Use of gamma in the production of new Iranian cultivars of mutant gladiolus (Fusarium-tolerant)

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Abstract

Use of gamma rays to create genetic diversity in flowers and horticultural plants such as a modern breeding methods to reduce the length of the breeding period and play an effective role in the development of new cultivars with superior characteristics. In the plant breeding technique with gamma rays, strategic plants with the aim of increasing variation, quality and yield, tolerance of biotic and abiotic stresses, durability and marketability are considered. Gladiolus is one of the most horticultural crops in the world and as a cut flower has great economical value in the world. Mutation breeding is an established method for improvement and has played a major role in the development of new mutant cultivars. The steps include determining the breeding target, Cooling, Induced mutations with Gamma, dosimetry, compatibility, trait stability assessment, evaluation of tolerance and resistance to fungal diseases, selection and introduction.

Keywords: Genetic diversity, Corm, Biotic and abiotic stresses, Mutations and New cultivars

Introduction

Flowers and ornamental plants give color, beauty and energy to the living environment as well as strengthen the immune system, brain and lung function, cause disease resistance [1]. The most important ornamental plants in the world are include rose, carnation, chrysanthemum and gladiolus, respectively, which are currently being studied and researched by the Nuclear Agriculture Research Institute as a joint project [2,3].

The production of flowers and ornamental plants is a profitable economy in most countries of the world, including the Netherlands, Japan, China and the US [2]. In Iran, studies have been done only in the field of planting improvement, and not much work has been done in the field of breeding improvement [2]. The luxury and diverse flower and plant market is in high demand for new varieties [2,3]. Due to Iran's non-membership in the Global Protocol UPOV (Protection of Reproductive Rights) and due to the easy reproduction of ornamental plants, Suitable quality cultivars are not given to Iran [2]. On the other hand, modification of new cultivars by classical methods is not possible due to heterozigosity, flower structure and physiological barriers; Therefore, mutation breeding is the most effective way to improve cultivars and the need to pay attention to this industry and try to improve the different species of flowers and ornamental plants to increase marketability and exports [2,3].

Modern modification of flowers and ornamental plants, including somaclonal diversity in tissue culture and induced mutations, production of polyploid and haploid plants, as well as the use of markers, genetic engineering and biotechnology techniques in the improvement of horticultural plants, with The aim is to create diversity in color, shape and structure and increase marketability [1-5]. In any breeding program, genetic diversity and modification is essential to improve plant characteristics [4]. Mutation induction is one of the most effective ways to increase natural genetic resources, improve and introduce new cultivars among crops that are propagated by seed or unsexual methods [2,4]. Increase yield, tolerance to biotic and abiotic stresses such as increase the plant's resistance to drought, salinity, pests and diseases, variation, shelf life and Perfume of the flower [2,4].

Climate change has continued, Water and soil resources are declining [3], Scientists and the international community encouraged to find the right solution, so that the need to invest in research and development (R&D) and new technologies which are mainly for the optimal use of resources, increase the efficiency of inputs, conservation of natural and environment resources [5].

At present, in the Nuclear Agriculture Research school, some strategic flowers and horticultural plants that have a very high potential for currency, income generation and employment are being studied and researched, which include: Rose, Anthurium, orchids, Gladiolus, Chrysanthemums, Irises, Pothos, Zamofolia, Sansevieria and Aglonema, and some Cacti, Succulents and Medicinal plants. This article describes about Gladiolus breeding methods and protocoles. Gladiolus belongs to the Iridaceae family in temperate, arid and summer regions. In Gladiolus, reproduction can originate from seed, but due to heterozygosity, it does not lead to pure and desirable propagation; Therefore, the corm are used for asexual reproduction. Gladiolus is one of the most important of cut flowers; In terms of area under cultivation in Iran, it is the first among cut flowers and onion flowers and is one of the native plants of Iran and has a good position in terms of production and

introduction of new cultivars. Problems of imported cultivars, due to non-native cultivars, lack of adaptation to Iran's climate and their susceptibility to fungal diseases such as Fusarium, the growing need for new cultivars, It prompted us to design the breeding project.

Experimental

Preparation of the materials

Corms intended for breeding experiments must be grown and stored under similar conditions.After cooling the corms at 4 ° C for 40 days, White Sport, Rose soprim, Amsterdam Rose and Red Adonis corms were treated with gamma radiation with cobalt 60 source in Gamma-cell located at the Nuclear Agriculture Research Institute and the optimal dose based on 50% survival and 50% reduction in plant growth (LD50) for corms Radiation was determined [1-5].

More than 600 corms for each cultivar were treated with gamma ray at the optimal dose. Separating generations and clones with favorable changes in important morphological and marketable traits such as color, number of florets, spike length, flower shape, flower height were preserved, five of which due to changes in color and habit Growth have been selected [1-5].

After propagation and selection of these mutant genotypes in the field and research greenhouse, for additional testing will be studied according to common methods. According to the UPOV guidelines, quantitative traits will be measured by calipers, ruler and meters. Color-related traits are performed based on the RHS color chart. Also after purification and identification of fungal agents, gladiolus corms were treated With Fusarium disease agent In three repetitions and evaluated using Koch test [4].

Results and discussion

New cultures that result from complex crosses between specific groups are heterozygous and tetraploid [2,4]. On the other hand, knowledge of inherited traits is also poor, so the maternal basis for choosing parents for crossbreeding is not usually available [2,4]. Research has shown that in short-term breeding programs, mutation induction techniques can increase the frequency of gene mutations, the formation of new germplasm and cultivars [2,3]. Numerous fungal, viral and bacterial diseases affect gladiolus culture. Different species of Fusarium fungus cause jaundice, onion rot, leaf browning and wilt [1-4]. Evaluations continue on Fusarium tolerance. As a result of these works, a series of Gladiolus cultivars have been obtained that need to be evaluated and introduced in the market [Figure 1].

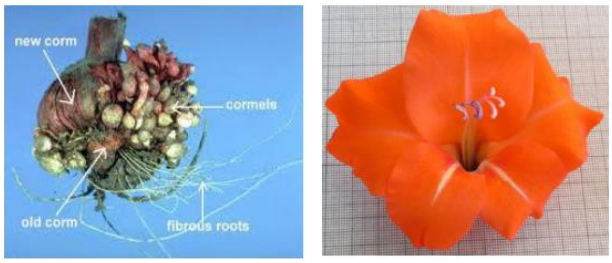

Figure 1. Gladiolus corm and mutant gladiolus flower

Conclusions

Mutations breeding and producing cultivars in this way in gladiolus is the first time in the country. The development of some characteristics such as winter flowering ability, flower aroma and resistance to major pathogens is also considered [1-5]. One of the most important goals of ornamental plants is to change the color of the flowers [5]. 40-60 Gy was appropriate dose for gladiolus irradiation and Evaluations continue on Fusarium tolerance. The importance of producing flowers and ornamental plants in Iran for reasons such as currency exchange through sales to neighboring countries, job creation for 12 people per ½ hectare In the greenhouse, high productivity in greenhouse cultivation and improving water use efficiency due to the off-season, cheap labor force and, high light and cheap energy. Iran is ranked 17th in flower production and 115th in flower exports [1-2,5].

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