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Nuclear techniques in agriculture and genetics

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Abstract: These days, practically everyone is aware of the role nuclear technology has played in revolutionizing electricity generation and energy diversification. Not so well-known are the many other, non-power applications of this technology. During the past half-century, the worlds of medicine, agriculture and industry have seen significant improvements due to the harnessing of radioisotopes. And with the surfacing of new applications every day, nuclear science continues to make major contributions to the quality of our life, providing welfare and prosperity for all. Here, we'll look at some of the contributions of nuclear technology, and why Iran can – and is trying – to benefit from it In addition to other nuclear techniques, the classical method can solve many of the problems of effective and rapid agricultural issues. One of the peaceful applications of nuclear energy in agriculture is to create a genetic mutation in plants, and increase the variety of plants for the reform, the importance of this technique on increase of yield and the amount of the medicinal and aromatic plants in ingredients has been significant. Valuable medicinal plants, according to Iran's reserves, in this article, a study of the success obtained in the use of nuclear techniques to increase yield and active constituents in some of the most important medicinal and aromatic plants will be paid.

Keywords: Medicinal Plants, the Nuclear Technique, Genetic Mutation, Effective Materials

1. Introduction

Irradiation, carried out under conditions of Good Manufacturing Practice, is commended as an effective, widely applicable food processing method judged to be safe on extensive available evidence that can reduce the risk of food poisoning, control food spoilage and extend the shelf-life of foods without detriment to health and with minimal effect on nutritional or sensory quality. This view has been endorsed by international bodies such as the World Health Organization, the Food and Agricultural Organization and Codex Alimentations.

Food irradiation is slowly gaining consumer acceptance in the US and several other countries but it is slow to gain support within many parts of Europe, including the UK, where the Food Standards Agency (FSA) recommends no extension of application. Many consumers are initially hostile to irradiation but when the process is explained to them they become generally more in favour. There is a role for respected professional bodies to inform consumers of the advantages and limitations of the technology so that they can make informed decisions on buying and eating irradiated foods

Iran is using radiation technology to increase the genetic variation of its cereals, oilseeds, pharmaceutical and industrial crops as well as fruit trees. Considering the scarceness of freshwater in Iran, much of the work in this area is geared toward developing strains which are drought and saline resistant. By modifying and stabilizing the desired traits, Iran hopes to increase the quantity and quality of its field and horticultural crops.

Radioisotopes are also used to change the genetic make-up of crops and produce strains which are superior in multiple aspects. By applying small doses of gamma or neutron irradiation, it is possible to induce mutations in crops and create varieties which are more disease resistant, tolerant to harsh climatic conditions, show increased yield and have shorter growing time. This practice has been in place for several decades and has led to the development of

some 1,800 crop varieties in the world.

Mutation breeding is hugely successful. The wide use of mutation induction for crop improvement is documented in the FAO/IAEA Mutant Variety Database, which includes more than 3200 officially released mutant varieties from 214 different plant species in more than 60 countries throughout the world. Over 1,000 mutant varieties of major staple crops, cultivated on tens of millions of hectares enhance rural income, improve human nutrition and contribute to environmentally sustainable food security in the world. Mutation breeding has become the most successful field of application of nuclear techniques in food and agriculture: more and more mutant crop varieties, especially in rice have been released to farmers. In agriculture, radiation could help kill insect pests, develop more disease-resistant crops, improve the nutritional value of some crops or their baking or melting qualities or reduce their cooking time. A technique called mutation induction uses mutagens like chemicals or gamma radiation to speed up the natural processes of evolution of plant DNA that have driven human-directed agriculture for thousands of years.Wide varieties of the mutant plant strains are produced, from which those with desired traits such as better yield, tolerance to harsh conditions or diseases, and better nutritional value can then be selected by plant breeders. Through these techniques, more than 3,000 varieties of some 170 different plant species have been released through the joint IAEA/FAO program, including drought-resistant wheat for Kenya's dry lands, hardy barley in the Peruvian high Andes and high-yielding rice in Vietnam. This procedure differs from the genetic modification of plants, which have had their DNA combined on a molecular level with other genetic material to create a new set of genes. This modified DNA causes the genetically modified plants to acquire novel or modified traits. In addition to other nuclear techniques, the classical method can be an effective solution in solving many of the agricultural issues. The practical use of the method is to increase the efficiency of nuclear agriculture and improve the quality of the advanced countries in more than 50 years and in other countries in developing a 30-year history [1] and its application in developing. Genetic diversity increases as the reservoir for the activity of plant breeding and the genetic mutation increases [2]. A sustainable change in the DNA sequence mutation which causes a change in the gene caused improper construction in amino acids and proteins. As a result of this phenomenon, that fundamental organism occurred and many of the activities within the cell undergone transformation [3].

