



BIOSAFETY OF GENETICALLY MODIFIED ORGANISMS GMOS /PLANT BIOTECHNOLOGY PROGRAMS: A REVIEW ARTICLE

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Article history:	Abstract:
Received: 7 th September 2022 Accepted: 7 th October 2022 Published: 14 th November 2022	Biotechnologies are a means with enormous potential for overcoming some of the obstacles to increasing agricultural production, and they are adding new methods to accelerate plant improvement, biotechnologies have historically emerged as a scientific, political, economic and social phenomenon. Therefore, governments must develop strategies, policies, and legal frameworks to support and incorporate biotechnologies into their agricultural research. For this objective Develop robust and cutting-edge research programs to take advantage of the significant contribution of biotechnologies and genetic engineering to improve yields and analyze and fill in the gaps and missing pieces of its technology and scientific knowledge.

Keywords: Plant Biotechnology Programs, Appropriate technology transfer

A REVIEW ARTICLE PROBLEM: Genetic engineering is the first example of treating the improvement of breeding material by introducing special genes from genetic material or other sources to the desired plants through the possibility of researchers now to take one gene from a plant or animal cell and insert it into another variety to give it the desired characteristic such as resistance to pests and dangerous diseases. The result is what is generally called a genetically modified organism or genetically modified organism that results from the use of modern biotechnologies.

A REVIEW ARTICLE OBJECTIVE: The operational plan for capacity building, which presented the main elements, includes the following: Institutional capacity building, Development and training of human resources, Risk assessment and other technical and scientific expertise, Risk Management, Public awareness, participation and education at all levels, including decision-makers and all parties concerned and the general public, Information exchange and data management, including full participation in the Safety Clearing-House vitality, Scientific and technical cooperation between institutions at the regional, sub-regional and international levels, Technology transfer and introduction.

1- INTRODUCTION

Biosafety of genetically modified organisms or genetically modified plants is something an uncertain unknown that requires the establishment of a biosafety framework that can be effectively integrated into national strategies and policies in agriculture and food in the country, biotechnologies are known as tremendous technology with completely supernatural capabilities, these technologies represent opportunities because biotechnologies in developing and using them require deep knowledge and sciences, and therefore capacity building is important. It is essential to allow countries to benefit from these new technologies as well as to manage their risks (Bañuelos, *et al.* 2007). The international community has recognized and responded to these needs for capacity building, and in the last five years only, To develop capacities to encourage adherence to a protocol for biosafety and biotechnologies in general. Biotechnologies are currently considered one of the most important aids in improving agricultural crop production and food production(Chen, *et al.* 2013). This technology has become known and in the stages of application in many developed countries(Bizily, *et al.* 2003). In general, the application of genetic engineering methods is increasing in the world year after year, as it is noticed that the cultivation of crops, Genetically modified organisms have increased at an average rate of 11% over the previous year, so the use of biotechnologies, and perhaps this is due to the lack of sufficient knowledge in this field and the lack of laboratories that. It works in the field of genetic transfer and the production or detection of genetically modified organisms in addition to the lack of authority responsible for monitoring and controlling the use, handling, transportation and disclosure of genetically modified products. Relying on the national projects and studies implemented in this framework by the Ministry of Environment and the Ministry of Agriculture with the participation of various scientific institutions in Iraq (Chen, *et al.* 2015). Institutions or organizations that have started work in the field of biotechnologies are still working in the field of molecular characterization although biotechnologies are still in their early stages of development; there are some efforts to

exploit these effective technologies. In general, most of the work of biotechnology research is confined to the direction that has a return direct economic as in the field of agriculture, universities have recently established programs in biotechnology or engineering genetic (Bridgwater, 20120) . With the development of the biotechnology industry at a rapid pace, the international community has agreed on the need to develop a protocol legally binding biosafety under the 1992 Convention on Biological Diversity and establishing policy, administrative and legislative frameworks necessary to be put in place to reduce risks to the environment and human health that may arise from and applications of modern biotechnology. It should also be noted that the successful development and application of technologies vitality is only possible when there is an extensive research and knowledge base on genetically modified organisms.

This commitment includes: sharing expertise, capacity building and agreements International Principles of Biosafety. Recent developments in modern biotechnology techniques represent a great link between conservation and optimal use of biological resources, biotechnologies are also offered to developing countries.

1-2 Genetically modified organisms GMOS: A human being using any method that results in the insertion, rearrangement or removal of genetic material from the genome of an organism. Measures designed to ensure safety when dealing with neighborhoods risk management, Genetically engineered, used and released into the environment release of genetically engineered research, production, and application of genetically engineered organisms in an open system, including release: To the natural ecosystem, such as farmland, pasture, forest, water bodies, etc(WHO, 2013). Use of genetically modified product outside the scope of: (release into the environment) release into the environment .Ordinary physical containment, such as closed areas, laboratories, nurseries, fermentation units, or any closed buildings, Under biosafety conditions established by the National Biosafety Committee. Biosafety Term used to refer to policies and procedures. Approved to ensure the safe use of contemporary biotechnology applications and to prevent or reduce potential risks, biotechnologies and their products by promoting good laboratory practices, procedures and use containment for proper containment installations and fixtures. Measures that impede or limit the survival or spread of organisms or their products in research related to the intentional introduction of living things into the environment.

