coagulation overall disturbed the other mechanisms such as the immune response that playing the significant role to fight with the harmful pathogens as well as the bacteria and helping to remove them as the waste product [23].

Extracts of the foods exhibit the compounds such as has quercetin as well as flavonoids that selectively inhibited the aggregation of the platelet. These compounds mainly present in the inner as well as the outer portion of the foods. The extract of the foods as well as blood from the healthy patients that stored in tube contains the proper amount of the EDTA. In the previous studies, the aggregation of the platelets efficiently enhanced by the increased level of the cAMP. Quercetin also inhibited the cellular expression of the aggregation of the platelets by binding to the any factor that involved in the coagulation. It also involved in the inhibition of the activity of the kinase that ultimately inhibited the aggregation of the platelets. Quercetin also the type of the flavonoid that directly involved in the inhibition of the cellular mechanism of the platelets [24, 25].

Previous studies demonstrated that quercetin only the flavonoid that contributed in the thrombolytic activity in the extracts of the foods. This activity depends on the concentration of the quercetin. It has high concentration in the outer portion of the foods but the inner portion contains the low concentrations. Outer portion of the foods has more of the thrombolytic activity and outer portion exhibits the thrombolytic activity. This activity gains more importance in the foods that exhibit the more concentration of the quercetin [26].

Flavonoids especially quercetin involved in cellular mechanism showing the complexity. The structure of the quercetin showing complexity and relatively stable for most of the part of the body. It is unstable due to the chain of the large number of the organic form of the compounds such as carbon in which hydrogen attached in stable form and heavy molecule structure when taken in the form of the foods thorough the diet [27, 28].

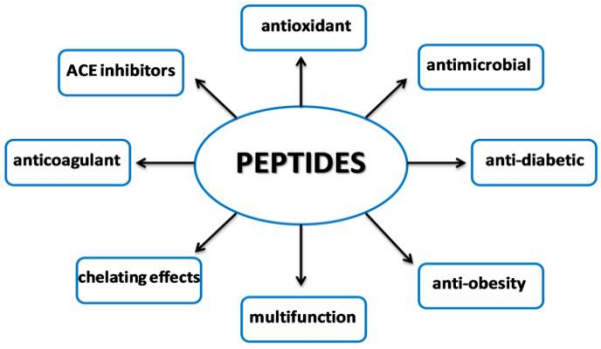

Fig-3: Shows the role of plants bioactive peptides

It was also demonstrated in the previous studies that extracts of the daily taken foods due to the presence of the certain compounds that related to the family of the sulphur. These are cysteine also the methionine. These compounds biochemically playing the significant role in aggregation of the platelets. These compounds were measured old methods in the previous studies. Quercetin also inhibits the formation of the thrombus that causes the blockage in the specific tissues of the arteries. This compound gains the most significant value in making the composition of the onion as it reduces the risks of the attack to heart and other related disease. These compounds needed more methods for their composition and accurate analysis needed in the future based studies [29-31].

Another study demonstrated that colon cancer targeted by applying the extracts of the foods depends on the concentrations of specific compounds in the foods. High potential of the extracts inhibited the growth of the colon cancer and hence more for the survival of the particular type of the cell. Cells of the colon that multiplied in alarming stage under cancer stage ultimately leads to the deaths of the near cells. A study demonstrated that extracts obtained from the foods possesses the activity against the lung cancer in the fetal cells of the human. Their high concentrations resulted the decreases the growth of the abnormal cells of the human lung while low concentrations of the extracts of the foods resulted the low inhibition of the growth of the human lung. Cells of the human cells that produced abnormally multiplied rapidly due to mutations [32, 33].

Extracts of the foods possess the properties like anti proliferative. Extracts also has properties like anticancer due to specific composition of the flavonoids compounds. It also exhibit the compounds that responsible for the prevention of cancer. These compounds are the anthocyanins as well as the most active compound in the inner portion of the foods called quercetin. It has largest property to inhibit the proliferation of the cells of tumor. Quercetin actively binds to the cells of the tumor and also inhibited their growth. The other compound such as the flavonoids that partially inhibited the growth of the tumor [34, 35].

CONCLUSION

Gene transformation is the most advanced method for transferring of novel genes by which any genetically modified plants produced with desired characteristics. The extracts of the food components with specific composition of compounds exhibit the activities against the breast cancer cells. These compounds also contributed to the inhibiting the cells of cancer of cervix. So, extracts of the foods possess the compounds that could be used in future studies in the treatments of the various disease mostly the cancer as well as the tumor.

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