In the majority of research related to the use of nuclear energy in creating mutations in medicinal plants and aromatic, the following targets are the view [4]

1. Create high-yield cultivars slightly.
2. Improvement of high effective materials.
3. Improve resistance to pests and disease.
4. Morphologic characteristics of improved biological and medicinal plants
5. Limiting factors to improve high-resistance such as Assembly and.

Fertilizers are commonly used in agriculture to maximize yield and achieve higher crop production. However, they are very costly and cause a great deal of damage to the environment. Therefore, it is important that they be used efficiently. Radioactive tracers allow scientists and farmers to optimize the use of fertilizers by determining how much of the chemicals are absorbed by the plant and how much is lost to the environment. This is effective in two ways. First, it reduces costs for the farmer, and second, it minimizes the environmental damage that can result from excessive use of fertilizers.

Iran is one of the countries that are heavily reliant on the use of chemical fertilizers for increasing crop production. Estimates show Iran is using more than four million tons of these chemical substances every year. This figure is expected to undergo a significant increase in the coming years, reaching 7.5 million tons by 2018. This high and inappropriate application of chemical fertilizers has caused undesirable changes in Iran's environment, biodiversity and public health. However, with the help of nuclear technology, Iranian researchers have been able to reduce the use of fertilizers by 30 percent in the growing of several strategic crops such as wheat, corn and sugar cane.

2. Materials and methods

To date, more than 50 countries have given approval for over 60 products to be irradiated. The USA, South Africa, the Netherlands, Thailand and France are among the leaders in adopting the technology. Currently regulations on food irradiation in the European Union are not fully harmonized. Directive 1999/2/EC establishes a framework for controlling irradiated foods, their labeling and importation, while Directive 1999/3 establishes an initial positive list of foods which may be irradiated and traded freely between Member States. However, this initial positive list has only one food category – dried aromatic herbs, spices and vegetable seasonings. Some countries, such as Belgium, France, the Netherlands and the UK allow other foods to be irradiated, whereas other countries, such as Denmark, Germany and Luxembourg remain opposed. Within the UK seven categories of foods are cleared for irradiation to specified doses. Regulations across the world make provision for labeling to ensure that consumers are fully informed whether foods or ingredients within them have been irradiated. Following the stxa mutant and the discovery benefits of genetic variation for plant development, establishment of nuclear technique to jump as an instrument in order to modify the plants that were used. At the beginning of investigations raised by using the mutation, according to the peculiarities of plant cloning researchers, finding was slightly considered. This plays a great role in the use of nuclear techniques to create a genetic mutation and improve the characteristics of the plants [5].A genetic mutation in plants in addition to the

effects on the characteristics of the plant, on the qualitative characteristics of slight changes is also effective and these kinds of mutations that cause a change in the specifications of the quality are small plants genetic mutations (microbial mutation). Up to 1974 with the use of a genetic mutation, more than 200 varieties of modified is achieved [6] Regular and comprehensive measures in order to increase the qualitative characteristics of medicinal plants by genetic mutation of 1970 was started [6]. We shall refer to a number of the study:

2.1. Genetic Mutations in the Genus "Solanum Spp"

The use of radiation radioactive mutations causes better chemical composition of s. khasianum than others. A genetic mutation on this plant causes a high fruit yield and content plants with cloning Glico abundant isolation. Also varieties of PRL-20/2 were introduced, which in terms of fruit yield and salsodin rate is higher. With this genetic mutation. induction which causes fruit varieties with higher yield and number of thorns less so that these varieties have a long flowering period, are more stubborn. Severe radiation radioactive radiation on plant varieties in s. laciniatum causes plants to have Gledhill as early as possible, a higher- level function of fruit and isolation of Glico [7].