The target gene is the gene responsible for modifying the genetic makeup of the recipient cells gene responsible for expressing the genetic information of the receptor cells. Cartagena Protocol on Biosafety to the Convention on Biological Diversity: It is an environmental agreement that aims to protect biodiversity from potential dangers from living modified organisms. Genetically derived from modern biotechnology. The protocol mainly focuses on the cross-border transportation of any object Modern, may have harmful effects (Biotechnology), the conservation and sustainable use of biodiversity and, in particular, establish appropriate procedures for prior informed consent (Das, *et al.* 2016). For Advance Informed Agreement to be considered. The protocol establishes a procedure for an advanced information agreement Ensure that countries are provided with prior written notice with the information necessary to make informed decisions. Information prior to approval of the first import of living modified organisms to be introduced into the environment. also establishes the protocol is a Biosafety Clearing-House in order to facilitate the exchange of information and experience about organisms living modified organisms and to assist States in implementing the Protocol such as Soil, water, air and all living things that share it or live in it(Dimitroula, *et al.* 2015).

1-3 Capacity Building: Capacity building refers to the process by which individuals, groups, organizations, and institutions are raised societies are able to understand and deal with their development needs in the general sense and in a sustainable manner, which are the steps necessary to create and enhance the capabilities of a state, institute, institution, or individual, to carry out its assigned functions set and achieve its objectives, the introduction of one or more of the donor genes for a number of traits: (transformation) (modification) presumed beneficial mostly, to plant or animal species, the intensity, frequency, and duration of contact with environmental factors exposure any technology that uses living organisms, their whole or parts, or materials from biotechnology, these organisms are to produce or modify a product, to improve plants or animals or to develop microorganisms for specific uses. Risk assessment of the introduction of a genetically engineered organism: a risk assessment recombinant DNA to the environment or to a natural or human-managed ecosystem. The diversity of living organisms, from any terrestrial or aquatic environmental source, and biodiversity includes within each species and between species and ecosystems, deoxyribonucleic acid, which is the genetic material of living matter. DNA: (DNA), It is the organism that has modified its genetic material by modifying part of it or inserting part of the material (host): hereditary alien to it or both ways any cellular biological entity, capable of self-sustaining and responding to forces: (organism) a living organism evolutionary; The organism that receives genetic material from the donor organism. (recipient organism): a recipient organism artificially modified genotypes capable of transmitting genes: (transgenic material) a genetically modified material recombinant to other neighborhoods any plant, animal or microbial origin material or from any source whatsoever: (genetic material) It contains functional inheritance units (Elekes, 2014). The total sum of chromosomes and all hereditary material: genome, genome, genetic makeup of an organism chromosomes found in a particular organism

1-4 Environmental risks

Environmental risks that have selective advantages that allow an undesirable change to the ecosystem danger is the sum of the probability of a biohazard occurring and the severity of that hazard. Probability Genetic engineering products: (genetic engineering products). Its components or products resulting from expression of the target gene in genetically engineered organisms buildings (such as laboratories or greenhouses) that surround neighborhoods for

the purpose of (contained facility): a containment facility effectively restricting its movement and limiting its movement outside this structure (Grispen, *et al.* 2011).

The structural and functional unit of genetic information that controls the characteristics of living matter. It is a phrase, the pieces of DNA that carry the genetic information. A living organism, substance, or any other means used to transfer genetic material from a living organism to a vector future organism any individual in the plant kingdom a plan system of containment or semi-containment operations established by control system biological or physical. Any system that does not comply with the environmental conditions to restrict the reproduction of organisms is called an open system. Techniques used to treat deficient RNA: (genetic engineering) or under in vivo conditions or on the organism in vitro oxygen and RNA in vitro (Gu, *et al.* 2015).