2.2. Genetic Mutations in the Genus "Dioscorea Spp"

Active radiation successfully increased the performance of Diosgenin and its gland in D.alata and D. bulbifera Also, new varieties of D. bulbifera have been introduced that have a high rate of saprogenic [7].

2.3. Genetic Mutations in the Genus "Atropa Belladonna"

Both methods of radioactive radiation and mutagenic chemical substances cause the economic characteristic of plant variation [7].

2.4. Genetic Mutations in the Genus "Datura Spp"

The technique to create the size of mutations in sex has been effective and has been shown that the radioactive radiation in low rate increased the yield of the plants [4].

2.5. Genetic Mutations in the Genus "Papaver Somniferum"

Conducted research on the causes of plants had a mutation rate of higher mutagenic chemical compound morphine and this has greater effect on plants.

2.6. Genetic Mutations in the Genus "Mentha Spp"

The species m. arvensis by tabanden on astolon being the ionized radiation, for improving performance in parts of this plant were used. Use of gamma radiation on any of the rich of the menthol causes were with the capability of a better harvest without negative effect on the amount of time that used by the menthol. Researchers using ionized radiation have been able to establish varieties with greater linalool acetate and linalool [8]. Radioactive radiation-resistant varieties have been able to create a ortisiliom that has the desired percentage of essential oils as well as others. This variety, later in the United States were sensitive to any of the alternative posidegi and took into consideration As well as the use of diagnostic radiation and gamma rays were able to create varieties of the species M.rotundifolia essential oil that has a high percentage of hands [7].

2.7. Genetic Mutations in the Genus "Cymbopogon Spp"

Numerous researchers carried out similar research with the creation of the mutations in the plant species in this genus have achieved higher performance. With the establishment of plant species with mutations in growth traits, C. martini find the optimal amount of essential oils, as well as radioactive radiation using a variation of the frequency of species between the creation of C. khasianus and diverse population, to have high rate of geranial acetate with crop segregation [4].

2.8. Genetic Mutations in the Genus "Rosa Spp"

Radioactive radiation induced mutation in plant flower-formation, in addition to the change in the rose, it is also essential in the change [9].

2.9. Genetic Mutations in the Genus "Pelargonium Spp"

The first study was done of the effect on mutations in relation to plant radioactive radiation sensitivity, and the growth rate in these conditions was observed. Radioactive radiation in plant with ten times the effects of essential oils have been achieved [7].

2.10. Genetic Mutations in the Genus "Crocus Sativus"

The researchers of the gland under the influence of different dose saffron rays (25 and 20 and 30 GY) reduced, gamma. High dose of plant height and the low dose (5 and 10 GY) increased in plant height [10].

3. Conclusions and Discussion

Using gamma ray in the dose 2/5 and 5 GY there are causes of stxa mutant with a higher yield and morphological. A study of research conducted showed that the use of nuclear techniques may be long in order to improve the characteristics of morphologically and medicinal ingredients in plants. Also, the use of the technique was that nuclear is very effective for increasing essential oils and their mosilage plants kind of ingredients and these essential oils has been significant in this study.

4. Suggestions

The proposal is the result of mutation effect of the

nuclear plant in Iran on indigenous medicinal importance that has a large, industrial benefit and has been studied; Due to the fact that the occurrence of genetic mutation causes high resistance to stresses, pests and disease, in an environment, therefore, is recommended due to the drought crisis in Iran and the subject of this technique for the NIP to medicinal and aromatic plants more resistance. Our research team plans to examine the effects of gamma ray on medicinal plants found in the city of Kerman. That the results of it will be provided soon.

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