1-5 Applications of biotechnology in Iraq

Selection and breeding: It is one of the most important traditional methods that have been used and are still widely used in various organisms, where it depends on cross-breeding between individuals bearing a set of desirable traits, it produces, there are new individuals in each of them with a new genetic form, and cross-breeding may soon be within the same species or between species or beyond that between the races, which is difficult. Hybridization depends mainly on the good choice of parents and on the mechanism of implementation of hybridization recently, hybrid varieties have increased, especially in the field of seed production vegetables, crops, etc. The process of selection and breeding based on cross-breeding is widely used in various fields among them, we mention: The development of many strains and varieties of grains and legumes such as wheat, barley, corn and lentils and chickpeas, beans and cotton, as well as in the field of vegetables, where many strains of tomato and watermelon were developed yellow, red, cucumber, cabbage, onions, etc., and many bodies are interested in this area. The General Commission for Scientific Agricultural Research, the Atomic Energy Commission, and the Remote Sensing Commission. For a large number of types of vegetables that carry a set of desirable qualities with regard to resistance to some diseases and increase productivity, as is the case in the first generation hybrids of tomatoes, cucumbers, eggplant and watermelon and in the field of fruit trees there are many hybrids of some types of fruits and in the field of production, there are many attempts made on farm animals such as cows, sheep, goats and others. **Mutations:** is defined as a sudden, continuous change in the genetic structure that is not caused by isolation or the new combinations, and a new allele arises from it that differs from the original allele in the extent of its action and its effect on expression appearance of a particular trait. Mutation is passed down from generation to generation and is the main source of all differences. Genetic mutations are divided into two types (He, *et al.* 2015). **Spontaneous mutation:** which appears in the form of sudden, natural genetic changes and reappears every now and then the rate of its occurrence is very low the incidence of spontaneous mutation depends on the condition.

Physiological and biochemical of the cell. Since the discovery of mutations, geneticists have been studying how control of mutations and the possibility of creating new genetic traits, and scientists have come up with the use of effects. External accelerates the rate of occurrence of the mutation and this is called the emerging mutation. **Induced mutation:** It is the mutation that results industrially from treatment with mutagens X-rays have an effective effect in generating mutations, and it has become known that alpha, beta and gamma rays are among the 1943 is credited with discovering that Auer Bach is the most powerful influence on the creation of mutations. And it was for the world Chemicals have an effective effect in increasing the rate of mutations have been exploited in many experiments by plant breeders, but in the field of animal husbandry its uses are very limited (He, *et al.* 2015).

In Iraq, many attempts have been made to use mutations to produce new strains or varieties in the field of fruit trees, field crops and legumes using the new boom as in the activity which is carried out by the General Authority for Scientific Agricultural Research in the development of new strains of soybeans, which are in Its way of approval is due to its good quality qualities and an increase in production, and radioactive mutations have been used In the production of salt-tolerant, drought tolerant, late blight-resistant potatoes and white rot-resistant garlic,

As well as in the production of sterile males for some economic pests, such as the apple fruit worm in the Atomic Energy Authority there are many varieties of fruits that resulted from natural mutations and have been approved for their important specifications, as is the case in the orange, which is one of the most luxurious varieties of citrus fruits, as well as a type of citrus apple and Top Red, which are considered among the luxurious red varieties, which are widely cultivated in most of the apple growing areas are in the country.

Tissue culture: It means the cultivation of any plant part on an artificial nutrient environment that contains all the factors necessary for the life of the plant organ under fully sterile conditions free from microbial contamination and there are several tissue culture levels, including:

- A. **Plant organ transplantation:** It refers to the cultivation of plant organs such as growing tops or leaves...etc.
- B. **Embryo transplantation:** It means the implantation of separated embryos, whether they are fully developed or incompletely developed.
- C. **Cell culture:** This is done by cultivating single cells or in the form of very small cell aggregates in an environment liquid nutrient.
- D. **Cultivation and fusion of protoplasts:** It means the cultivation of cells that have removed the cell wall.
- E. **Production of monoecism plants:** by cultivating anthers, pollen, or eggs plant tissue culture is used in many important applications, which include: Propagation of plants that are difficult to grow Propagation by traditional methods, obtaining physical variations, producing plants free of viral diseases (Xia, *et al.* 2013).

2- CONCLUSIONS AND RECOMMENDATIONS

There are several applications, including modern biotechnologies in Iraq, the use of molecular biology technologies for many purposes, including: making genetic maps, characterizing and identifying different plant species, varieties and breeds, evaluating genetic assets in genetic banks, studies of the emergence and development of strains and ensuring the purity of genetic resources, and other that or a set of genes from one organism through which a gene is transferred to another organism the host and the ability of this material to be transferred the genome of a living organism to the genetic material. Expressing itself in the host organism, making it perform a function that was not originally there, but acquired from the donor, and the two organisms may be of the same species or they may not have any genetic relationship between it.

In Iraq in its initial stages, and in general, the use of biotechnologies in Iraq is still new, knowing that these technologies can play a major role in agricultural development, but there is a lack of understanding and knowledge of these technologies, their benefits and the dimensions of risks on humans and the environment. So far there are no LMOs resulting from the use and circulation of GMOs anybody responsible for monitoring and controlling the use, handling and transfer of genetically modified products, and there is an urgent need to issue evidence for the safe application and control of the effects of genetically modified organisms on human health and biodiversity. This shortage is linked to the lack of legislation regulating the work of biotechnologies and biosecurity, and thus the inability to do so the risk assessment for the ecosystem and endemic species is very low, and public awareness is very low the field.

At the national level there are no locally produced genetically modified crops. But it is likely that some genetically modified materials (soybean and corn) may have entered our local markets in different ways without subjecting them to the necessary tests as a result of the lack of scientific methods to detect these products, which requires It is necessary to expedite taking the necessary measures and tests, and to monitor the entry of various products into the country.

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